Grade 2

End of Year Teacher Pack

Includes:

- Lesson Plans
- Blackline Masters
- Assessment & Practice Book Answers
- Quizzes and Unit Tests
- Rubrics for Scoring Quizzes and Tests
- Common Core State Standards Correlations
Unit 4 Number and Operations in Base Ten: Strategies for Large Numbers

This Unit in Context
Having counted by 2s, 3s, 4s, and 5s within 20 starting at zero in 2.2 Unit 3 (2.OA.C.4), in this unit students will count by 5s, 10s, and 100s within 1,000 with different start points (2.NBT.A.2), including zero. Starting from zero leads naturally to multiplication by 10 and 100, which students will begin in Grade 3 (3.NBT.A.3) and continue in Grades 4 and 5 (4.NBT.A.1, 4.NBT.B.5, and 5.NBT.A.2). Skip counting by 5s, 10s, and 100s starting at zero is a required skill for efficient counting, is used in data management in Grade 3 when scales become multi-unit (3.MD.B.3), and is used when doing measurement conversions within the metric system from larger units to smaller ones (4.MD.A.1).

The ability to skip count from any number helps develop fluency in mentally adding and subtracting tens and hundreds; this will help students with more general mental math calculations (for example, if students recognize that 347 + 200 is 547, they can build on that understanding to add 347 + 216) (2.NBT.B.7 and 3.NBT.A.2).

Mathematical Practices in This Unit
In this unit, you will have the opportunity to assess MP3 and MP5 to MP8. Here are some examples of how students can show that they have met a standard.

MP5: In NBT2-42 Extension 5, students choose strategically when to use pencil and paper or mental math to solve addition problems involving the addition of a two-digit number to a three-digit number.

MP6: In NBT2-45 Extension 3, students attend to precision when they use math words such as subtract, subtraction, more than, less than, and equal to explain how they found missing numbers in an equation.

MP8: In NBT2-44 Extension 2, students look for and express regularity in repeated reasoning when they try several examples of subtracting 10 and 100 and notice the pattern of which digits remain unchanged.
Unit 4  Number and Operations in Base Ten: Strategies for Large Numbers

Introduction

In this unit, students will skip count by 10s, 100s, and 5s, as well as develop fluency in mentally adding and subtracting tens and hundreds. In addition to building automaticity in these essential calculations, this unit lays the foundation for multiplication later on.

In the first lesson, students will count by 10 and 100 from multiples of tens and hundreds. In the second lesson, they will use place value to find patterns when adding tens and hundreds to numbers that are not multiples of 10 or 100. The first two lessons closely parallel each other. The third lesson incorporates both types of repeated addition for skip counting by 5s; students start from multiples of 5, then skip count on from any number. In the fourth lesson, students will develop fluency working with tens and hundreds in addition and subtraction. Finally, in the last number and operations lesson in Grade 2, they will do puzzles and word problems using what they have learned.

NOTE: The comma separator for four-digit numbers (e.g., 1,000) does not appear in the AP Book or the Teacher’s Guide in Grade 2.

The following Generic BLM, found in section U, is used in Unit 4:

BLM Hundreds Charts (p. U-4)
Goals
Students will skip count by 10s and 100s starting from a multiple of 10. Students will begin to develop automaticity in adding 10 to multiples of 10.

PRIOR KNOWLEDGE REQUIRED
Can count by tens
Can represent 100 as 10 tens
Can read and write numbers to 999 in numerals

MATERIALS
base ten blocks (optional)
paper base ten blocks to affix to the board, at least 10 hundreds and 20 tens (optional)

Practicing counting by tens. As a class, skip count by 10s to 100.

Skip counting by 10s to 200. ASK: When you count by tens, what comes after 100? (110) After that? (120) Prompt all the way to 200. As a class, count by tens from 10 to 200.

Write on the board:
130, __, __, __, 170, __, __

Have volunteers fill in the blanks by skip counting by 10, as shown below:
130, 140, 150, 160, 170, 180, 190

For the following exercise, remind students that the numbers they say when counting by tens are called multiples of 10.

Exercises: Write the multiple of 10 that comes before and after the number.

a) __, 70, __

b) __, 120, __

c) __, 150, __

Bonus: __, __, 200

Answers: a) 60, 70, 80; b) 110, 120, 130; c) 140, 150, 160; Bonus: 180, 190, 200

Write on the board:
10 20 30 40 50 60 70 80 90 100
110 120 130 140 150 160 170 180 190 200

ASK: What is the same about all the numbers we say when we count by 10? (they all end in 0) Underline the number of tens in each number (not the tens place).
The final picture should look like this:

\[
\begin{array}{cccccccccccc}
10 & 20 & 30 & 40 & 50 & 60 & 70 & 80 & 90 & 100 \\
110 & 120 & 130 & 140 & 150 & 160 & 170 & 180 & 190 & 200 \\
\end{array}
\]

SAY: Look at the underlined numbers. Have a volunteer read the underlined numbers aloud (1, 2, 3, … , 20) ASK: What did [volunteer] do when he read the numbers? (he counted) As you ask the following questions, point to the numbers on the board. ASK: How many tens do you need to make 10? (1) 20? (2) 50? (5) 120? (12) What do the underlined numbers count? (the number of tens)

**Counting tens to make a number.** On the board, draw or affix 15 tens, grouped as 10 tens and 5 tens. Count the tens together, and ASK: What number does this show? (150) Count by tens aloud, pointing to each one in turn to 150. Write “150.” ASK: How many tens did I draw? (15) What do you notice about 15 and 150? (150 is 15 with a 0 on the end) Underline the 15 in 150.

Repeat with 170. Draw the tens as one group of 10 tens plus 7 tens. (170)

**Exercises:** What number do the tens blocks show?

\[
\begin{array}{ccc}
a) & b) & \text{Bonus:} \\
\end{array}
\]

**Answers:** a) 120, b) 140, Bonus: 200

Write on the board:

180

ASK: How many tens do we need to make 180? (18) SAY: We can make 180 with a hundreds block and 8 tens or we can make it with 18 tens. Underline the 18 in the number. Draw (or affix) the tens, grouped as 10 tens and 8 tens, as shown below:

\[
\begin{array}{ccc}
180 \\
\end{array}
\]

If students need more practice, write different multiples of 10 on the board and ask how many tens are needed to make the number. Underline the part of the number that gives the answer but do not draw the blocks. For example, write “160.” ASK: How many tens do we need to make 160? (16) Underline the 16. (160)

**Exercises:** Draw tens blocks to show the number.

\[
\begin{array}{ccc}
a) & \text{Bonus:} \\
\end{array}
\]

**Answers:** a), Bonus:
Adding ten. Draw or affix 16 tens blocks grouped as 10 tens plus 6 tens. ASK: How many tens blocks are there? (16) What number do the tens blocks show? (160) Write “160” below the blocks and underline the 16. SAY: What if we add 10 more? Draw a plus sign and another tens block. ASK: How many tens are there now? (17) Do you need to count again? (no) What number do the blocks show now? (170) The final picture should look like this:

\[
\begin{array}{c}
\text{160} \\
+ \\
\text{10}
\end{array}
\]
\[= \text{170}\]

Repeat with \(210 + 10 = 220\).

For the following exercise, have students work with a partner to do the bonus question. You may wish to distribute base ten blocks or have students draw tens blocks.

Exercises: Add.

\[
a) \quad 110 + 10 \\
b) \quad 140 + 10 \\
c) \quad 190 + 10 \quad \text{Bonus:} \quad 360 + 10
\]

Answers: a) 120, b) 150, c) 200, Bonus: 370

Write on the board:

\[
130 + 10
\]

ASK: How many tens blocks would we need to draw 130? (13) Underline the 13 in 130. ASK: To add 10, how many more tens blocks do we need? (1) ASK: How many tens blocks do we have after adding the tens block? (14) Write “= 140” on the board. The final picture should look like this:

\[
130 + 10 = 140
\]

Cover or cross out the ones digits and SAY: When we add ten, it’s like counting without the ones digit.

Repeat with \(180 + 10 = 190\).

Exercises: Add.

\[
a) \quad 170 + 10 \\
b) \quad 120 + 10 \\
c) \quad 150 + 10 \quad \text{Bonus:} \quad 290 + 10
\]

Answers: a) 180, b) 130, c) 160, Bonus: 300

Counting and adding tens beyond 200. ASK: When you count by tens, what comes after 200? (210) As a class, count by tens from 200 to 300 then from 500 to 600. Write on the board:

\[
720, __, __, 750, __, 770, __, __
\]

Have volunteers fill in the missing numbers on the board, as shown below:

\[
720, 730, 740, 750, 760, 770, 780, 790
\]
Exercises: Count by tens to fill in the missing numbers.
   a) 410, __, __, 440, ___  b) 940, __, __, __, 980
c) __, __, 640, ___

Answers: a) 410, 420, 430, 440, 450; b) 940, 950, 960, 970, 980;
c) 620, 630, 640, 650

Write “340” on the board. ASK: How many tens would we need to make 340? (34) Underline the 34, as shown below:

340

Write “+ 10” beside 340 and ASK: How many tens will we have if we add 1 more? (35) So what is 340 + 10? (350) Write “= 350” and underline the number of tens. The final picture should look like this:

340 + 10 = 350

Exercises: Add.
   a) 560 + 10  b) 780 + 10  Bonus: 690 + 10

Answers: a) 570, b) 790, Bonus: 700

Counting by hundreds. Draw or affix 10 hundreds blocks on the board. Below the first block, write “100.” SAY: If we have only 1 hundreds block, it makes 100. ASK: What do 2 hundreds blocks make? (200) Write “200” below the second block. Continue until you have written “900,” then SAY: 10 hundreds blocks makes 1000. Write “1000,” as shown below:

100 200 300 400 500 600 700 800 900 1000

SAY: You have learned that the numbers that we say when we count hundreds are multiples of 100. ASK: What is the same about all the multiples of 100? (they end in 2 zeros) What do the multiples of 10 end in? (zero) Is 100 a multiple of 10? (yes) Can a number be a multiple of 100 hundred and a multiple of 10? (yes) SAY: All of the multiples of 100 are also multiples of 10 because they all end in zero.

SAY: Since we are counting hundreds, we can ignore both of the ending zeros. Underline all but the last 2 zeros and have a volunteer read the underlined numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 10) ASK: What is [volunteer] doing? (she is counting)

Erase the picture from the board. Write on the board:

600

The final picture should look like this:

500, 600, 700

Repeat with 300. (200, 300, 400)

**Exercises:** Write the multiples of 100 that come before and after the number.

a) __, 400, __

b) __, 800, __  **Bonus:** __, 1200, __

**Answers:** a) 300, 400, 500; b) 700, 800, 900; Bonus: 1100, 1200, 1300

**Extensions**

1. Jane counted by tens. Find her mistake.
   a) 640, 650, 606, 670, 680
   b) 270, 280, 290, 2100, 2110
   c) 530, 540, 550, 650, 750

   **Answers:** a) 606 should be 660; b) 2100, 2110 should be 300, 310; c) 650, 750 should be 560, 570

2. Bill counted by tens 4 times. The last number he said was 90. What number did he start from?

   **Answer:** 50

3. a) Anne has 150 apples on Monday. She picks 10 more apples each day on Tuesday, Wednesday, and Thursday. How many apples does she have on Thursday?

   b) Anne has 150 apples on Monday. She gives away 10 apples each day on Tuesday, Wednesday, and Thursday. How many apples does she have on Thursday?

   **Answers:** a) 180, b) 120

4. a) Start at 0. Add 10. Add 100. Then add 10 and add 100 again. Repeat until you have written 10 numbers.

   b) Circle 0. Then circle every other number in your list.

   c) What do the circled numbers have in common?

   **Answers:** a) 0, 10, 110, 120, 220, 230, 330, 340, 440, 450; b) 0, 10, 110, 120, 220, 230, 330, 340, 440, 450; c) The first 2 digits are the same.

5. a) Start at 0. Add 100. Add 100 again. Add 10. Add 10 again. Repeat the pattern until you reach 660.

   b) Which numbers in part a) also appear in Extension 4 part a)?

   c) Why do those numbers appear in both questions?

(MP3, MP7)
Answers: a) 0, 100, 200, 210, 220, 320, 420, 430, 440, 540, 640, 650, 660; b) 0, 220, 440; c) after 4 turns in Extension 4, you add 10 + 100 + 10 + 100 = 220, and in part a), you add 100 + 100 + 10 + 10 = 220, so every 4 turns the number will be the same.

6. A carton holds 100 cans of soup. The store buys 600 cans. How many cartons do they get?
Answer: 6

7. Carlos has 540 blocks to put away. He puts them in piles of 10 blocks. Then he puts 10 piles of ten into plastic bags. Carlos stops when he has fewer than 10 piles left.

a) Draw a picture to show the bags of blocks and the piles of blocks.
b) Carlos puts the bags away one at a time. Then he puts away the piles one at a time. Write numbers to show the blocks as he puts them away.
c) Write numbers to show the blocks that are left as he puts them away.

Answers
a) 100 100 100 100 10 10 10 10
b) 0, 100, 200, 300, 400, 500, 510, 520, 530, 540
c) 540, 440, 340, 240, 140, 40, 30, 20, 10, 0

8. Have students do this exercise mentally. Write a random two- or three-digit number on the board. Have students do a series of additions of either 10 or 100. Start with only 2 or 3 additions, and gradually increase to longer sequences. For example, write “120.” Then SAY: Add 10 to 120. Add 100 to your answer. Now add 10 again. ASK: What is the final answer? (240) Have students keep track of tens on their right hand and hundreds on their left hand.
Goals
Students will skip count by 10s and 100s starting from any number. Students will begin to develop automaticity in adding 10.

PRIOR KNOWLEDGE REQUIRED
Can count by tens
Can represent 100 as 10 tens
Can read and write numbers to 999 in numerals

MATERIALS
- paper base ten blocks to affix on the board, at least 20 tens and 10 ones (optional)
- base ten blocks
- BLM Hundreds Charts to 400 (pp. O-24–27, see Extensions 2 and 3)

NOTE: This lesson mirrors Lesson NBT2-41 but works with numbers that do not end in 0.

Counting tens and ones. Draw or affix blocks on the board to represent 163 using 16 tens grouped as 10 tens and 6 tens, and 3 ones. Count the tens together as a class and ASK: What number do the tens show? (160) What number do all the blocks show? (163) Write “163” below the blocks. Point as you SAY: The tens give the first 2 digits (underline them) and the ones give the ones digit. The picture should look like this:

```
 163
```

Repeat with 241. Draw the tens as 10 tens and 4 tens. The final picture should look like this:

```
 241
```

Exercises: What number do the blocks show?

a)  
```
  
```

b)  
```
  
```

Bonus:  
```
  
```

STANDARDS
2.NBT.A.2, 2.NBT.B.8

VOCABULARY
digit
hundreds
multiple of 10
ones
tens

digit
hundreds
multiple of 10
ones
tens

US 2.2 LP U4 NBT41-45 O1-23 V7.indd   8
2019-04-23   1:37:44 PM
**Answers:** a) 172, b) 123, Bonus: 318

Write on the board:

142

ASK: If we do not use hundreds blocks, how many tens blocks do we need to show 142? (14) Underline 14. ASK: How many ones do we need? (2)

Have a volunteer draw or affix blocks to represent 142 using only tens and ones. SAY: We made this by making 140 and 2. Write “140” below the tens, add a plus sign and “2” below the ones. SAY: 14 tens blocks makes 140. The final picture should look like this:

```
140 + 2
```

Repeat with 256.

**Exercises:** Draw tens and ones blocks to show the number.

a) 137  

**Answers:** a) 137, Bonus: 215

**Adding ten.** Draw or affix blocks to represent 136 using 13 tens blocks grouped as 10 tens plus 3 tens, and 6 ones. ASK: How many tens blocks are there? (13) What number do the tens blocks show? (130) What number do the blocks show altogether? (136) Write “136” below the blocks and underline the 13. SAY: What if we add 10 more? Draw a plus sign and one more tens block. ASK: How many tens are there now? (14) Do you need to count them again? (no) What number do the blocks show now? (146)

ASK: What is in the ones place? (6) Has the ones place changed? (no) Why not? (we added a 10 which does not change how many ones there are)

SAY: When we add tens blocks to a number, the ones digit never changes. Write “+ 10 = 146” beside 136. The final picture should look like this:

```
136 + 10 = 146
```

Repeat with 244 + 10 = 254.

For the following exercises, provide students with base ten blocks.

**Exercises:** Use blocks to add the tens. Then add the ones.

a) 117 + 10  

**Answers:** a) 127, b) 184, c) 193, Bonus: 362
Write on the board:

$$146 + 10$$

ASK: How many tens blocks would we need to draw 146? (14) Underline the 14 in 146. ASK: To add 10, how many more tens blocks do we need? (1) ASK: How many tens blocks would we have after we added the ten? (15) Would the ones change? (no) How many ones blocks would we have? (6) Write “= 156.” The final picture should look like this:

$$146 + 10 = 156$$

Cover or cross out the ones digits and SAY: Even when the ones are not zero, when we add ten, it is like counting without the ones digit.

Repeat with 269 + 10 = 279.

**Exercises:** Add.

a) 156 + 10  
   b) 287 + 10  
   c) 679 + 10  
   **Bonus:** 893 + 10

**Answers:** a) 166, b) 297, c) 689, Bonus: 903

**Counting by tens.** SAY: What if we count by tens starting at a number that is not a multiple of 10, like 3? Write “3” on the board. Draw 3 ones above the 3. ASK: If we add 10, what do we get? (13) Draw 1 ten beside the ones and write “13.” Draw another ten and ASK: What if we add 10 again? (23) What if we add 10 one more time? (33) Underline the tens digits. The picture should look like this:

```
  3
  13
  23
  33
```

SAY: We did not add or take away any ones so the ones digit stays the same. It is always 3. ASK: What do you notice about the tens digit? (it counts by 1 each time)

Write “726” on the board. ASK: How many tens would it take to make 726? (72) Underline 72. If we add 10, how many tens would there be? (73) What is 726 + 10? (736) Write “736” and underline the 73. Repeat the question to create the following sequence on the board:

$$726, 736, 746, 756, 766$$

Repeat with 854 adding 10 three times. (854, 864, 874)

**Exercises:** Add 10 each time.

a) 51, 61, __, __, __  
   b) 144, 154, __, __, __  
   c) 667, 677, __, __, __  
   **Bonus:** 992, 1002, __, __, __

**Answers:** a) 51, 61, 71, 81, 91; b) 144, 154, 164, 174, 184; c) 667, 677, 687, 697, 707; Bonus: 992, 1002, 1012, 1022, 1032
Counting by hundreds. Draw on the board:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

SAY: If we have only 1 hundreds block, it makes 124. Underline the 1. ASK: What do 2 hundreds blocks make? (224) Write “224” below the second block and underline the 2. Continue asking in this way until you write “924.” SAY: 10 hundreds blocks makes 1 thousand so this is 1024. Write and underline “1024.” The final picture should look like this:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>24</td>
<td>124</td>
<td>224</td>
<td>324</td>
<td>424</td>
<td>524</td>
<td>624</td>
<td>724</td>
<td>824</td>
<td>924</td>
</tr>
</tbody>
</table>

SAY: What is the same about all of the numbers? (they end in 24) Does adding hundreds change the tens or ones digit? (no) SAY: When we add hundreds, the tens and ones digits stay the same, and we count up by 1 from the hundreds digit. Count the underlined numbers together as a class.

Clear the board. Write “452” on the board. ASK: How many hundreds in 452? (4) Underline the 4. ASK: What number do we get when we add 100? (552) If we add again? (652)

Repeat with 207. (307, 407) Repeat with 620. (720, 820)

**Exercises:** Add 100 each time.

a) 329, 429, ___, ___

b) 506, 606, ___, ___

**Bonus:** 740, 840, ___, ___

**Answers:** a) 329, 429, 529, 629; b) 506, 606, 706, 806; Bonus: 740, 840, 940, 1040

**ACTIVITY**

Provide students with base ten blocks. In this activity, students will predict how many tens or hundreds they need to add to make a new number. Have students make a number, say 62, using tens and ones. Ask them to guess how many tens they will need to add to make another number, say 92. Then have them add tens to make 92. ASK: How many hundreds will you need to add? (3) Then have them build 392. Continue in this way with students adding tens and hundreds.
Extensions

1. Nina has 326 stickers in her collection. She wants to have 700 stickers. Each week, she can buy only a pack of 1, 10, or 100 stickers.

   a) Each week, Nina buys as many stickers as she can without getting more than 700. Write how many stickers she has at the end of each week.

   b) Nina can buy 100 stickers only every 4 weeks. Write how many stickers she has at the end of each week.

   **Answers:** a) 326, 426, 526, 626, 636, 646, 656, 666, 686, 696, 697, 698, 699, 700; b) 326, 426, 436, 446, 456, 556, 566, 576, 586, 686, 696, 697, 698, 699, 700

Distribute **BLM Hundreds Charts to 400** for Extensions 2 and 3.

2. a) Start at 23. Add 100 three times. Shade the numbers on BLM Hundreds Charts to 400.

   b) Put the charts on top of each other, one at a time. What do you notice?

   **Answers:** a) 23, 123, 223, and 323 are shaded; b) the numbers line up


   a) What do you notice about the two charts?

   b) Can you shade charts 3 and 4 without adding? Explain.

   **Answers:** a) The numbers all line up. b) Yes, because the answers will be in the same place on the charts.

4. Students do the exercise mentally. Write a random two- or three-digit number on the board. Have students do a series of additions of either 10 or 100. Start with only 2 or 3 additions, and gradually increase to longer sequences. For example, write “126.” SAY: Add 10 to 126. Add 100 to your answer. Now add 10 again. ASK: What is the final answer? (246) Have students keep track of tens on their right hand and hundreds on their left hand.

   **(MP5, MP7)**

5. Use pencil and paper or mental math to answer the question. Explain your choice.

   a) 370 + 30  b) 440 + 80  c) 323 + 49  d) 290 + 70

   **Sample explanations:** a) I added mentally because 70 and 30 make a hundred, so 370 + 30 = 400; b) I added mentally because I can split 80 into 60 + 20, so 440 + 80 = 440 + 60 + 20 = 500 + 20 = 520; c) I used pencil and paper because I couldn’t see an easy way to add mentally: 323 + 49 = 372; d) I added mentally because I can split 70 into 10 + 60, so 290 + 70 = 290 + 10 + 60 = 300 + 60 = 360
Goals

Students will skip count by 5s using patterns in place value.

PRIOR KNOWLEDGE REQUIRED

Can add 5 to three-digit numbers

MATERIALS

BLM Hundreds Charts (p. U-4)
transparency of one chart from BLM Hundreds Charts (p. U-4)

Counting by fives from a multiple of 5. Give students BLM Hundreds Charts. Project one chart from BLM Hundreds Chart on the board. SAY: On the first hundreds chart, we will shade the numbers that you say when you count by fives. ASK: What number do we shade first? (5) Shade 5 on your chart and have students shade theirs. SAY: Count on by 5. Give students a chance to do this, then ASK: What number did you get? (10) Demonstrate counting on to 10 using your chart. Do this again so that everyone has shaded the number 15. Then have students continue on their own to shade the multiples of 5 to 100. Have a student who finishes quickly shade the projected chart.

As you circulate among students, have them take turns reading the multiples of 5. ASK: What do you notice about the numbers you say when you count on by fives? (they are in 2 columns on the chart, they all end in 0 or 5) SAY: These numbers are almost like the multiples of 10, except that the multiples of 5 end in 0 or 5. ASK: What do you notice about the tens digits? (tens digits stay the same twice and then change) SAY: Since there are two numbers shaded in each row of the hundreds chart, we get the same tens digit twice, and then it changes. That makes it easy to find the next multiple of 5 without adding.

Write on the board:

20

ASK: Is 20 a multiple of 5? (yes) SAY: Every number that ends in 0 or 5 is a multiple of five. What will the next multiple of five after 20 end with? (5) What number comes next if we add 5? (25) Write “25.” Repeat to get 30. SAY: We have a 2 in the tens digit twice so we need a 3 this time. Continue the sequence to 40. SAY: When we go from a number ending in 5 to a number ending in 0, the tens digit goes up. ASK: How do we know the tens digit has to go up without adding? (because the numbers are getting bigger) SAY: If the ones get smaller to make the number bigger, the tens have to be bigger. So we go from 25 to 30, and from 35 to 40.
The picture should look like this:

\[
\begin{array}{ccccc}
20 & 25 & 30 & 35 & 40 \\
\end{array}
\]

Repeat with 75. (75, 80, 85, 90, 95)

Repeat with 260. (260, 265, 270, 275, 280, 285) Underline the first two digits in each number. SAY: When we add fives we are not quite counting the tens because we say each number twice: 26, 26, 27, 27, 28, 28. Then write “295” on the board. ASK: What comes next? (300)

**Exercises:** Count by 5s.

a) 30, 35, __, __, __        b) 355, 360, __, __, __

**Bonus:** 785, 790, __, __, __

**Answers:** a) 30, 35, 40, 45, 50; b) 355, 360, 365, 370, 375; Bonus: 785, 790, 795, 800, 805

**Counting by fives from other numbers.** SAY: Let’s add fives starting from a different number. Shade 4 on your second hundreds chart. Project another chart from BLM Hundreds Chart on the board and shade 4. ASK: What is 4 + 5? (9) Have students shade 9, while you shade 9 on your chart. ASK: What is 9 + 5? (14) Shade it in. Have students continue shading and adding until they reach 100. As before, have a volunteer complete the projected chart.

ASK: What do you notice about the numbers you shaded? (they are in 2 columns, they end in 4 or 9, there are 2 per row) ASK: What is 5 + 5? (10) SAY: Adding 5 twice is the same as adding 10. ASK: How do you add 10 on a hundreds chart? (move down a row) SAY: When we add 5 over and over like this, we move across and then down, across and then down. Indicate this on the projection of the chart.

Write on the board:

\[
\begin{array}{c}
61 \\
\end{array}
\]

ASK: What is 61 plus 5? (66) Write “66.” Pointing at 61 on the hundreds chart, SAY: We moved across from 61 to 66. ASK: What comes next? (we move down) When we add 5, what comes after 66? (71) Write “71.” Repeat until the picture looks like this:

\[
\begin{array}{ccccc}
61 & 66 & 71 & 76 & 81, 86, 91 \\
\end{array}
\]

Underline the tens digits. Have a volunteer read the underlined numbers. ASK: What do you notice about the tens digits? (we say each one twice, then it changes)

 Repeat with 123 and add fives.

**Exercises:** Add 5 each time.

a) 12, 17, __, __, __        b) 48, 53, __, __, __

**Bonus:** 351, 356, __, __, __
Answers: a) 12, 17, 22, 27, 32; b) 48, 53, 58, 63, 68; Bonus: 351, 356, 361, 366, 371

Extensions

1. There are 5 school days in every week. Count by 5s to find how many days of school there are in 7 weeks.

   Answer: 5, 10, 15, 20, 25, 30, 35; there are 35 school days in 7 weeks

2. Sam has 21 stickers in his collection. He buys 5 more stickers each week. Show how many stickers he will have for the next 6 weeks.

   Answers: 21, 26, 31, 36, 41, 46, 51; after 6 weeks, Sam will have 51 stickers

(MP8) 3. Look for a pattern in the numbers you make by starting at 0 and adding 5s. Use the pattern to write five 4-digit numbers that you get when you start at 0 and add 5s.

   Sample solution: I started at 0 and wrote 1- and 2-digit numbers by adding 5s. I noticed that all the numbers that have ones digit 0 or 5 are numbers I can make by adding 5s when I start at 0. So I can use any 4-digit numbers that have ones digit 0 or 5. For example, 1005, 1010, 1015, 1020, 1025.
Goals
Students will use strategies based on place value to add and subtract 10 and 100 with fluency.

PRIOR KNOWLEDGE REQUIRED
Can count by tens to 990
Can count by hundreds to 900
Can add tens and hundreds within 1000
Can write three-digit numbers in numeric expanded form

MATERIALS
whiteboard, one per student (optional)

NOTE: The focus of this lesson is on mental math. Much of the in-class work is oral.

Adding ones, tens, and hundreds. Write “300” on the board. ASK: What is 300 + 1? (301) What is 300 + 10? (310) What is 300 + 100? (400). Write the answers on the board, as shown below:

\[
300 + 1 = 301 \quad 300 + 10 = 310 \quad 300 + 100 = 400
\]

Have students write answers on a piece of paper and hold it up. If students have whiteboards, they can use those instead of paper.

Repeat with 205. (206, 215, 305)
Repeat with 547. (548, 557, 647)
Repeat with 888. (889, 898, 988)
Repeat with more numbers but ask for the additions in any order (i.e., not always + 1, next + 10, then + 100).

Practicing with place value. Write “345” on the board and have a volunteer write the expanded form, as shown below:

\[
345 = 300 + 40 + 5
\]

ASK: How many of each kind of block do you need to make 345 (3 hundreds, 4 tens, 5 ones) Continue writing on the board:

\[
220 = \quad 202 =
\]

ASK: How many blocks are needed to make 220? (4 blocks) Which blocks? (2 hundreds, 2 tens) Write the expanded form. (220 = 200 + 20) ASK: How many blocks are needed to make 202? (4 blocks) Which ones? (2 hundreds, 2 ones)
Write the expanded form, as shown below:

\[ 220 = 200 + 20 \quad 202 = 200 + 2 \]

ASK: Which number is greater? (220) ASK: Why are there only 2 numbers in the expanded forms? (because one digit is 0) SAY: When there is a zero in a number, it is very important to put it in the correct place.

Write on the board:

\[ 670 = 600 + \underline{70} \quad 607 = 600 + \underline{7} \]

SAY: The expanded form for these numbers has only 2 numbers because of the zero. We have to be careful to add the correct number. What does the 7 stand for in 670? (70) What do we need to add in the expanded form? (70) What do we need to add for 607? (7) Have volunteers fill in the blanks as shown below:

Exercises: Write the expanded form.

a) 808  b) 880  c) 990  d) 909  e) 407  f) 530

Answers: a) 800 + 8, b) 800 + 80, c) 900 + 90, d) 900 + 9, e) 400 + 7, f) 500 + 30

Subtracting tens. Write on the board:

\[ 70 - 10 \]

ASK: What is 70 minus 10? (60) Write “= 60.” SAY: When we add 10, we count up in the tens digit. When we subtract 10, we count back in the tens digit. Underline the 7 and the 6 as shown below:

\[ 70 - 10 = 60 \]

Write “230 – 10” on the board. ASK: How many tens are needed to make 230 from tens? (23) Underline 23. ASK: How many tens will we have if we take away 1 ten? (22) What is 230 – 10? (220) Write “= 220” and underline the 22. The final picture should look like this:

\[ 230 - 10 = 220 \]

Write “157 – 10” on the board. ASK: How many tens do we need to make 157 without using hundreds blocks? (15) Underline the 15. ASK: If we take away 1 ten, how many will we have left? (14) So what is 157 – 10? (147) Write on the board and underline, as shown below:

\[ 157 - 10 = 147 \]

NOTE: Some students may use other methods to subtract. If so, encourage them to underline the first two digits, subtract 1 from the digits, and then recopy the last digit.
**Exercises:** Subtract.

a) $90 - 10$  

b) $130 - 10$  

c) $274 - 10$

d) $963 - 10$  

**Bonus:** $405 - 10$

**Answers:** a) 80, b) 120, c) 264, d) 953, Bonus: 395

Write “120” on the board. ASK: How many tens do we need to make 120?  
(12) Underline the 12. ASK: If we take away 1 ten, how many tens will we have left? (11) What is 120 $- 10$? (110) Write “110.” Repeat until you get to 80, as shown below:

$$120, 110, 100, 90, 80$$

Have a volunteer read the underlined parts of the numbers. ASK: What is [volunteer] doing? (counting back) SAY: When we add tens, we count on. When we subtract tens, we count back.

Write “253” on the board. ASK: How many tens are needed to make 253 without using hundreds? (25) Underline the 25. ASK: What will we get if we subtract 10? (243) Write “243” and underline the 24. SAY: We count back for the tens and the ones stay the same. Repeat until you get to 213, as shown below:

$$253, 243, 233, 223, 213$$

Write a three-digit number on the board and have each student in the class write or say the next number in the decreasing sequence. You might change numbers periodically or choose a large number and have the whole class participate in creating a long sequence.

**Subtracting hundreds.** Write on the board:

$$800 - 100$$

ASK: What is $800 - 100$? (700) Write “$= 700.” SAY: When we add 100, we count up in the hundreds digit. When we subtract 100, we count back in the hundreds digit. Underline the 8 and 7 as shown below:

$$800 - 100 = 700$$

Write “230 $- 100” on the board. ASK: How many hundreds do we need to make 230 from hundreds? (2) Underline the 2. ASK: How many hundreds will we have if we take away 100? (1) What is $230 - 100$? (130) Write “$= 130” and underline the hundreds digits. The final picture should look like this:

$$230 - 100 = 130$$

Repeat with $450 - 100$. (350)

Write “476 $- 100” on the board. ASK: How many hundreds do we need to make 476? (4) Underline the 4. ASK: If we take away 1 hundred, how many will we have left? (3) So what is $476 - 100$? (376) Write on the board and underline: $476 - 100 = 376$. 
Repeat with $893 - 100$, $760 - 100$, and $958 - 100$. (793, 660, 858)

**Exercises:** Subtract.

a) $600 - 100$  
 b) $420 - 100$  
 c) $893 - 100$  
 d) $752 - 100$

**Bonus:** $2341 - 100$

**Answers:** a) 500, b) 320, c) 793, d) 652, Bonus: 2241

Write “900” on the board. ASK: How many hundreds in 900? (9) Underline the 9. ASK: If we take away 1 hundred, how many will be left? (8) What is $900 - 100$? (800) Write “800.” Repeat until you get to 500, as shown below:

900, 800, 700, 600, 500

Have a volunteer read the underlined parts of the numbers. ASK: What is [volunteer] doing? (counting back) SAY: When we add hundreds, we count up by hundreds. When we subtract hundreds, we count back by hundreds.

**Exercise:** Start at 500. Subtract 100 each time until you reach 0.

**Answers:** 400, 300, 200, 100, 0

Write “796” on the board. ASK: How many hundreds in 796? (7) Underline the 7. ASK: What do we get if we subtract 100? (696) Write “696” and underline the 6. SAY: We count back (or down) the hundreds and the tens and ones stay the same. Repeat until you get to 496, as shown below:

796, 696, 594, 496

Write a three-digit number on the board and have each student in the class write or say the next number in the decreasing sequence. You might change numbers periodically or choose a large number and have the whole class participate in creating a long sequence.

**Extensions**

1. Underline all of the digits except for the tens and ones. Then subtract 100.

   a) $2300 - 100$  
   b) $5600 - 100$  
   c) $3947 - 100$

   **d) $9724 - 100$**

   **Answers:** a) $2300 - 100 = 2200$, b) $5600 - 100 = 5500$, c) $3947 - 100 = 3847$, d) $9724 - 100 = 9624$

   (MP8)

2. a) When you subtract 10, which digit always stays the same? Give an example.

   b) When you subtract 100, which digits always stay the same? Give an example.

   **Answers:** a) The ones digit always stays the same, e.g., $59 - 10 = 49$.  
   b) The tens and ones always stay the same, e.g., $431 - 100 = 331$.  

**Number and Operations in Base Ten 2-44**
3. Write a subtraction to show how subtracting 10 can change the hundreds digit.

**Sample answer:** Any multiple of 100 \(-\) 10. For example, 700 \(-\) 10 = 690.

4. Repeat the same operation to find the missing numbers.
   a) 79, 74, 69, __, __, __
   b) 62, 57, 52, __, __, __

   **Answers:** a) 79, 74, 69, 64, 59, 54; b) 62, 57, 52, 47, 42, 37

5. Repeat the same operation to find the missing numbers.
   a) 790, 740, 690, __, __, __
   b) 620, 570, 520, __, __, __
   c) 870, 820, 770, __, __, __
   d) 600, 550, 500, __, __, __

   **Answers:** a) 790, 740, 690, 640, 590, 540; b) 620, 570, 520, 470, 420, 370; c) 870, 820, 770, 720, 670, 620; d) 600, 550, 500, 450, 400, 350
Goals

Students will use what they learned about skip counting and place value for addition and subtraction to solve puzzles and word problems.

PRIOR KNOWLEDGE REQUIRED

Can add and subtract tens and hundreds within 1000

MATERIALS

BLM Hundreds Charts (p. U-4, see Extensions 1 and 2)

Solving puzzles by using strategies based on place value to add. Write on the board:

\[
\begin{align*}
? + ? &= 8 \\
\end{align*}
\]

SAY: If both question marks are the same number, what number is it? 
PROMPT: What number added to itself is 8? Give students time to think about it. (4) ASK: How did you figure it out? Did anyone use another way? (possible answers: testing \(1 + 1 = 2\), \(2 + 2 = 4\), until reaching \(4 + 4 = 8\); knowing that \(4 + 4 = 8\))

Write on the board:

\[
\begin{align*}
3 \ ? + 2 \ ? &= 64 \\
\end{align*}
\]

Pointing to the first addition, SAY: Let’s do this question first. Both question marks are the same number. ASK: What number is it? (2) SAY: Let’s see if it works. Do not alter the addition on the board but write beside it, as shown below:

\[
\begin{align*}
3 \ ? + 2 \ ? &= 32 \\
\end{align*}
\]

SAY: \(2 + 2\) is 4 and \(3 + 2\) is 5 so 2 is the correct number. Pointing to the second addition, ASK: What is the difference between these two additions? (6 instead of 5) ASK: If \(3 + 2\) is 5, can we get 6 in the tens column? (yes) How can we get a 6? (by carrying when we add the ones) SAY: So when we add the ones, we get 4 in the ones column and we also carry a 1. ASK: What do the ones add to before we carry a ten? (14) What number added to itself is 14? (7)
SAY: Let's test it. Write beside the addition, as shown below:

\[
\begin{array}{ccc}
3 & ? & 32 \\
+2 & ? & +22 \\
\hline
5 & 4 & 54 \\
\end{array}
\]

\[
\begin{array}{ccc}
3 & ? & 37 \\
+2 & ? & +27 \\
\hline
6 & 4 & 64 \\
\end{array}
\]

Have students complete Questions 1–10 on AP Book 2.2 p. 104.

**Solving puzzles by using strategies based on place value and repeated addition.** Write Question 11 on AP Book 2.2 p. 105 on the board, then read the question. SAY: You say me when you count by fives. I am greater than 15 but less than 22. Let’s count by fives. Count by fives together until, say, 45. (If a student asks, tell them that if it is unspecified, you start counting by fives at 0.) Write the numbers on the board:

0  5  10  15  20  25  30  35  40  45

SAY: You say me when you count by fives. So the answer must be one of these numbers or a bigger number. Read and underline the sentence: I am greater than 15 but less than 22. SAY: I am greater than 15, so the number cannot be these. Cross out 0, 5, 10, and 15. ASK: Why is it not any of these? (they are not greater than 15) SAY: But it is also less than 22. ASK: Can we cross out 45? (yes) Why? (it is greater than 22) Which other numbers are greater than 22? Can we cross out 40? (yes) Prompt for each number in descending order. Cross out all numbers except for 20. SAY: One number is left, 20. ASK: Is it the answer? (yes) SAY: Let’s double check. You say me when you count by fives. ASK: Do you say 20 when you count by fives? (yes) SAY: I am greater than 15 but less than 22. ASK: Is 20 greater than 15? (yes) Is it less than 22? (yes)

SAY: When we do this kind of problem, we use each clue to find fewer and fewer possible answers until there is only one answer.

Have students complete Questions 12–15 on AP Book 2.2 p. 105.
Extensions

1. Use the first chart on BLM Hundreds Charts.
   a) Shade all the numbers you say when you count by threes.
   b) On the same chart, circle all the multiples of 10.
   c) Write all the numbers that are both shaded and circled.
   d) What do you notice about the numbers you wrote?
   
   **Answers:** a) and b)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>21</td>
<td>31</td>
<td>41</td>
<td>51</td>
<td>61</td>
<td>71</td>
<td>81</td>
<td>91</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>22</td>
<td>32</td>
<td>42</td>
<td>52</td>
<td>62</td>
<td>72</td>
<td>82</td>
<td>92</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>23</td>
<td>33</td>
<td>43</td>
<td>53</td>
<td>63</td>
<td>73</td>
<td>83</td>
<td>93</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>24</td>
<td>34</td>
<td>44</td>
<td>54</td>
<td>64</td>
<td>74</td>
<td>84</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>25</td>
<td>35</td>
<td>45</td>
<td>55</td>
<td>65</td>
<td>75</td>
<td>85</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>26</td>
<td>36</td>
<td>46</td>
<td>56</td>
<td>66</td>
<td>76</td>
<td>86</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>17</td>
<td>27</td>
<td>37</td>
<td>47</td>
<td>57</td>
<td>67</td>
<td>77</td>
<td>87</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>18</td>
<td>28</td>
<td>38</td>
<td>48</td>
<td>58</td>
<td>68</td>
<td>78</td>
<td>88</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>19</td>
<td>29</td>
<td>39</td>
<td>49</td>
<td>59</td>
<td>69</td>
<td>79</td>
<td>89</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

   c) 30, 60, 90; d) You get these numbers when you count by 30.

2. Use the second chart on BLM Hundreds Charts. Repeat Question 1 with any two numbers from 2, 3, 4, 5, and 10.

   (MP6, MP7)

3. Which number makes the equation true? Explain how you found the number.
   a) \(256 - 5 = 259 - \_\) \(\_\) \(\_\)
   b) \(300 - \_ = 302 - 8\)
   
   **Sample answers**
   a) 259 is 3 more than 256, so I need to add 3 more to 5 to find the missing number since the two subtractions are equal. \(5 + 3 = 8\), so the missing number is 8.
   b) 300 is 2 less than 302, so I need to subtract 2 from 8 to find the missing number since the two subtractions are equal. \(8 - 2 = 6\), so the missing number is 6.

4. Have students solve online puzzles. Search for appropriate puzzles using key words such as “place value” and “crossword puzzle.”
# Hundreds Charts to 400 (I)

<p>| | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
<td>46</td>
<td>47</td>
<td>48</td>
<td>49</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>52</td>
<td>53</td>
<td>54</td>
<td>55</td>
<td>56</td>
<td>57</td>
<td>58</td>
<td>59</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>62</td>
<td>63</td>
<td>64</td>
<td>65</td>
<td>66</td>
<td>67</td>
<td>68</td>
<td>69</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>72</td>
<td>73</td>
<td>74</td>
<td>75</td>
<td>76</td>
<td>77</td>
<td>78</td>
<td>79</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>82</td>
<td>83</td>
<td>84</td>
<td>85</td>
<td>86</td>
<td>87</td>
<td>88</td>
<td>89</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>92</td>
<td>93</td>
<td>94</td>
<td>95</td>
<td>96</td>
<td>97</td>
<td>98</td>
<td>99</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
# Hundreds Charts to 400 (2)

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>102</td>
<td>103</td>
<td>104</td>
<td>105</td>
<td>106</td>
<td>107</td>
<td>108</td>
<td>109</td>
<td>110</td>
</tr>
<tr>
<td>111</td>
<td>112</td>
<td>113</td>
<td>114</td>
<td>115</td>
<td>116</td>
<td>117</td>
<td>118</td>
<td>119</td>
<td>120</td>
</tr>
<tr>
<td>121</td>
<td>122</td>
<td>123</td>
<td>124</td>
<td>125</td>
<td>126</td>
<td>127</td>
<td>128</td>
<td>129</td>
<td>130</td>
</tr>
<tr>
<td>131</td>
<td>132</td>
<td>133</td>
<td>134</td>
<td>135</td>
<td>136</td>
<td>137</td>
<td>138</td>
<td>139</td>
<td>140</td>
</tr>
<tr>
<td>141</td>
<td>142</td>
<td>143</td>
<td>144</td>
<td>145</td>
<td>146</td>
<td>147</td>
<td>148</td>
<td>149</td>
<td>150</td>
</tr>
<tr>
<td>151</td>
<td>152</td>
<td>153</td>
<td>154</td>
<td>155</td>
<td>156</td>
<td>157</td>
<td>158</td>
<td>159</td>
<td>160</td>
</tr>
<tr>
<td>161</td>
<td>162</td>
<td>163</td>
<td>164</td>
<td>165</td>
<td>166</td>
<td>167</td>
<td>168</td>
<td>169</td>
<td>170</td>
</tr>
<tr>
<td>171</td>
<td>172</td>
<td>173</td>
<td>174</td>
<td>175</td>
<td>176</td>
<td>177</td>
<td>178</td>
<td>179</td>
<td>180</td>
</tr>
<tr>
<td>181</td>
<td>182</td>
<td>183</td>
<td>184</td>
<td>185</td>
<td>186</td>
<td>187</td>
<td>188</td>
<td>189</td>
<td>190</td>
</tr>
<tr>
<td>191</td>
<td>192</td>
<td>193</td>
<td>194</td>
<td>195</td>
<td>196</td>
<td>197</td>
<td>198</td>
<td>199</td>
<td>200</td>
</tr>
</tbody>
</table>
# Hundreds Charts to 400 (3)

<table>
<thead>
<tr>
<th></th>
<th>201</th>
<th>202</th>
<th>203</th>
<th>204</th>
<th>205</th>
<th>206</th>
<th>207</th>
<th>208</th>
<th>209</th>
<th>210</th>
</tr>
</thead>
<tbody>
<tr>
<td>211</td>
<td>212</td>
<td>213</td>
<td>214</td>
<td>215</td>
<td>216</td>
<td>217</td>
<td>218</td>
<td>219</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>221</td>
<td>222</td>
<td>223</td>
<td>224</td>
<td>225</td>
<td>226</td>
<td>227</td>
<td>228</td>
<td>229</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>231</td>
<td>232</td>
<td>233</td>
<td>234</td>
<td>235</td>
<td>236</td>
<td>237</td>
<td>238</td>
<td>239</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>242</td>
<td>243</td>
<td>244</td>
<td>245</td>
<td>246</td>
<td>247</td>
<td>248</td>
<td>249</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>251</td>
<td>252</td>
<td>253</td>
<td>254</td>
<td>255</td>
<td>256</td>
<td>257</td>
<td>258</td>
<td>259</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>261</td>
<td>262</td>
<td>263</td>
<td>264</td>
<td>265</td>
<td>266</td>
<td>267</td>
<td>268</td>
<td>269</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>271</td>
<td>272</td>
<td>273</td>
<td>274</td>
<td>275</td>
<td>276</td>
<td>277</td>
<td>278</td>
<td>279</td>
<td>280</td>
<td></td>
</tr>
<tr>
<td>281</td>
<td>282</td>
<td>283</td>
<td>284</td>
<td>285</td>
<td>286</td>
<td>287</td>
<td>288</td>
<td>289</td>
<td>290</td>
<td></td>
</tr>
<tr>
<td>291</td>
<td>292</td>
<td>293</td>
<td>294</td>
<td>295</td>
<td>296</td>
<td>297</td>
<td>298</td>
<td>299</td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>
Hundreds Charts to 400 (4)

<table>
<thead>
<tr>
<th></th>
<th>301</th>
<th>302</th>
<th>303</th>
<th>304</th>
<th>305</th>
<th>306</th>
<th>307</th>
<th>308</th>
<th>309</th>
<th>310</th>
</tr>
</thead>
<tbody>
<tr>
<td>311</td>
<td>312</td>
<td>313</td>
<td>314</td>
<td>315</td>
<td>316</td>
<td>317</td>
<td>318</td>
<td>319</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>321</td>
<td>322</td>
<td>323</td>
<td>324</td>
<td>325</td>
<td>326</td>
<td>327</td>
<td>328</td>
<td>329</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td>331</td>
<td>332</td>
<td>333</td>
<td>334</td>
<td>335</td>
<td>336</td>
<td>337</td>
<td>338</td>
<td>339</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>341</td>
<td>342</td>
<td>343</td>
<td>344</td>
<td>345</td>
<td>346</td>
<td>347</td>
<td>348</td>
<td>349</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>351</td>
<td>352</td>
<td>353</td>
<td>354</td>
<td>355</td>
<td>356</td>
<td>357</td>
<td>358</td>
<td>359</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>361</td>
<td>362</td>
<td>363</td>
<td>364</td>
<td>365</td>
<td>366</td>
<td>367</td>
<td>368</td>
<td>369</td>
<td>370</td>
<td></td>
</tr>
<tr>
<td>371</td>
<td>372</td>
<td>373</td>
<td>374</td>
<td>375</td>
<td>376</td>
<td>377</td>
<td>378</td>
<td>379</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>381</td>
<td>382</td>
<td>383</td>
<td>384</td>
<td>385</td>
<td>386</td>
<td>387</td>
<td>388</td>
<td>389</td>
<td>390</td>
<td></td>
</tr>
<tr>
<td>391</td>
<td>392</td>
<td>393</td>
<td>394</td>
<td>395</td>
<td>396</td>
<td>397</td>
<td>398</td>
<td>399</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>
Unit 5  Measurement and Data:
Measuring in US Customary Units

This Unit in Context

In this unit, students will extend the knowledge gained in 2.1 Units 7 and 8 of measuring lengths and distances in metric units (centimeters and meters) to lengths in US customary units (inches and feet). Students will estimate lengths using benchmarks that they establish, and then check their estimates by measuring. In 2.1 Units 7 and 8, students solved one-step word problems involving addition or subtraction of lengths; in this unit, students will extend this to solve both one-step and two-step word problems of this type (2.MD.B.5).

Students will estimate and measure lengths, organize data in line plots, and answer questions about the data. In order to read and draw line plots, students will use their knowledge of representing numbers on number lines from 2.1 Unit 2 (2.MD.B.6). This work is extended in Grades 3 to 5, through changes to the horizontal scale: the horizontal scale on a line plot in Grade 3 may be marked off using whole numbers, halves, or fourths (3.MD.B.4); and in Grades 4 and 5 they may be marked off using whole numbers, halves, fourths, or eighths (4.MD.B.4 and 5.MD.B.2).

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP.1 to MP.7. Here are some examples of how students can show that they have met a standard.

MP.1: In MD2-22 Extension 1, students make sense of a non-routine problem about measuring the height of a staircase. Students persevere to solve the problem when they notice the regularity of the size of the steps and look for a way to measure the stairs quickly and efficiently.

MP.2: In MD2-23 Extension 2, students reason abstractly and quantitatively when they create a real-world problem that matches a picture and when they represent and solve a partner’s word problem using a diagram and number sentences.

MP.7: In MD2-22 Extension 1, students look for and make use of structure in a problem about measuring the height of a staircase when they notice the equal height of the steps and look for a way to use repeated addition to measure the stairs quickly and efficiently.
Introduction

In this unit, students will extend their knowledge of measuring lengths and distances in metric units (centimeters and meters) to lengths in US customary units (inches and feet). Students will estimate lengths using benchmarks that they establish, and then check their estimates by measuring. They will estimate and measure lengths, organize data in line plots, and answer questions about the data.

Materials. Each student will need both a 12-inch ruler and an inch-centimeter ruler for this unit. Commercial rulers are preferable—in the case of the inch-centimeter rulers, the scales need to increase in the same direction and the zeros on both scales should be exactly aligned. If you do not have such rulers on hand, you can make them using BLM 12-Inch Rulers (pp. P-69–70) and BLM Inch-Centimeter Rulers (pp. P-73–74). If you use the BLMs, you can make up to nine rulers at a time, tape them to an 11 inch by 17 inch sheet of paper, and make copies as needed.

Ideally, each student should also have a yardstick. If yardsticks are not available, you can use rolled and taped newspapers, each cut to 1 yard long. You will also need several measuring tapes for the class.
MD2-17  Measuring in Inches
Pages 106–109

STANDARDS
2.MD.A.1

VOCABULARY
about  closer  distance  exactly  exactly halfway  inch  inches  length  measure  ruler  unit of measurement

Goals
Students will measure distances and lengths between points by counting jumps. For lengths between two whole numbers, they will decide which number is closer. For lengths exactly halfway between two whole numbers, they will choose the larger number.

PRIOR KNOWLEDGE REQUIRED
Can measure lengths in centimeters  Can measure lengths to the nearest unit  Can count to 30

MATERIALS
overhead projector  a transparent 12-inch ruler or transparency of a ruler from BLM 12-Inch Rulers (pp. P-69–70)  12-inch rulers or rulers from BLM 12-Inch Rulers (pp. P-69–70)  1-inch pattern block squares  BLM Measuring Lines in Inches (p. P-71)  BLM Measured Lengths (p. P-72, see Extension 2)

Introduce inches. ASK: Where have you heard the word inch before? Show students an inch ruler and point out 1 inch. SAY: An inch is a unit of measurement. We can measure the length of small objects in inches. Write on the board:

\[
\text{centimeter} \quad \text{cm}
\]

Remind students that they used a short form for centimeter, cm. SAY: There is a short form for inch. Write on the board:

\[
\text{centimeter} \quad \text{cm} \quad \text{inch} \quad \text{in}
\]

SAY: The short form for inch and inches is in. It is spelled the same way as the word “in.” This can be confusing, so for now we will always use “inch” and “inches” instead of the short form.

Consecutive numbers on inch rulers are 1 pattern block apart. Project a transparent 12-inch ruler or a transparency of a ruler from BLM 12-Inch Rulers. Put a 1 inch by 1 inch pattern block square in the space between 0 and 1 on the ruler. ASK: How long is one pattern block? (1 inch) Put a second block between 1 and 2 on the ruler and ASK: How long are two pattern blocks? (2 inches) How many inches long are five pattern block squares? (5 inches) Demonstrate using five pattern blocks. Repeat for 9 and 12 pattern blocks.
ACTIVITY 1

Provide each student with a pattern block and a 12-inch ruler or a ruler from BLM 12-Inch Rulers. Have students put one pattern block square on the ruler between 0 and 1 to get an idea of the length of an inch. Then, have students move the pattern block to the space between 1 and 2, 2 and 3, and so on, to demonstrate that all pairs of consecutive numbers are the same distance apart.

Measuring distance in inches. Tape an inch ruler to the board. Below it, draw an enlarged picture of the first 4 inches of the ruler, as shown below:

```
0 1 2 3 4
inches
```

SAY: This is just a bigger version of the first part of the ruler. Run your finger along the top edge of the enlarged ruler from 0 to 1 and SAY: 0 and 1 are 1 inch apart. Repeat for 1 to 2 and ASK: How many inches apart are 1 and 2? (1) Repeat for 2 to 3 and 3 to 4. (1, 1) Draw arrows above the ruler taped to the board. Make the arrows exactly 4 inches apart as shown below:

```
0 1 2 3 4 5 6 7 8 9 10 11 12
inches
```

Run your finger along the top edge of the ruler from the left arrow to the right arrow and SAY: We will measure the distance between these arrows by counting jumps. Count from 0 to 4 and draw jumps as you go. ASK: How many jumps did we count? (4) SAY: We know that every jump shows 1 inch and there are 4 jumps. ASK: So how many inches is that? (4 inches) Draw a horizontal line above the arrows and SAY: The distance from 0 to 4 is 4 inches. The final picture should look like this:

```
0 1 2 3 4 5 6 7 8 9 10 11 12
inches
```

Repeat with arrows at 0 and 10, 0 and 12, and 0 and 5. (10 inches, 12 inches, 5 inches) Leave the last example on the board. Point out that the number of jumps is always the same as the number below the arrow on the right. For 10 jumps, the arrow is above 10. For 12 jumps, the arrow is above 12. For 5 jumps, the arrow is above 5. ASK: Do we need to count the jumps to know the distance or can we look at the number below the arrow? (look at the number below the arrow)
Erase the jumps from the last example, but leave the arrows. Move the ruler so the arrows line up at the 3 and 8, as shown below:

```
0 1 2 3 4 5 6 7 8 9 10 11 12
```

inches

ASK: What number is below the arrow on the right? (8) Does this mean that the arrows are 8 inches apart? (no) Why not? (the arrow on the left is not above zero) Draw 5 jumps between the arrows and have students count with you. ASK: How many jumps apart are the arrows? (5)

Repeat with two more examples—each time, leave the jumps and arrows on the board and move only the ruler to a different position. ASK: Why do we always get the same answer? (only the ruler moves) Slide your finger from the arrow on the left to the arrow on the right and SAY: The distance between the arrows did not change. Align the left arrow with 0. SAY: We can align the left arrow with any number on the ruler and get the correct answer. But when we align the left arrow with 0, the ruler does the counting for us. This is why we line up one end of whatever we are measuring with 0 when we use a ruler.

Have students complete BLM Measuring Lines in Inches using their inch rulers. (1. 6 inches, 2. 5 inches, 3. 3 inches, 4. 2 inches, 5. 4 inches, 6. 1 inch, 7. 7 inches)

“Closer to” and “about.” Draw on the board:

```
[Pattern blocks diagram]
```

The line between the two rows of pattern blocks should end between 7 and 8, and should be closer to 7. Have students count the blocks in each row. (7, 8)

ASK: How long is the line? Is it longer or shorter than 7 blocks? (longer) Is it longer or shorter than 8 blocks? (shorter) SAY: The line is neither exactly 7 nor exactly 8 blocks long. It is between 7 and 8.

Draw a line across the end of the thick line, two pairs of dots and two ovals, as shown below:

```
[Pattern blocks diagram]
```

ASK: Is the line closer to 7 or 8 blocks? (7) How can you tell? (sample answer: the dots at 7 blocks and at the end of the line are closer to each other than the dots at 8 blocks and at the end of the line) SAY: Since
the line is closer to 7, we say the line is about 7 blocks long.

Write on the board:

The line is about 7 blocks long.

Repeat with several other lines—avoid using lengths that are exactly halfway between two blocks. Have students signal their answers.

Repeat with a line that ends exactly halfway between 5 and 6 blocks.

SAY: When a length is halfway between two numbers, we use the larger number for the answer. We say the line is about 6 inches long. Repeat with three more examples using lengths that are exactly halfway between two blocks. Have students signal the answers.

**ACTIVITY 2**

**Measuring lines.** Have students work in pairs. Give each student a straightedge to draw 3 lines of different lengths in their notebooks. The lines should go in the same direction. Then have both students in each pair use their inch rulers to measure and record the lengths of the lines, first in one partner’s notebook and then in the other partner’s notebook. Have students compare results with each other. The pairs of measurements for a given line should be the same.

**Extensions**

1. Measure the length and width of selected books in the class library in inches.

   (MP3, MP6)  

2. Give each student a strip from BLM Measured Lengths and have them copy the table shown below in their notebooks.

<table>
<thead>
<tr>
<th>Whole paper strip</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>C</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>D</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>

   Have students measure, in inches, the length of the whole strip and then of each section, and record the lengths in the table. Remind students to use the larger number when a length is halfway between two numbers. Then have students add the lengths of A, B, C, and D. ASK: Does this total equal the original measurement of the whole strip? (no)

   Have students explain why there is a difference.

   **Sample answer:** For each section, the length is exactly halfway between two numbers of inches, so the length we write down is half an inch more than the actual length. When we add the lengths of the
sections from the table, we are adding half an inch more for each of the four sections, so we end up with more than the actual length of the whole strip.

3. Tell students that these lines represent measuring tapes. ASK: How many inches apart are the two numbers on the inch measuring tape?

   a) 6 10
   b) 3 12
   c) 27 45
   d) 48 91

   **Answers:** a) 4 inches, b) 9 inches, c) 18 inches, d) 43 inches
Goals

Students will use benchmarks to estimate lengths to the nearest inch and check their estimates by measuring with a ruler.

PRIOR KNOWLEDGE REQUIRED

Can count beyond 20
Can measure lengths to the nearest inch
Can iterate units

MATERIALS

12-inch rulers or rulers from BLM 12-Inch Rulers (pp. P-69–70)
3 cardboard strips per student, each about 2 inches wide and 4 inches longer than the longest object in Activity 1
objects of the same length (e.g., pencils of the same length, pens of the same length, erasers of the same length)
finger paint
new crayon
new pencil
various objects of different lengths
piece of string about 3 1/2 feet long; a pencil; tape; a length of plastic, metal, or wood; and a weight per pair of students (see Extension 3)
piece of string about 2 student arm spans long per student (see Extension 4)

Review meaning of estimate. SAY: An estimate is a guess based on what you know. It is different from guessing with no information. When you estimate, you need to think and then guess.

Using the width of two or three fingers as a benchmark for 1 inch. Give each student a 12-inch ruler or a ruler from BLM 12-Inch Rulers. Have them determine whether two or three of their fingers fit between consecutive inch marks on the ruler, as shown below.

Ask them to start with two fingers and add a third if two fingers are not 1 inch wide. Have them choose the benchmark that is closest to 1 inch. SAY: When you do not have a ruler to measure 1 inch, you can use your fingers to estimate an inch.

NOTE: Activity 1 will need to be divided into two parts to allow for fingerprints to dry—have students complete the first part before recess, lunch, or another break in the day.
ACTIVITY 1

Using fingerprints to estimate the length of objects. Explain to students that they will estimate lengths of objects to the nearest inch by using the two- or three-finger benchmark they determined earlier. Give each student three different objects (e.g., pencil, pen, eraser, straw, paper money), three cardboard strips about 2 inches wide and about 4 inches longer than the longest object, an inch ruler, and finger paint. NOTE: At the end of the activity, students will compare their estimates, so make sure you provide objects of the same length (e.g., if each student gets a pencil, all the pencils should be of the same length).

Direct students to line up one end of an object with the end of a cardboard strip, and then make a pencil mark at the other end, as shown below:

Have students make fingerprints along the strip until they reach the line, using the same two or three fingers at a time (depending on their personal benchmarks for 1 inch). You will need to pause the activity here, to allow for the fingerprints to dry completely.

When the fingerprints have dried, have students draw a line after every two or three fingerprints (depending on their personal benchmarks for 1 inch). Tell students to write the name of the object and its estimated length to the nearest inch on the strip. Repeat with the other two objects. Have students compare estimates of the same objects. The estimates should be close, but do not need to be the same.

Write a list of the names of the objects on the board for students to refer to. After each estimate, have students use their rulers to measure the lengths they marked originally, and write the measurement to the nearest inch on the strip. The finished cardboard strips should look something like this:

Using other benchmarks to estimate the length of objects. Have most students work individually, using inch rulers to measure and record one of the following lengths to the nearest inch: a new crayon, a new pencil, their shortest finger, or the long side of a JUMP Math AP Book. Have the remaining students work in pairs to measure their hands from their wrists to their fingertips, as shown below:
Ask a volunteer to help you demonstrate this to the class. Have Partner 1 measure and record the measurement of Partner 2’s hand in inches. Then, have them switch roles.

Draw on the board:

<table>
<thead>
<tr>
<th>Crayon</th>
<th>Pencil</th>
<th>Hand</th>
<th>Shortest Finger</th>
<th>Long Side of JUMP Math AP Book</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ask for, and then record the length of each object in the table on the board. Discuss why hand and finger measurements vary. (people’s hands and fingers are different lengths) If any of the other measurements vary, discuss why that might have happened. For example, although the pencils are all the same length, people might align the ruler and pencil slightly differently from one another. Measure these objects again and write the lengths in the table.

Hold an object that is about 7 inches long, such as a paintbrush or a spoon, beside a JUMP Math AP Book, as shown below:

Point to the table of benchmarks you created and SAY: We know that the book is 11 inches tall. ASK: Is the object shorter or taller than the book? (shorter) Should its length be more or less than the book’s length? (less) Ask students for estimates. Write on the board:

- 1 inches
- 7 inches
- 14 inches

SAY: Since the object is shorter than the book, 14 inches cannot be the correct answer. ASK: Is the object very much shorter or only a bit shorter than the book? (a bit shorter) Which estimate is better, 1 inch or 7 inches? (7 inches) Write a check mark in the box beside 7 inches.

Repeat for an object that is about 15 inches long. Again, have students estimate the length, then write three lengths on the board, as shown below:

- 9 inches
- 15 inches
- 25 inches
With the object beside the JUMP Math AP Book, ASK: Is 9 inches a good estimate? (no) How do you know? (the book is 11 inches and the object is taller than the book, so it cannot be a smaller number) Is 25 inches a good estimate? (no) How do you know? (the object is just a bit taller than the book, so it cannot be 25 inches) Is 15 inches a good estimate? (yes) Write a check mark in the box beside 15 inches.

Repeat by comparing a variety of objects to the other benchmarks in the table you created. For the three lengths that you write on the board, one should be quite a bit less than the actual length of the object, one should be close to the actual length, and one should be quite a bit more than the actual length.

**ACTIVITIES 2–3**

2. **Estimating the length of objects.** Draw on the board a 4-inch line, a 6-inch line, and an 11-inch line, and label them, as shown below:

   ![Lengths](image)

   Hold up a variety of objects of different lengths and have students estimate the length of each object, based on the lines on the board. After recording several estimates for each object, measure it to find its actual length.

3. **Estimating the length of lines.** Students will work in pairs. Have students use straightedges to draw two lines of different lengths in their notebooks—students should turn their notebooks sideways so they have more room to draw. The lines must be long enough for students to use their fingers to estimate.

   Demonstrate how to estimate the length of a line in inches. Draw a line on the board and have a volunteer place their fingers on it (according to their personal benchmarks for 1 inch) while you draw the marks, as shown below:

   ![Fingers](image)

   Partners will work together to estimate the length of their lines using their personal benchmarks for 1 inch. Partner 1 repeatedly places 2 or 3 fingers (according to the benchmark for one inch determined earlier) while Partner 2 draws the marks. Then partners count the number of marks on the line and write the estimated length in inches beside the line. Next, they switch roles to estimate one of Partner 2’s lines, and repeat the process for the second lines.
Partners then measure their own lines with an inch ruler and record the results beside each line. A sample result is shown below:

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>fingers: about 4 inches</td>
</tr>
<tr>
<td>ruler: about 4 inches</td>
</tr>
</tbody>
</table>

**Extensions**

(MP5) 1. a) Estimate the length of your classroom. Use your fingers or meter sticks.

   b) In pairs, explain your choices in part a). How do you know the tool you chose is the better choice?

   **Sample answer:** b) I chose meter sticks because using my fingers would take too long.

(MP5) 2. a) Estimate the length of a paint brush. Use your fingers or your JUMP Math AP Book.

   b) In pairs, explain your choices in part a). How do you know the tool you chose is a good choice?

   **Sample answer:** b) I chose my fingers because my AP Book is longer than a paint brush.

3. Have students work in pairs. Tell them to measure the distance from a desktop to the floor. Give each pair a piece of string about 3 1/2 feet long with one end wrapped around and taped to the middle of a pencil; tape; a length of plastic, metal, or wood from which to suspend the string; a weight; and a 12-inch ruler. Tell them to use all of the given materials. If students have difficulty, provide the following sequence of hints: the weight needs to be near the edge of the desk; the piece of plastic needs to be under the weight with part of it extending beyond the edge of the desk; the next step involves the string and the tape.

   **Sample solution:**

   ![Sample solution diagram]

   **NOTE:** There are many ways to answer the question. If students find the solution quickly, challenge them to find other methods of finding the distance using materials of their choice.
4. Use a 12-inch ruler to measure a piece of string that is about 2 arm spans long.

5. Use your answer to Extension 4 to find the length of a piece of string about 4 arm spans long without measuring.

Answer: the length should be double the answer from Extension 4
Goals
Students will measure the length of objects in inches and in centimeters. They will describe how the two measurements relate to each other and to the size of the unit.

PRIOR KNOWLEDGE REQUIRED
Can count numbers beyond 20
Can use a ruler to measure lengths to the nearest centimeter
Can use a ruler to measure lengths to the nearest inch

MATERIALS
rulers with inch and centimeter markings, or rulers from BLM Inch-Centimeter Rulers (pp. P-73–74)
overhead projector
blank transparencies
transparent ruler with inch and centimeter markings, or transparency of a ruler from BLM Inch-Centimeter Rulers (pp. P-73–74)
erasable marker
BLM An Exact Number of Inches or Centimeters? (p. P-75)
BLM Centimeters or Inches? (p. P-76)

Comparing inches and centimeters. Project a blank transparency and place a transparent ruler with inch and centimeter markings (or a transparency of a ruler from BLM Inch-Centimeter Rulers) on it. SAY: This ruler shows inches and centimeters. ASK: Which numbers show inches? (top row) Which numbers show centimeters? (bottom row) PROMPT: How many fingers did you use to estimate centimeters and how many fingers did you use to estimate inches? ASK: How many inches does the ruler show? (12) How many centimeters does it show? (30) Are there more inches or more centimeters? (centimeters) Cover up all but the first inch and first centimeter markings and ASK: Which is longer, 1 inch or 1 centimeter? (1 inch)

Measuring in inches and centimeters. On the transparency, use an erasable marker to draw two 9-inch lines starting from zero, one above the ruler and one below, as shown below:

<table>
<thead>
<tr>
<th>0 inches</th>
</tr>
</thead>
</table>
| 0 cm

ASK: How many inches long is the line? (9) About how many centimeters long is the line? (between 22 cm and 23 cm) SAY: It is more than halfway between 22 cm and 23 cm, so we say the line is about 23 cm long.
Write on the transparency:

9 inches       about 23 cm

Repeat with the following line lengths: 2 inches, 10 inches, 12 cm, and 19 cm. Have students write the answers in their notebook as shown above. Then write the answers on the board. (2 inches, about 5 cm; 10 inches, about 25 cm; 12 cm, about 5 inches; 19 cm, about 8 inches)

Draw a 10 cm line on a blank transparency, and write below it:

___ inches or centimeters

about ___ inches or centimeters

Have a volunteer measure the line in inches. ASK: Does the line stop exactly at an inch mark? (no) About how many inches long is the line? (4 inches) SAY: So, we need to write the number in the second blank. Write “4” in the second blank. ASK: What do we circle here? (inches) Have a volunteer measure the line in centimeters. ASK: Does the line stop exactly at a centimeter line? (yes) SAY: So, we need to write the number in the first blank. Write “10” in the first blank. ASK: What do we circle? (centimeters)

Have students complete BLM An Exact Number of Inches or Centimeters?. (1. 6 inches, about 15 centimeters; 2. 3 centimeters, about 1 inch; 3. 14 centimeters, about 6 inches; 4. 7 inches, about 18 centimeters)

Any number of inches is longer than that same number of centimeters. Project the transparent ruler again. Point to the 1 inch and 1 cm marks. ASK: Are both numbers 1? (yes) Which is longer, 1 inch or 1 centimeter? (1 inch) Repeat with 5 inches and 5 cm, and then with 9 inches and 9 cm. ASK: Is there a pattern? (yes) What is it? (when the numbers are the same, the inches are longer)

Project a blank transparency and use a ruler to draw a pair of horizontal lines: make one line 8 inches long and the other line 8 cm long, as shown below:

_________________

SAY: One of these lines is 8 inches and the other one is 8 centimeters long. Write “8” below both lines. Point to the top line and then the bottom line and have students raise their hand for the line that is in centimeters. (the top line)

Repeat with several other examples—for some pairs of lines, do not align the ends.

ASK: If both lines are the same number of units long, which line is always in centimeters: the longer line or the shorter line? (shorter line) Give students BLM Centimeters or Inches?. (1. 5 inches, 5 cm; 2. 7 cm, 7 inches; 3. 3 cm, 3 inches; 4. 1 inch, 1 cm; 5. 4 cm, 4 inches)
When the lengths are the same, there are more centimeters. Project the transparent ruler on a blank transparency. SAY: I will draw a line above the ruler and a line below the ruler. Cover the centimeter scale, and draw a 10-inch line above the ruler. Then, cover the inch scale and draw a 25.4 cm line below the ruler. The picture should look like this:

![Ruler Diagram]

Cover both scales and have students verify that the lines are the same length. Uncover the scales. Point at the markings where each line ends and ASK: What are the units for the larger number, inches or centimeters? (centimeters) Have students signal inches or centimeters by using their hands to form an “I” or a “C.”

Repeat with lines of length 28 cm and about 11 inches, but this time ask what the units are for the smaller number. (inches) Repeat with lines of length 6 inches and about 15 cm, and 5 cm and about 2 inches.

Draw on the board:

![Pen Diagram]

The pen is 8 inches long.

ASK: If we measure the pen in centimeters, will the number be less than 8 cm, about 8 cm, or more than 8 cm? (more than 8 cm) Students can signal thumbs up for more, thumbs down for less, and both thumbs pointing toward each other for about the same.

Repeat with pictures of a 20 cm paintbrush, a 7-inch pencil case, and a 40 cm watermelon.

**Exercises:** Circle the correct answer.

a) A snake is 14 inches long. How long is the snake in centimeters?
   - less than 14 cm
   - about 14 cm
   - more than 14 cm

b) A banana is 17 cm long. How long is the banana in inches?
   - less than 17 inches
   - about 17 inches
   - more than 17 inches

c) A rock is 8 inches wide. How wide is the rock in centimeters?
   - less than 8 cm
   - about 8 cm
   - more than 8 cm

d) A bike lock is 65 cm long. How long is the lock in inches?
   - less than 65 inches
   - about 65 inches
   - more than 65 inches

**Answers:** a) more than 14 cm, b) less than 17 inches, c) more than 8 cm, d) less than 65 inches
Extensions
(MP3, MP4, MP6) 1. a) Sharon cut four lengths of string: 30 cm, 18 cm, 22 cm, and 3 inches. Is the total length of the strings more than 73 inches? Explain how you know.
   b) Ted cut three lengths of string: 25 inches, 67 inches, and 15 cm. Is the total length of the strings more than 107 cm? Explain how you know.
   c) In pairs, share your explanations for parts a) and b). Do you agree with each other? Discuss why or why not.

Selected sample answers
a) No, because the total length of the strings is 70 cm and 3 inches. Three inches less than 73 inches is 70 inches, which is longer than 70 cm.
b) Yes, because the total length of the strings is 92 inches and 15 cm. 107 cm – 15 cm = 92 cm. Since 92 inches is longer than 92 cm, the total length of the strings is longer than 107 cm, which is 92 cm + 15 cm.

NOTE: For part c), encourage partners to ask questions to understand and challenge each other's thinking (MP3) and use of math words (MP6)—see p. A-43 for sample sentence and question stems to guide students.

2. Cameron needs 2 windows that are 80 cm wide altogether. He buys two windows that are each 40 inches wide. Did he buy the correct windows? Explain how you know.
   Answer: no, 80 inches is a lot wider than 80 cm
Goals

Students will use a benchmark to estimate lengths to the nearest foot and use a 12-inch ruler to check their estimates.

PRIOR KNOWLEDGE REQUIRED

- Can estimate lengths to the nearest unit
- Can measure lengths to the nearest unit
- Can iterate units
- Can estimate lengths using benchmarks

MATERIALS

- 12-inch rulers or rulers from BLM 12-Inch Rulers (pp. P-69–70), one per pair of students
- Masking tape (optional)
- Labeled objects ranging from 1 ft to 4 ft in length or width (e.g., paintbrushes, desks, chairs, doors)
- Strip of paper slightly longer than 1 ft
- Strips of paper (see Extension 1)

Introduce feet. SAY: You know how to measure in centimeters, in meters, and in inches. We used meters to measure large objects and distances. It makes sense to measure the length of the classroom in meters instead of using hundreds of centimeter cubes. We do the same thing for inches. Hold up a 12-inch ruler. SAY: A foot is a unit of measurement. One foot is 12 inches long. The plural of foot is feet. Write on the board:

\[
\text{foot} \quad \text{feet} \quad \text{ft}
\]

SAY: The short form for foot and feet is ft. Circle the “f” and “t” in “foot,” “feet,” and “ft.”

Review measuring to the nearest unit using a 12-inch ruler. Have students estimate the width of a classroom door. Then demonstrate how to measure the door using a 12-inch ruler. First, make a horizontal line across the door as a guide using masking tape or a pencil. SAY: I will mark off 1 ft at a time. Explain that the ruler may not fit an exact number of times. Use the ruler to show that the door is more than 3 ft wide but less than 4 ft wide. (see pictures below)
ASK: Is the width of the door closer to 3 ft or 4 ft? (3) SAY: Since the door is closer to 3 ft, we say the door is about 3 ft wide.

Demonstrate measuring the width of the door incorrectly (e.g., measure on a diagonal or not in a straight line), and ask students why the measurement is incorrect.

**ACTIVITY 1**

**Measuring to the nearest foot by iterating a 12-inch ruler.** Label a variety of objects that range from about 1 ft to 4 ft long in length or width (e.g., paintbrushes, desks, chairs, doors).

Have students work in pairs. Give each pair of students a 12-inch ruler, or a ruler from BLM 12-Inch Rulers. Each pair measures two objects the same way that you measured the door earlier in the lesson. For example, Partner 1 uses the ruler to measure the width of a window, and Partner 2 makes marks. Then Partner 2 uses the ruler to measure the width of the window, and Partner 1 makes marks. Have students write the name of each object and its measurement in their notebooks, and then repeat the process with a second object. As a class, discuss the results and any discrepancies.

**Using a benchmark to estimate a length in feet.** Hold out your forearm, as shown below:

Pointing from your elbow to your fingertips, SAY: The distance from a Grade 2 student’s elbow to their fingertips is about 1 ft.

Ask a volunteer to hold out their forearm and place a 12-inch ruler beside it. Remind students that they used either two- or three-finger widths to estimate in inches. SAY: We can use the length from your elbow to your fingertips in the same way, except we use it to estimate lengths in feet. Show students how to use their forearm to estimate a foot. Cut out a strip of paper that is a bit longer than 1 ft and tape it to the board (do not use a ruler to make the strip of paper). Have a volunteer come to the board and hold up their arm, above or below the strip of paper, as shown below:

SAY: We line up our elbows with one end of the object that we want to estimate. [Volunteer’s] arm is about 1 ft long and the paper strip is a bit longer (or shorter). We say that the strip of paper is about 1 ft long. Demonstrate with some objects that are not taped to the board (e.g., a book, a paintbrush).
ACTIVITY 2

Have students work in the same pairs as in Activity 1. Each pair selects two objects that they did not measure in Activity 1. This time, they estimate the length or width of each object using their forearms, and then measure using a 12-inch ruler. Have students write the name of each object, the estimate, and the measurement in their notebooks. As a class, discuss the results and any discrepancies.

Extensions

1. a) Cut a strip of paper that is about the length of your forearm. Then make another strip of paper that you think is the length of an adult’s forearm. Use the two strips of paper to estimate the length of a long object in the classroom, such as the blackboard. Write your estimates to the nearest arm length. What do you notice?

b) An adult and an 8-year-old used their forearm to estimate the width of a hall. Why might the estimates be quite different?

Sample answers: a) it took more paper strips in student arm lengths than in adult arm lengths to estimate the length of the classroom; b) if the adult’s arm is longer, then the number of adult arm lengths to estimate the width of the hall will be less than the number of 8-year-old arm lengths

2. Show students the following pictures. Have them explain why the first way of estimating will give a better estimate of length.

First way:

Second way:

Answer: The first way will give a better estimate because it is like a ruler. Jake’s arm is always the same length, just like on a ruler where the inches are all the same length. The second way is not like a ruler because each arm is a different length.

3. A ruler is 12 inches long. How long are 2 rulers?

Answer: 24 inches

4. What is the length in inches? Hint: One foot is 12 inches.

a) a chair that is 2 ft long  
b) a desk that is 3 ft long

Answers: a) 24 inches, b) 36 inches
Goals
Students will use benchmarks to estimate lengths to the nearest yard.
Students will use a yardstick and/or a measuring tape to check their estimates.
Students will explore the relationship between yards and feet.

PRIOR KNOWLEDGE REQUIRED
Can measure lengths in different units
Can measure lengths to the nearest unit
Can estimate lengths using benchmarks
Can iterate units

MATERIALS
yardsticks or rolled and taped newspapers cut to 1 yd long
three 12-inch rulers or three rulers from BLM 12-Inch Rulers
masking tape
strips of paper about 2 inches by 11 inches
scissors
1-yard-long pieces of string
measuring tapes

Introduce yards. ASK: What units of measurement have we used to measure length? (centimeters, meters, inches, feet) SAY: We used meters and feet to measure long objects and distances. We can also use a unit of measurement called a yard to measure long distances. The plural of yard is yards. Write on the board:

yard
yards
yd

SAY: The short form for yard and yards is yd. Circle the “y” and “d” in “yard” and “yards,” and then circle “yd.”

Hold up a yardstick. SAY: A yardstick is useful for measuring large objects and long distances. Tape three 12-inch rulers and a yardstick to the board, as shown below. You may want to use rulers from BLM 12-Inch Rulers so that it is easier to overlap the ends of the rulers.

SAY: One yard is 3 ft long. Explain that for most yardsticks, the feet are not marked, which can make yardsticks a bit tricky to use.
Have students complete either Activity 1 or Activity 2 below, but not both. After the activity, have students complete the table in Question 5 on AP Book 2.2 p. 116. Both activities will produce the same result but in slightly different ways.

**ACTIVITIES 1–2**

1. **There are 3 feet in 1 yard.** Give each student a strip of paper that measures about 2 inches by 11 inches. You can use paper that is 8 1/2 inches by 11 inches and cut strips that are about 2 inches wide (see picture 1). Students fold the strip in half (see picture 2), and then in half again lengthwise (see picture 3). Then they unfold the strip of paper and cut off one of the 4 sections (see picture 4).

![Picture 1: strip of paper](image1.png)

1

![Picture 2: strip folded in half](image2.png)

2

![Picture 3: strip folded in half again](image3.png)

3

![Picture 4: strip with section cut off](image4.png)

4

5

Each student will now have a model of a yardstick divided into three equal parts (see picture 5). Explain that the strip of paper is like a mini-yardstick. Point out that the entire length is like 1 yd and each section is like 1 ft. The three sections represent 3 ft.

Draw on the board:

<table>
<thead>
<tr>
<th>Yards</th>
<th>Mini-Yardsticks</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** You may need to add more rows to the table.

Pointing at the first and last columns in turn, SAY: The table shows yards and feet. I want to know how many feet there are in 1 yd, 2 yd, 3 yd, and so on. Tape your mini-yardstick in the first row under “Mini-Yardsticks” and SAY: I will count the number of feet: 1, 2, 3. ASK: How many feet are in 1 yard? (3) Write “3” in the first row under “Feet.” Have two volunteers tape their mini-yardsticks in the second row under “Mini-Yardsticks” and SAY: Now we have 2 yards. Have the class count the number of feet with you: 1, 2, 3, 4, 5, 6. Write “6” in the second row under “Feet.” Continue until you run out of mini-yardsticks; if a cell is incomplete, sketch the mini-yardsticks that are missing.
2. **Making a row of yardsticks to find the number of feet.** Tape a yardstick to the board and ASK: How many feet is this? (3) Above the yardstick, write “1 yard” and below it, write “3 feet.” Tape another yardstick to the board so that the two yardsticks are end to end. ASK: How many feet do we have now? (6) Write the labels for the second yardstick, as shown below:

<table>
<thead>
<tr>
<th>Yards</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 yard</td>
<td>2 yards</td>
</tr>
<tr>
<td>3 feet</td>
<td>6 feet</td>
</tr>
</tbody>
</table>

Continue until you have taped five yardsticks to the board. SAY: I want to write our results in a table. Draw on the board:

<table>
<thead>
<tr>
<th>Yards</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SAY: We will write the number of yards in one column and the number of feet in the other. Write “1” in the first row under “Yards.” Pointing to the yardstick labeled “3 feet,” ASK: How many feet is this? (3) Write “3” under “Feet.” Repeat for 2 yardsticks, and ask for the number of feet. (6) Continue until the table is complete, as shown below:

<table>
<thead>
<tr>
<th>Yards</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

**Review counting by 3s.** Remind students that they know how to count by 3s. SAY: Since there are 3 ft in every yard, you can use counting by 3s to find the number of feet in any number of yards. Draw on the board:

- ☐
- ☐
- ☐

ASK: How many circles are there? (3) Write “3” under the column of circles. Draw another column of three circles and ASK: If I add three more circles, how many are there now? (6) Write “6” under the second column. ASK: How do I show adding three more circles? (draw three more circles) How many are there now? (9) Continue in this way to 15. Have students find the number of feet in 5 yards by counting by 3s. (3, 6, 9, 12, 15 feet) The final picture is shown on the next page.
**Big steps are about a yard long.** SAY: We used big steps to estimate meters. We can also use big steps to estimate yards. Since yards are a little shorter than meters, our steps will need to be a little smaller. Use tape to mark three long parallel lines 1 yd apart on the floor. Have students stand facing the second line with their heels on the first line (position 1), and take a big step so that their heel is on the second line (position 2). Students should practice taking the first step with their left foot and their right foot because they will need to alternate feet when they actually pace the steps. Then have students take two steps, as shown below:

```
  1 yard  1 yard
```

Use the following method for students who are having trouble with the previous method. Have students stand facing the second line with their heels on the first line, and take a big step so that their heel touches the second line. Have students practice taking a step in this way several times. For multiple steps, show students how to lead off with the same foot each time, as shown in the diagram below: take a big step (positions 1 and 2); bring the back foot forward beside the front foot (position 3), then take another big step with the same foot (position 4).

```
  1 yard  1 yard
```

Have students take five steps that they think will be about 1 yd each, and have a partner check using a yardstick. Emphasize that it is hard to take big steps, so students need to be careful and to try to walk in a straight line.

**Using big steps to estimate distances.** Have students predict the distance in yards from, for example, your classroom door to a nearby classroom door or to the opposite side of the hall. Then have students use big steps to estimate the distance to check their prediction. Allow students to adjust their prediction after measuring part of the distance.

Now have students repeat the process but in the opposite direction. Before they make their predictions, ask if the measurement should be larger than, smaller than, or about the same as the distance they just measured. After students have taken big steps to walk back, ask if they got the same results for both directions. (the measurements should be the same) Then have them make a prediction for the distance to a different location, and use big steps to estimate the distance.
ACTIVITY 3

Finding benchmarks for 1 yard. Demonstrate how to check if a string is 1 yd long. Align one end of the string with the zero on the yardstick. If the string extends to the other end of the yardstick, it is 1 yd long.

Give each student 1-yard-long pieces of string and ask them to confirm that the string is 1 yd long. (If you have only a few yardsticks, draw horizontal lines on the board or stick a few 1-yard-long pieces of tape to the floor and have students use these to check their strings instead. Make sure that students see you use a yardstick to create the lines.) Have students use the string to find objects or distances in the classroom that are about 1 yd, more than 1 yd, and less than 1 yd long. Suggest some examples like the distance around the seat of a chair or the distance from the floor to a door knob. As a class, discuss which objects are about 1 yd long.

Measuring with only one yardstick. Give each student a yardstick or a rolled and taped newspaper cut to 1 yd long. Demonstrate using a single yardstick to measure a distance: place the yardstick on the floor at the starting point, mark the end, move the yardstick, and so on. ASK: What is an easier way to use yardsticks to measure exactly the same distance? If no one responds, put down your yardstick at the place you started before and ask a volunteer to place their yardstick so that it is end-to-end with yours. Ask again for ideas about finding easier ways to measure. Again, if no one answers, have another volunteer place their yardstick end-to-end with the second one, as shown below:

```
  first yardstick  second yardstick  third yardstick
```

Discuss problems with this method, for example, making a zigzag instead of a straight line.

Using a measuring tape. SAY: I want to see why it is better to use a long tool to measure a long distance than a long chain of short tools. Hold up and extend a measuring tape to its full length and SAY: This is a measuring tape. Point out the feet markings and the yard markings (if there are any). Gather as many yardsticks as you have. As a class, decide on a long distance to measure and where the starting point should be. Ask students one at a time to add their yardsticks to the end of a growing chain, re-using yardsticks if necessary. Have a few students record the number of yards. Then, demonstrate using the measuring tape to measure the same distance, re-using the tape if necessary. ASK: Which is easier? Which is quicker? Which one requires fewer measuring tools? (measuring tape)

If a number of measuring tapes are available, have students work in groups and take turns to use a tape and yardsticks to measure objects and distances.
Extensions

1. Have students stand with their backs to the same wall and take six big steps like the ones they used as a benchmark for 1 yd. Clarify that the purpose is to demonstrate how different everyone’s big step is (not to move as far or go as fast as possible). Discuss the problems that arise from using benchmarks, such as big steps, that are different lengths for different people. Help students come to the conclusion that benchmarks are only appropriate for making quick estimates.

2. Nina uses a yardstick to measure the width of the hallway and finds that it is 4 yards wide. How wide is the hallway in feet?

   Answer: 12 ft

(MP2, MP4)  

3. Solve the problem. Show your work and explain what each step means in the story problem.

   a) A stool is 20 cm tall. A chair is 15 cm taller than the stool. A table is 20 cm taller than the chair. How tall is the table?

   b) A pen is 3 cm longer than a marker. A pencil is 2 cm longer than the pen. How much longer than the marker is the pencil?

Sample solutions

a) The chair is \( 20 + 15 = 35 \) cm tall. The table is 20 cm taller than the chair, so I added \( 35 + 20 = 55 \) to find that the table is 55 cm tall.

b) I drew a marker, a longer pen, and an even longer pencil and showed the distances I know:

\[
\begin{align*}
? \text{ cm} & \quad 3 \text{ cm} & \quad 2 \text{ cm} \\
\text{marker} & \quad \text{pen} & \quad \text{pencil}
\end{align*}
\]

The pen is 3 cm longer than the marker and the pencil is 2 cm longer than the pen, so the pencil is 5 cm longer than the marker.
MD2-22  Choosing Tools and Units
Pages 117–118

STANDARDS
2.MD.A.1, 2.MD.A.3

VOCABULARY
about
feet
foot (ft)
inches
measuring tape
unit of measurement

Goals
Students will choose appropriate tools and units to measure lengths.

PRIOR KNOWLEDGE REQUIRED
Can distinguish between inches and feet
Can use benchmarks to estimate lengths in inches and feet

MATERIALS
pieces of paper, each with a name of an object or a distance
paper bag
yardsticks or rolled and taped newspapers cut to 1 yd long
measuring tape
pieces of paper, each labeled with a picture of an object or a distance
a bag

Review benchmarks for inches and feet. ASK: What did you use to
estimate 1 inch? (two- or three-finger widths) 1 foot? (forearm)

ACTIVITIES 1–2
1. Choosing units: inches or feet? In advance, prepare pieces
of paper and write on each the name of an object (e.g., mouse,
melon, car) or a distance (e.g., from the classroom door to the
front door of the school, from the tip to the base of the thumb,
from the floor to the ceiling). Place these in a paper bag. Have
students draw a piece of paper one at a time and either read it out
loud or give it to you to read. Then ask the class to signal the most
appropriate unit of measurement by placing hands close together
for inches and far apart for feet, as shown below:

![inches and feet signals]

SAY: For some objects and distances, you can signal inches or
feet. This is fine, because some objects and distances are long
enough to be measured in feet and also short enough to be
measured in inches. For example, you might measure the length of
a watermelon in inches or in feet.
2. **Choosing tools: a yardstick or a 1-yard-long piece of string?**

   Have students use yardsticks (or rolled and taped newspapers cut to 1 yd long) to measure some of the objects they already measured using a piece of string in Lesson MD2-21. Then discuss which objects students prefer to measure with a yardstick and which they prefer to measure using a piece of string. For example, it’s easier to measure the distance around an object using a piece of string. Discuss the convenience of using a tool with units marked on it. (an unmarked piece of string still has to be measured)

**NOTE:** Many standard measuring tapes are 12 ft, 16 ft, 25 ft, or 100 ft long. Make sure you use one that will fit in your classroom when fully extended.

**How long is a measuring tape?** Draw a mark at one end of the board and write “0” below it. Ask a volunteer to hold the end of the measuring tape on the mark. Extend the measuring tape by walking beside the board a few feet away from the student. Draw a mark on the board where you stop and hold the measuring tape at the mark. Have students estimate the length from the volunteer to you in inches and in feet. Record a few estimates and then say and write the actual number of inches and feet below the mark.

Repeat a number of times, increasing the distance each time until the measuring tape is fully extended. At this point, describe how far from zero you are. For example, SAY: The whole measuring tape is a little longer than the board. If the measuring tape is, for example, 192 inches or 16 feet, SAY: This means that 192 inches or 16 feet is a little longer than the board. ASK: How long do you think 192 feet is? After students give a few suggestions, you might give an example (in a tall building, 192 feet is several floors above the ground).

**ACTIVITIES 3–4**

3. **Extend the measuring tape to its full length and have two volunteers hold the ends at a height so that everyone can see the measuring tape. Stand behind the measuring tape and, in no particular pattern, point at several different points on it. Have students estimate the length to the nearest foot. Have two different volunteers hold the measuring tape and repeat.**

4. **Choosing tools: a 12-inch ruler, a yardstick, or a measuring tape?** In advance, collect a variety of pictures of objects or distances and put them in a bag. Have students stand beside each other to form a line, either on a line of masking tape or against a wall. One at a time, have students draw a picture from the bag and hand it to you. Show the picture to the class. Students signal the most appropriate measuring tool as follows: take one small step for a 12-inch ruler, one big step for a yardstick, and three big steps for a measuring tape.
Extension

(MP1, MP7) The drawing shows a set of stairs. You can find the height of a real set of stairs using a 12-inch ruler. Explain how you could do it.

Answer: Check that the vertical parts of the steps are all the same height. Measure one step, count how many steps there are, and then add the height of the step that number of times.
Goals
Students will draw pictures to solve one-step word problems involving the addition and subtraction of lengths.

PRIOR KNOWLEDGE REQUIRED
Can add and subtract within 100
Can distinguish between inches, feet, and centimeters
Can answer one-step word problems

MATERIALS
overhead projector
blank transparencies
erasable markers
transparent 12-inch ruler or transparency of a ruler from BLM 12-Inch Rulers (pp. P-69–70)
12-inch rulers or rulers from BLM 12-Inch Rulers (pp. P-69–70)

Adding lengths within 10. Project a blank transparency and write at the top of it:

A spring is 1 inch long. Marco stretches the spring 2 more inches. How long is the spring now?

Read the problem aloud, then place a transparent 12-inch ruler (or a transparency of a ruler from BLM 12-Inch Rulers) below the word problem. Do not draw or write on it—you will use it to demonstrate adding two lengths. Draw a tightly coiled spring above the ruler from 0 to 1; make sure you leave some space between the spring and the ruler, as shown below:

SAY: The spring goes from 0 to 1 inch. You can show the length of the spring with a line that also goes from 0 to 1 inch. Draw dots above 0 and 1 and join them with a line, as shown below:
SAY: Marco stretches the spring 2 more inches. Draw an extended spring from 0 to 3 above the first spring. SAY: Since the spring becomes 2 inches longer, we need to add 2 inches to the line we drew. Extend the line from 1 to 2 and then from 2 to 3. Draw a dot at the end of the line above the 3. The final picture should look like this:

Remove the ruler and write “0,” “1,” and “3” below the dots, as shown below:

The spring is 3 inches long.

ASK: How long is the spring now? (3 inches) Write the answer as a sentence beside the picture, as shown above.

Below the answer to the previous problem, write on the transparency:

A hamster is 5 inches long. It grows 3 inches. How long is the hamster now?

Read the problem aloud. SAY: We drew a picture to answer the problem about the spring. Now I want to draw the same kind of picture to answer the problem about the hamster. Place the transparent ruler below the question. ASK: Where do I draw the dots to show the hamster’s length at the beginning? (at 0 and 5) Draw the dots above the ruler and join them with a line. ASK: How many inches did the hamster grow? (3 inches) How can I show this in the picture? (draw 3 more inches starting from 5) Extend the line to 8 and draw a dot at the end of the line. SAY: This dot shows how long the hamster is now. ASK: How long is the hamster now? (8 inches) Remove the ruler and write “0,” “5,” and “8” below the dots. Write the answer as a sentence beside the picture. The final picture should look like this:

The hamster is 8 inches long.

For the following exercises, provide students with 12-inch rulers or rulers from BLM 12-Inch Rulers. Read each word problem aloud and have students draw a picture in their notebook to represent each problem, prompting them as needed.
Exercises: Draw dots and a line to show the length of the pet. Make the line longer and draw a dot at the end of it to show how much the animal grows.

a) A mouse is 3 inches long. It grows 1 inch. How long is the mouse now?

b) A frog is 1 inch long. It grows 5 inches. How long is the frog now?

c) A lizard is 5 inches long. It grows 4 inches. How long is the lizard now?

Answers

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>b</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>c</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

The mouse is 4 inches long. The frog is 6 inches long. The lizard is 9 inches long.

Adding lengths within 100. Write on the board:

Last year Kathy planted a tree. It was 23 inches tall. It grew 2 inches this year. How tall is the tree now?

Read the problem aloud and then SAY: We will make a picture to answer the problem. Draw on the board a ruler from 0 to 26. ASK: How do we show the starting height of the tree? (draw a dot at 0 and at 23, and join the dots with a line) Draw the dots and the line. ASK: How do we show the amount it grew? (draw 2 more inches) Extend the line 2 inches and draw a dot at the end of the line above 25. ASK: How tall is the tree now? (25 inches) Write the answer as a sentence beside the ruler, as shown below:

```
23 24 25 26
The tree is 25 inches tall.
```

SAY: It’s very hard to draw such long rulers, so we draw only the part we need. Erase all of the ruler but the part shown above. Describe an extreme example, such as drawing a ruler for a blue whale that is 837 inches long. ASK: Would it be easy to draw a ruler that goes from 0 to 840 inches? (no) SAY: We need only the end of the ruler. We do not need to see the beginning of the ruler or the line because we know they both start at 0.

Write on the board:

A turtle is 26 inches long. It grows 5 inches. How long is the turtle now?

ASK: How do we show the length of the turtle when it is 26 inches long? (draw a line from before 25 that goes to 26 and put a dot at 26) How do we show that the turtle grows 5 inches? (draw a line that starts at 26 and goes 5 more inches and add a dot at 31) Draw it on the board, and then write the answer beside the ruler, as shown below:

```
25 26 27 28 29 30 31 32
The turtle is 31 inches long.
```

For the following exercises, read each problem aloud, draw a partial ruler, and then prompt students to explain how to draw the picture and how to
write the answer as a sentence. Make sure students do not draw the partial rulers themselves.

Exercises

a) A polar bear is 52 inches tall. It grows 6 inches. How tall is the polar bear now?

b) A fox is 29 inches long. It grows 3 inches. How long is the fox now?

c) A stork is 33 inches tall. It grows 7 inches. How tall is the stork now?

Answers

a) The bear is 58 inches tall.

b) The fox is 32 inches long.

c) The stork is 40 inches tall.

Subtracting lengths within 10. SAY: In the problems we did before, we drew pictures to show things getting longer. We can also use pictures to show things getting shorter. Project a blank transparency and write at the top of it:

A string is 5 inches long. Bob cuts off 2 inches. How long is the string now?

Place a transparent inch ruler below the word problem and read the problem aloud. ASK: How do we show the length of the string before it is cut? (draw a dot at 0 and at 5 and join them with a line) Draw the line, as shown below:

SAY: We show cutting off 2 inches by starting an arrow at 5 and drawing it 2 inches long toward zero. Draw the arrow, as shown below:

ASK: How long is the string now? (3 inches) Remove the ruler and write “0,” “3,” and “5” below the line segment. Write the answer as a sentence beside the picture. The final picture is shown on the next page.
The string is 3 inches long.

Repeat with the following problem:

A balloon is 11 inches long. Sal lets out some air and the balloon gets 4 inches shorter. How long is the balloon now?

This time have students generate the answer as a sentence. (The balloon is 7 inches long.) Write the sentence beside the picture.

For the following exercises, have students use 12-inch rulers as you did in the examples above. Read each problem aloud and use prompts to help students draw a picture to represent each problem in their notebooks.

**Exercises:** Draw a line to show the length. Draw an arrow to show how much to take away. Write the answer as a sentence.

a) A stick is 7 inches long. Josh breaks off 4 inches. How long is the stick now?

b) Kim stretches a spring so it is 10 inches long. When she lets go, the spring is 6 inches shorter. How long is the spring now?

c) A piece of celery is 9 inches long. Lily bites off 2 inches. How long is the piece of celery now?

**Answers**

\[a) \quad 0 \quad 3 \quad 7 \quad \text{The stick is 3 inches long.} \]
\[b) \quad 0 \quad 4 \quad 10 \quad \text{The spring is 4 inches long.} \]
\[c) \quad 0 \quad 7 \quad 9 \quad \text{The celery is 7 inches long.} \]

**Subtracting lengths within 100.** Write on the board:

A string is 37 inches long. Carlos cuts off 4 inches. How long is the string now?

Read the problem aloud and then draw a partial ruler from 32 to 37, as shown below. SAY: As we did when the numbers are large, we draw only the end of the ruler. Draw a line that ends at 37, as shown below, and SAY: We know the line starts at 0 and ends at 37, but it is fine to draw just the part we need, which is the end of the line. ASK: How do we show cutting off 4 inches? (draw an arrow 4 inches long that starts at 37 and goes toward 0) Draw the arrow. ASK: How long is the string now? (33 inches) What sentence can we write? (The string is 33 inches long.) Write it on the board. The final picture should look like this:

\[32 \quad 33 \quad 34 \quad 35 \quad 36 \quad 37 \quad \text{The string is 33 inches long.} \]
For the following exercises, read each problem aloud, draw a partial ruler, and prompt students to explain how to make the picture and how to write the answer as a sentence. Make sure students do not draw the partial rulers themselves.

Exercises

a) A stick is 51 inches long. Lynn breaks off 6 inches. How long is the stick now?

b) Roy draws a line 44 cm long. He erases 5 cm. How long is the line now?

c) A rope is 68 feet long. Rani cuts off 3 feet. How long is the rope now?

Answers

a) [Diagram showing a partial ruler with marked lengths 43 to 51.]

The stick is 45 inches long.

b) [Diagram showing a partial ruler with marked lengths 37 to 45.]

The line is 39 cm long.

c) [Diagram showing a partial ruler with marked lengths 60 to 68.]

The rope is 65 feet long.

Adding and subtracting lengths within 10. Write the following word problems on the board, leaving enough space under each problem to fit a ruler:

1. A lizard is 3 inches long. It grows 2 inches. How long is the lizard now?
2. A line is 3 inches long. Carl erases 1 inch. How long is the line now?
3. A leaf is 3 inches long. It grows 1 inch. How long is the leaf now?
4. A ribbon is 3 inches long. Sun cuts off 2 inches. How long is the ribbon now?

Tell students that you want them to help you draw a picture for the first sentence in each problem. Place an inch ruler below the first problem, read the first sentence aloud, and ask students what to draw. (a dot at 0 and 3 and then join the dots with a line, write “0” and “3” below the dots) Draw the dots and line and write “0” and “3.” Repeat for the remaining three problems. All four problems should have the same starting picture, as shown on the next page.
Place the ruler below the first problem again and read the second sentence aloud. ASK: What do we do now? (make the line 2 inches longer and draw a dot at the end of it) How do you know which direction to go in? (grow means add, so we move away from zero) Draw the 2 inches and the dot. ASK: How long is the lizard now? (5 inches) Write “5” under the last dot.

Place the ruler below the second problem and read the second sentence aloud. ASK: What do we do? (draw an arrow 1 inch long that starts at 3 and points toward zero) How do you know which direction to go in? (erase means subtract, so we move toward zero) Draw the arrow. ASK: How long is the line now? (2 inches)

Repeat for the remaining two problems and have students explain how they know which direction to go in. The final pictures should look like this:

1. A lizard is 3 inches long. It grows 2 inches. How long is the lizard now?

2. A line is 3 inches long. Carl erases 1 inch. How long is the line now?

3. A leaf is 3 inches long. It grows 1 inch. How long is the leaf now?

4. A ribbon is 3 inches long. Sun cuts off 2 inches. How long is the ribbon now?

For the following exercises, have students use an inch ruler to draw a picture in their notebook for each problem. Tell them to try to vertically align the zeros in the four pictures.

**Exercises:** Draw a line to show the length. Show how much to add or take away.

a) A chain is 5 inches long. Sandy cuts off 2 inches. How long is the chain now?

b) A fish is 5 inches long. It grows 3 inches. How long is the fish now?

c) A straw is 5 inches long. Anwar cuts off 3 inches. How long is the straw now?

d) A branch is 5 inches long. It grows 2 inches. How long is the branch now?

After students have finished, draw the answers to the exercises above on the board in the incorrect order. Read each word problem aloud,
one at a time, point to the pictures on the board, and have students signal thumbs up for the picture that represents the problem you read. (see answers below)

a)  
\begin{center}
\begin{tikzpicture}[scale=0.7]
\draw[->,thick] (0,0) -- (5,0);
\filldraw (0,0) circle (2pt) node[below] {0};
\filldraw (3,0) circle (2pt) node[below] {3};
\filldraw (5,0) circle (2pt) node[below] {5};
\end{tikzpicture}
\end{center}

b)  
\begin{center}
\begin{tikzpicture}[scale=0.7]
\draw[->,thick] (0,0) -- (8,0);
\filldraw (0,0) circle (2pt) node[below] {0};
\filldraw (5,0) circle (2pt) node[below] {5};
\filldraw (8,0) circle (2pt) node[below] {8};
\end{tikzpicture}
\end{center}

c)  
\begin{center}
\begin{tikzpicture}[scale=0.7]
\draw[->,thick] (0,0) -- (5,0);
\filldraw (0,0) circle (2pt) node[below] {0};
\filldraw (2,0) circle (2pt) node[below] {2};
\filldraw (5,0) circle (2pt) node[below] {5};
\end{tikzpicture}
\end{center}

d)  
\begin{center}
\begin{tikzpicture}[scale=0.7]
\draw[->,thick] (0,0) -- (7,0);
\filldraw (0,0) circle (2pt) node[below] {0};
\filldraw (5,0) circle (2pt) node[below] {5};
\filldraw (7,0) circle (2pt) node[below] {7};
\end{tikzpicture}
\end{center}

Adding and subtracting lengths within 100. This section is the same as the previous one, except that it uses larger numbers. Write the following problems on the board, leaving enough space under each to draw part of a ruler:

1. A beaver is 30 inches long. It grows 2 inches. How long is the beaver now?
2. A stick is 30 inches long. Fred breaks off 1 inch. How long is the stick now?
3. A dog is 30 inches long. It grows 1 inch. How long is the dog now?
4. A rope is 30 inches long. Mandy cuts off 2 inches. How long is the rope now?

Explain that you want students to help you draw pictures for the first sentence of each problem. Draw part of a ruler below the first question. Read the first sentence aloud and ask students what to do. (draw a line to 30 and a dot at 30) Draw it. Repeat for the remaining three problems. All four word problems should have the same starting picture, as shown below:

\begin{center}
\begin{tikzpicture}[scale=0.7]
\draw[->,thick] (27,0) -- (33,0);
\filldraw (27,0) circle (2pt) node[below] {27};
\filldraw (28,0) circle (2pt) node[below] {28};
\filldraw (29,0) circle (2pt) node[below] {29};
\filldraw (30,0) circle (2pt) node[below] {30};
\filldraw (31,0) circle (2pt) node[below] {31};
\filldraw (32,0) circle (2pt) node[below] {32};
\filldraw (33,0) circle (2pt) node[below] {33};
\end{tikzpicture}
\end{center}

Return to the first problem and read the second sentence aloud. ASK: What do we do? (make the line 2 inches longer and draw a dot at the end of it) Draw the 2 inches and the dot. ASK: How long is the beaver now? (32 inches) Repeat for the remaining three problems. The final pictures are shown below:

1.  A beaver is 30 inches long. It grows 2 inches. How long is the beaver now?

\begin{center}
\begin{tikzpicture}[scale=0.7]
\draw[->,thick] (27,0) -- (33,0);
\filldraw (27,0) circle (2pt) node[below] {27};
\filldraw (28,0) circle (2pt) node[below] {28};
\filldraw (29,0) circle (2pt) node[below] {29};
\filldraw (30,0) circle (2pt) node[below] {30};
\filldraw (31,0) circle (2pt) node[below] {31};
\filldraw (32,0) circle (2pt) node[below] {32};
\filldraw (33,0) circle (2pt) node[below] {33};
\end{tikzpicture}
\end{center}
2. A stick is 30 inches long. Fred breaks off 1 inch. How long is
the stick now?

3. A dog is 30 inches long. It grows 1 inch. How long is the dog now?

4. A rope is 30 inches long. Mandy cuts off 2 inches. How long is
the rope now?

Extensions

1. Write a word problem for the picture.

   a) A path is 18 feet long. Mike makes it 2 feet longer. How long is
   the path now?
   b) A log is 35 feet long. Liz cuts off 2 feet. How long is the log now?

Sample answers
a) A path is 18 feet long. Mike makes it 2 feet longer. How long is
the path now?
b) A log is 35 feet long. Liz cuts off 2 feet. How long is the log now?

(MP2) 2. Have students work in pairs. Give each partner either Picture A or
Picture B, and have them write a word problem for their picture. Then
have partners exchange word problems (but not the picture) and draw
a picture to answer the problem their partner wrote.

Sample answers
A. Don’s paper is 17 inches long. He tapes 3 more inches of paper
to it. Then he tapes 2 more inches of paper to it. How long is
the paper now?

   $17 + 3 = 20$ and $20 + 2 = 22$, so Don’s paper is 22 inches long now.

B. Emma’s string is 8 inches long. She adds a string that is 4 inches
long. Then she cuts off 3 inches. How long is the string now?

   $8 + 4 = 12$ and $12 - 3 = 9$, so Emma’s string is 9 inches long now.
Goals
Students will solve one-step word problems about adding and subtracting lengths by drawing pictures and writing equations.

PRIOR KNOWLEDGE REQUIRED
Can draw a picture for a measurement problem
Can add and subtract within 100
Can write and answer addition and subtraction equations
Can answer one-step word problems

MATERIALS
12-inch rulers or rulers from BLM 12-Inch Rulers (pp. P-69–70)

Equations for adding lengths within 10. Write on the board:

A frog is 4 inches long. It grows 1 inch. How long is the frog now?

Read the problem aloud and SAY: We do not need a ruler to answer this question. ASK: How long is the frog at the beginning? (4 inches) Draw on the board:

\[ \begin{array}{c}
0 \\
4
\end{array} \]

Draw 4 jumps and a dot at the end of the jumps. Write “4” below the dot and join the dots with a line. SAY: Each jump represents 1 inch. The jumps show how many inches long the frog is at the beginning. The picture should look like this:

\[ \begin{array}{c}
0 \\
4
\end{array} \]

ASK: How many inches does the frog grow? (1 inch) SAY: To show that the frog grows 1 inch, we draw 1 more jump. Draw the jump, another dot, and a line. ASK: How long is the frog now? (5 inches) Write “5” below the last dot and the answer as a sentence beside the picture. The picture should look like this:

\[ \begin{array}{c}
0 \\
4 \\
5
\end{array} \]

The frog is 5 inches long.

SAY: We can write an addition sentence for the picture. Write “4 + 1 = 5,” as shown below:

\[ \begin{array}{c}
0 \\
4 \\
5
\end{array} \]

The frog is 5 inches long.

4 + 1 = 5
ASK: What do the numbers 4, 1, and 5 stand for? (4 is the frog’s length at the beginning, 1 is how much the frog grows, 5 is how long the frog is now)

Write on the board:

A tadpole is 2 inches long. It grows 1 inch. How long is the tadpole now?

Read the problem aloud. SAY: First, we draw a dot and write a zero. ASK: How do we show that the tadpole is 2 inches long at the beginning? (draw 2 jumps, a dot, and a line) Draw them. ASK: How long is the tadpole now? (3 inches) Where do we write the 3? (below the last jump) Write it. The picture should look like this:

![Tadpole diagram]

ASK: What addition sentence do we write? (2 + 1 = 3) Write it. ASK: What sentence can we write? (The tadpole is 3 inches long.) Write it, as shown below:

2 + 1 = 3

The tadpole is 3 inches long.

Give each student a 12-inch ruler or a ruler from BLM 12-Inch Rulers for the following exercises.

**Exercises:** Draw a picture. Write the addition sentence. Write the answer as a sentence.

a) A kitten is 5 inches long. It grows 2 inches. How long is the kitten now?

b) A bird is 3 inches tall. It grows 1 inch. How tall is the bird now?

c) A puppy is 7 inches long. It grows 3 inches. How long is the puppy now?

**Answers**

a)

![Kitten diagram]

5 + 2 = 7

The kitten is 7 inches long.

b)

![Bird diagram]

3 + 1 = 4

The bird is 4 inches tall.

c)

![Puppy diagram]

7 + 3 = 10

The puppy is 10 inches long.
Equations for adding lengths within 100. Write on the board:

A deer is 53 inches long. It grows 4 inches. How long is the deer now?

Read the problem aloud. SAY: We will draw a picture without using a ruler.
ASK: How long is the deer at the beginning? (53 inches) Draw on the board:

53

SAY: I drew part of the line before 53 to show that it started at zero.
ASK: In the problems we did earlier, how did we show that something grew 4 inches? (we made the line 4 inches longer and drew a dot at the end) Sketch four jumps starting from 53. Have students count the jumps.
SAY: Each jump represents 1 inch. Draw a dot at the end of the jumps and then the line. The picture should look like this:

53

Write the numbers, as shown below:

53 54 55 56 57

ASK: What sentence can we write? (The deer is 57 inches long.) Write it beside the picture. SAY: Let’s write an addition sentence. ASK: What numbers do we add? (53 and 4) What is the addition sentence? (53 + 4 = 57) Write it below the picture. ASK: What does each number stand for? (53 is the deer’s length at the beginning, 4 is how much the deer grows, 57 is how long the deer is now) The final picture should look like this:

53 54 55 56 57

53 + 4 = 57 The deer is 57 inches long.

For the following exercises, read each problem aloud and have students explain how to draw the picture, and how to write the addition sentence and the answer as a sentence.

Exercises

a) A shadow is 73 inches long. It gets 2 inches longer. How long is the shadow now?

b) A puddle is 58 inches long. It gets 3 inches longer. How long is the puddle now?

c) An otter is 23 inches long. It grows 7 inches. How long is the otter now?
Answers

a) 73 74 75
   73 + 2 = 75
   The shadow is 75 inches long.

b) 58 59 60 61
   58 + 3 = 61
   The puddle is 61 inches long.

c) 23 24 25 26 27 28 29 30
   23 + 7 = 30
   The otter is 30 inches long.

Equations for subtracting lengths within 10. Write on the board:

A string is 9 inches long. Ben cuts off 2 inches. How long is the string now?

Read the problem aloud and SAY: Just as we did with the addition problems, we will write a subtraction sentence. Drawing as you go, ASK: How long is the string at the start? (9 inches) How much did Ben cut off? (2 inches) How long is the string now? (7 inches) What is the subtraction sentence? (9 − 2 = 7) Write “9 − 2 = 7.” ASK: What is the answer as a sentence? (The string is 7 inches long.) The final picture should look like this:

9 − 2 = 7  The string is 7 inches long.

Exercises: Use a ruler to draw a picture for the problem. Write the subtraction sentence and the answer as a sentence.

a) A stick is 5 inches long. Glen breaks off 4 inches. How long is the stick now?

b) Helen stretches a spring so it is 9 inches long. When she lets go, the spring is 3 inches shorter. How long is the spring now?

c) A carrot is 6 inches long. Jenny bites off 1 inch. How long is the carrot now?

Answers

a) 5 − 4 = 1  The stick is 1 inch long.

b) 9 − 3 = 6  The spring is 6 inches long.

c) 6 − 1 = 5  The carrot is 5 inches long.
Equations for subtracting lengths within 100. Write on the board:

A ribbon is 23 inches long. Clara cuts off 5 inches. How long is the ribbon now?

Have students explain how to draw the picture. ASK: How long is the ribbon at the beginning? (23 inches) On the board, draw a partial inch ruler that ends at 23. ASK: How much did Clara cut off? (5 inches) Draw an arrow to show this. ASK: How long is the ribbon now? (18 inches) What is the subtraction sentence? (23 − 5 = 18) Write it. Explain that the only numbers we need to see are 18 and 23. Erase the ruler. ASK: What is the answer as a sentence? (The ribbon is 18 inches long.) Write it. The final picture should look like this:

\[ \begin{align*}
23 - 5 &= 18 \\
\text{The ribbon is 18 inches long.}
\end{align*} \]

Exercises: Draw a picture. Write the subtraction sentence and the answer as a sentence.

a) A log is 62 inches long. Grace chops off 5 inches. How long is the log now?

b) Ethan draws a line 87 inches long. He erases 6 inches. How long is the line now?

c) A rope is 96 inches long. Greg cuts off 4 inches. How long is the rope now?

Answers

a) \[ \begin{align*}
62 - 5 &= 57 \\
57 &\text{ inches long.}
\end{align*} \]

b) \[ \begin{align*}
87 - 6 &= 81 \\
81 &\text{ inches long.}
\end{align*} \]

c) \[ \begin{align*}
96 - 4 &= 92 \\
92 &\text{ inches long.}
\end{align*} \]
Extensions

1. Write an equation for the picture.

   a) 
   
   \[ 151 + 152 + 153 + 154 + 155 + 156 + 157 + 158 + 159 + 160 + 161 + 162 + 163 + 164 + 165 + 166 + 167 \]

   b) 
   
   \[ 397 + 398 + 399 + 400 + 401 + 402 + 403 + 404 + 405 + 406 + 407 + 408 + 409 + 410 + 411 + 412 + 413 \]

   c) 
   
   \[ 962 + 963 + 964 + 965 + 966 + 967 + 968 + 969 + 970 + 971 + 972 + 973 + 974 + 975 + 976 + 977 + 978 \]

   Answers: a) \[ 159 + 4 + 3 = 166 \], b) \[ 413 - 3 - 7 = 403 \], c) \[ 971 + 7 - 5 = 973 \]

   (MP4, MP5)

2. Solve the problem. Use any tools you think will help, such as grid paper, string, scissors, or paper and pencil. Show your work and explain what each of your steps means in the story problem.

   a) A red piece of string is 5 cm long. A green piece of string is 1 cm longer. How long are the two pieces together?

   b) Two pieces of string are 17 cm long together. One piece is 1 cm longer than the other. How long are the pieces?

Sample answers

   a) I used string, a ruler, and a pair of scissors. I cut a piece of string 5 cm long to be the red string and measured and cut another piece to be 1 cm longer to be the green string, so the green string is 6 cm long. I put the two pieces end-to-end and measured with a ruler. Together, the pieces of string are 11 cm long.

   b) I used grid paper. I drew a line 5 grid squares long for the red string, I drew a line underneath it 1 square longer for the green string, and found that the green string is 6 cm long. I added to find that the pieces together are 5 + 6 = 11 cm long.

   b) I used paper and pencil and addition sentences to find a pair of numbers that add to 17 and are only 1 apart. I started listing the pairs: 0 + 17, 1 + 16, and so on. I saw the numbers were far apart so I skipped ahead to find the answer more quickly. 8 + 9 = 17 and 8 and 9 are 1 apart, so the two strings are 8 cm and 9 cm long.
MD2-25  Word Problems and Equations (2)
Pages 124–125

STANDARDS
2.MD.B.5

Goals
Students will solve one-step word problems about adding and subtracting lengths using part-whole pictures and equations.

PRIOR KNOWLEDGE REQUIRED
Can add and subtract within 100
Can use part-whole pictures
Can add and subtract vertically
Can answer one-step word problems about length

MATERIALS
BLM Equations and Part-Whole Pictures (1) (p. P-77)
BLM Equations and Part-Whole Pictures (2) (p. P-78), two copies per student

Using a part-whole picture to find the length when both parts are known. Write on the board:

Blanca hops 5 feet on her left foot. Then she hops 2 feet on her right foot. How many feet does she hop altogether?

Read the problem aloud and SAY: This problem is like the ones we did in the last lesson, which we answered by drawing pictures. This time, we will use equations and part-whole pictures. Draw on the board:

\[
\begin{align*}
\text{feet on left foot} + & \quad \text{feet on right foot} = \quad \text{total feet} \\
\text{feet on left foot} & \quad \text{feet on right foot} \\
\end{align*}
\]

Point to the first blank in the equation and read the label aloud. ASK: How many feet does Blanca hop on her left foot? (5 ft) Write “5” in the first blank. Point to the second blank and read the label aloud. ASK: How many feet does Blanca hop on her right foot? (2 ft) Write “2” in the second blank. Point to the last blank and read the label aloud. ASK: Does the problem tell us the total number of feet she hops? (no) Draw a box in the last blank and SAY: The box shows that we do not know what number goes there yet. We know the parts and we have to find the whole.

Point out that each blank in the equation has a place in the part-whole picture. Have students help you transfer the known numbers from the equation into the part-whole picture. (write “5” in the bottom left, write “2” in the bottom right) ASK: Do we know both parts or do we know one part and the whole? (both parts) When we know both parts, do we add or subtract to
find the whole? (add) What is $5 + 2$? (7) Write “7” in the top of the part-whole picture. The final picture should look like this:

$$\begin{array}{c}
\frac{5}{feet\ on}\ \text{left\ foot} + \frac{2}{feet\ on}\ \text{right\ foot} = \frac{7}{total\ feet} \\
\frac{5}{feet\ on}\ \text{left\ foot} \quad \frac{2}{feet\ on}\ \text{right\ foot}
\end{array}$$

Have students use BLM Equations and Part-Whole Pictures (1) to complete the following exercises. Read each problem aloud and prompt students as needed.

**Exercises:** Write the numbers you know in the blanks. Draw a box for the number you do not know. Use the part-whole picture to find the number you do not know.

a) An ant walked 12 inches up a stem. Then it walked 11 inches on a leaf. How many inches did the ant walk altogether?

b) Alice ran 50 feet uphill. Then she ran 40 feet downhill. How many feet did she run altogether?

c) Amit rode 45 feet on a road. Then he rode 30 feet on a trail. How many feet did he ride altogether?

d) A bird flew 71 feet with a worm in its beak. Then it flew 24 feet without the worm. How many feet did it fly altogether?

**Answers**

a) 
$$\begin{array}{c}
\frac{12}{inches\ up\ stem} + \frac{11}{inches\ on\ leaf} = \frac{23}{total\ inches} \\
12\ \text{inches} \quad 11\ \text{inches}
\end{array}$$

b) 
$$\begin{array}{c}
\frac{50}{feet\ uphill} + \frac{40}{feet\ downhill} = \frac{90}{total\ feet} \\
50\ \text{feet} \quad 40\ \text{feet}
\end{array}$$

c) 
$$\begin{array}{c}
\frac{45}{feet\ on\ a\ road} + \frac{30}{feet\ on\ a\ trail} = \frac{75}{total\ feet} \\
45\ \text{feet} \quad 30\ \text{feet}
\end{array}$$
Using a part-whole picture to find the length when one part and the whole are known. SAY: For the problems we just did, we knew both parts and added them to find the whole. Now, we will do problems where we know only one part and the whole. Write on the board:

Ivan’s table is 4 feet long. He makes the table longer by adding a leaf. Now the table is 6 feet long. How many feet did he add to the table?

Read the problem aloud. Draw on the board:

Point to the first blank in the equation on the left and read the label aloud. ASK: How many feet is the table at the beginning? (4 ft) Write “4” in the blank. Point to the second blank and read the label aloud. ASK: Does the problem tell how many feet Ivan added to the table? (no) What do we draw to show that we do not know this number? (a box) Draw a box above the blank. Point to the last blank and read the label aloud. ASK: What is the total number of feet after Ivan makes the table longer? (6 ft) Write “6” in the blank.

ASK: What do we know: both parts, or one part and the whole? (one part and the whole) Have students help fill in the numbers they know in the part-whole picture. (write “4” in the bottom left, write “6” in the top) ASK: When we know one part and the whole, do we add or subtract to find the other part? (subtract) Write “6 – 4” in the equation on the right. ASK: What is 6 – 4? (2) Write “2” in the last blank and in the part-whole picture. The final picture should look like this:

Have students use BLM Equations and Part-Whole Pictures (2) to complete the following exercises.
Exercises: Write the numbers you know in the blanks. Draw a box for the number you do not know. Write what you know in the part-whole picture. Then subtract to find the number you do not know.

a) A curtain was 5 feet high. Beth added a border to make it longer. Then the curtain was 9 feet high. How many feet did Beth add to the curtain?

b) A banner was 7 feet long. Jay added another piece to make it longer. Then the banner was 10 feet long. How many feet did Jay add?

c) A dock was 46 feet long. The Johnsons added a new part to the dock. Then the dock was 58 feet long. How many feet did the Johnsons add?

Answers

a) \[
\begin{array}{c}
5 \\
\text{feet at the beginning}
\end{array} + \boxed{\begin{array}{c}
\text{feet added}
\end{array}} = \begin{array}{c}
9 \\
\text{total feet}
\end{array}
\]
\[
\begin{array}{c}
9 \\
\text{total feet}
\end{array} - \begin{array}{c}
5 \\
\text{feet at the beginning added}
\end{array} = 4
\]

b) \[
\begin{array}{c}
7 \\
\text{feet at the beginning}
\end{array} + \boxed{\begin{array}{c}
\text{feet added}
\end{array}} = \begin{array}{c}
10 \\
\text{total feet}
\end{array}
\]
\[
\begin{array}{c}
10 \\
\text{total feet}
\end{array} - \begin{array}{c}
7 \\
\text{feet at the beginning added}
\end{array} = 3
\]

c) \[
\begin{array}{c}
46 \\
\text{feet at the beginning}
\end{array} + \boxed{\begin{array}{c}
\text{feet added}
\end{array}} = \begin{array}{c}
58 \\
\text{total feet}
\end{array}
\]
\[
\begin{array}{c}
58 \\
\text{total feet}
\end{array} - \begin{array}{c}
46 \\
\text{feet at the beginning added}
\end{array} = 12
\]

Review vertical subtraction. Explain that sometimes it is easier to subtract numbers that are on top of each other than numbers that are beside each other. Write on the board:

\[
\begin{array}{c}
5 \\
- 3
\end{array} \quad \begin{array}{c}
6 \\
- 4
\end{array}
\]

Work through the subtractions together. (21, 19) If students need more practice, provide additional subtractions.

Have students use BLM Equations and Part-Whole Pictures (2) to complete the following exercises. Read each problem aloud and prompt students as needed. Students can write horizontal subtractions on the BLM or vertical subtractions in their notebooks to find the answers.
Exercises: Write the numbers in the blanks. Draw a box for the number you do not know. Write what you know in the part-whole picture. Subtract to find the number you do not know.

a) Before lunch Kate shoveled snow to make a path 24 m long. After lunch she shoveled more snow. Then the path was 28 m long. How many meters of snow did Kate shovel after lunch?

b) David painted a line 36 cm long. Then he painted another line. The two lines together are 42 cm long. How long is the second line?

c) The Clark’s driveway was 17 m long. They decided to make it longer. Then the driveway was 20 m long. How many m did they add?

d) A bridge was 76 meters long. A building crew made it longer. Then the bridge was 85 meters long. How many meters did the crew add?

Answers

a) \[
\begin{align*}
\text{meters} & \quad \text{meters} \\
\text{before lunch} & \quad \text{after lunch} \\
24 & \quad \Box \\
28 & \quad \text{total meters} \\
28 - 24 & = 4
\end{align*}
\]

b) \[
\begin{align*}
\text{cm of} & \quad \text{cm of} \\
\text{first line} & \quad \text{second line} \\
36 & \quad \Box \\
42 & \quad \text{total cm} \\
42 - 36 & = 6
\end{align*}
\]

c) \[
\begin{align*}
\text{meters of} & \quad \text{meters} \\
\text{driveway} & \quad \text{added} \\
17 & \quad \Box \\
20 & \quad \text{total meters} \\
20 - 17 & = 3
\end{align*}
\]

d) \[
\begin{align*}
\text{meters of} & \quad \text{meters} \\
\text{bridge} & \quad \text{added} \\
76 & \quad \Box \\
85 & \quad \text{total meters} \\
85 - 76 & = 9
\end{align*}
\]

Using a part-whole picture to find the length when the whole and the part that is taken away are known. SAY: In some of the problems we did, we added parts together to make a whole. Now, we will do problems where we will start with the whole and take away a part. Write on the board:

A ladder is 11 feet long. Ravi cuts off 2 feet of the ladder. How long is the ladder now?
Read the problem aloud. Draw on the board:

\[
\begin{array}{ccc}
\text{total feet} & \text{feet cut off} & \text{feet left} \\
\hline
& & \hline
& & \hline
\end{array}
\]

Point at the first blank in the equation on the left and read the label aloud. ASK: How many feet long is the ladder at the beginning? (11 ft) Write “11” in the blank. Point at the next blank and read the label aloud. ASK: How many feet did Ravi cut off? (2 ft) Write “2” in the blank. Point at the last blank and read the label aloud. ASK: Does the problem tell us how many feet are left after 2 feet are cut off? (no) How do we show this? (draw a box) Draw a box in the blank.

ASK: Do we know both parts or one part and the whole? (one part and the whole) Have students help you write what is known in the part-whole picture. (“11” in the top, “2” in the bottom left) ASK: When we know one part and the whole, do we add or subtract to find the other part? (subtract) Write “11 − 2” in the equation on the right. ASK: What is 11 − 2? (9) Write “9” in the last blank. The final picture should look like this:

\[
\begin{array}{ccc}
11 & \text{feet cut off} & 9 \\
\hline
2 & \text{feet left} & \hline
\end{array}
\]

Give students another copy of BLM Equations and Part-Whole Pictures (2) and have them use it to complete the following exercises. Read each problem aloud and prompt students as needed. Students can write horizontal subtractions on the BLM or vertical subtractions in their notebooks to find the answers.

**Exercises:** Write the numbers in the blanks. Draw a box for the number you do not know. Write what you know in the part-whole picture. Subtract to find the number you do not know.

a) Yu’s kite was 57 feet above the ground. She pulled it down 5 feet. How high is the kite now?

b) A plant was 35 cm tall. Jayden cut off the top 6 cm. How tall is the plant now?

c) A chain was 61 m long. Randi cut off 14 m. How long is the chain now?
Answers

a) 
\[ \frac{57}{\text{total feet}} + \frac{5}{\text{feet pulled down}} = \frac{52}{\text{feet left}} \]

b) 
\[ \frac{35}{\text{total cm}} + \frac{6}{\text{cm cut off}} = \frac{29}{\text{cm left}} \]

c) 
\[ \frac{61}{\text{total meters}} + \frac{14}{\text{meters cut off}} = \frac{47}{\text{meters left}} \]

Using a part-whole picture to find the length when the whole and the part that is left are known. SAY: In some of the problems we did, we knew the whole and the part that was taken away and we had to find the part that was left. Now we will do problems where we know the whole and the part that is left, but not the part that is taken away. Write on the board:

A piece of rope is 37 inches long. Marta cuts off some of it. Now the rope is 26 inches long. How much rope did Marta cut off?

Read the problem aloud. Draw on the board:

Point at the first blank in the equation on the left and read the label aloud. ASK: How many inches long was the rope at the beginning? (37 inches) Write “37” in the blank. Point to the next blank and read the label aloud. ASK: Do we know how many inches were cut off? (no) How do we show this? (draw a box) Draw a box in the blank. Point to the last blank and read the label aloud. ASK: How many inches are left? (26 inches) Write “26” in the blank.

SAY: We know the whole and the part that is left. So we need to find the part that Marta cut off. Have students help you transfer numbers into the part-whole picture. (write “37” in the top, write “26” in the bottom right) ASK: Do we need to add or subtract to find the other part? (subtract) Write “37 – 26” in the equation on the right. Have students subtract to find the answer. (11)
Write “11” in the last blank and in the part-whole picture. The final picture should look like this:

\[
\begin{array}{c|c|c}
\text{total inches} & \text{inches cut off} & \text{inches left} \\
37 & \square & 26 \\
\end{array}
\]

Have students use BLM Equations and Part-Whole Pictures (2) to complete the following exercises. Read each problem aloud and prompt students as needed. Students can write horizontal subtractions on the BLM or vertical subtractions in their notebooks to find the answers.

**Exercises:** Write the numbers in the blanks. Draw a box for the number you do not know. Write what you know in the part-whole picture. Subtract to find the number you do not know.

a) A ramp was 16 feet long. Jin cut off part of the ramp. Now it is 9 feet long. How many feet did he cut off?

b) Mark drew a line 45 inches long. He erased part of the line. Now it is 34 inches long. How many inches did he erase?

c) A tree was 72 m tall. Some of the top broke off. Now the tree is 68 m tall. How many meters broke off?

**Answers:**

a) 

\[
\begin{array}{c|c|c}
\text{total feet} & \text{feet cut off} & \text{feet left} \\
16 & \square & 9 \\
\end{array}
\]

\[16 - 9 = 7\]

b) 

\[
\begin{array}{c|c|c}
\text{total inches} & \text{inches erased} & \text{inches left} \\
45 & \square & 34 \\
\end{array}
\]

\[45 - 34 = 11\]

c) 

\[
\begin{array}{c|c|c}
\text{total meters} & \text{meters broken off} & \text{meters left} \\
72 & \square & 68 \\
\end{array}
\]

\[72 - 68 = 4\]
Extensions

1. Write a word problem for the picture. Give your word problem to a partner to answer using a part-whole picture.

   **NOTE:** Students do not need to write the labels for the part-whole picture.

   a) \[ \frac{20}{\text{total cm}} - \frac{13}{\text{cm cut off}} = \frac{?}{\text{cm left}} \]

   b) \[ \frac{14}{\text{total feet}} - \frac{?}{\text{feet cut off}} = \frac{9}{\text{feet left}} \]

   c) \[ \frac{?}{\text{total meters}} - \frac{2}{\text{meters cut off}} = \frac{8}{\text{meters left}} \]

Sample answers

a) Mona had a piece of tape 20 cm long. She cut off 13 cm. How long is the piece of tape now?

   \[ \frac{20}{\text{total cm}} - \frac{13}{\text{cm cut off}} = \frac{7}{\text{cm left}} \]

b) Sally’s driveway is 14 ft long. She shoveled snow off part of the driveway. There is still snow on 9 ft of the driveway. How many feet did she shovel?

   \[ \frac{14}{\text{total feet}} - \frac{9}{\text{feet left}} = \frac{5}{\text{feet cut off}} \]

   \[ \frac{20}{\text{total cm}} - \frac{13}{\text{cm cut off}} = \frac{7}{\text{cm left}} \]

   \[ \frac{14}{\text{total feet}} - \frac{9}{\text{feet left}} = \frac{5}{\text{feet cut off}} \]

   \[ \frac{10}{\text{total meters}} - \frac{2}{\text{meters cut off}} = \frac{8}{\text{meters left}} \]

   \[ \frac{20}{\text{total cm}} - \frac{13}{\text{cm cut off}} = \frac{7}{\text{cm left}} \]

   \[ \frac{14}{\text{total feet}} - \frac{9}{\text{feet left}} = \frac{5}{\text{feet cut off}} \]

   \[ \frac{10}{\text{total meters}} - \frac{2}{\text{meters cut off}} = \frac{8}{\text{meters left}} \]

   \[ \frac{20}{\text{total cm}} - \frac{13}{\text{cm cut off}} = \frac{7}{\text{cm left}} \]

   \[ \frac{14}{\text{total feet}} - \frac{9}{\text{feet left}} = \frac{5}{\text{feet cut off}} \]

   \[ \frac{10}{\text{total meters}} - \frac{2}{\text{meters cut off}} = \frac{8}{\text{meters left}} \]
2. Each cup in a muffin tray makes one muffin. Kim is making muffins in a muffin tray that has 3 rows of 4 cups. Each muffin needs 2 spoonfuls of batter. How many spoonfuls of batter will Kim need for 1 tray of muffins? Write your answer in complete sentences.

**Sample answer:** 3 rows of 4 cups is $4 + 4 + 4 = 12$ cups. Each cup gets 2 spoonfuls of batter, so Kim needs $12 + 12 = 24$ spoonfuls of batter for 1 tray of muffins.

Look for students to use number sentences (MP4) and to recognize their final result in terms of the situation (MP2).

Redirecting students: Encourage students to begin by drawing a picture of what is given and then to ask themselves if they see any ways to make number sentences in their picture.
**MD2-26 Two-Step Word Problems with Length**

**Goals**
Students will solve two-step word problems about length using part-whole pictures, comparing pictures, and equations.

**PRIOR KNOWLEDGE REQUIRED**
- Can add and subtract within 100
- Can use part-whole pictures and comparing pictures
- Can answer two-step word problems

**MATERIALS**
- 10 one-color counters per student
- BLM Representing Word Problems with Counters (p. P-79)
- BLM Equations and Part-Whole Pictures (pp. P-77–78)

Review answering two-step word problems using counters. Give each student 10 one-color counters and BLM Representing Word Problems with Counters. Have students put their counters beside the BLM. SAY: We will read a word problem and you will find the answer by signalling and moving counters. Write on the board:

On Monday it snowed 2 inches. On Tuesday it snowed 3 inches. On Friday it snowed 4 inches. How many inches of snow fell altogether?

\[
\begin{align*}
2 &+ 3 + 4 = 9 \\
\end{align*}
\]

Read the first sentence aloud and ASK: How many counters do you need to move? (2) Have students move 2 counters into the box on the BLM. SAY: We show moving 2 counters onto the paper by writing “2” in the first blank. Write “2”. Read the second sentence aloud and ASK: How many counters do you need to move? (3) Have students move 3 counters onto the BLM. ASK: What number do I write in the second blank? (3) Write “3” in the second blank. ASK: Do we use a plus sign or a minus sign to show moving more counters onto the paper? (a plus sign) Write “+” in the first circle. Read the third sentence aloud and ASK: How many counters do you need to move? (4) Do we write a plus or a minus sign? (a plus sign) What number do I write? (4) Have students move 4 counters onto the BLM as you write “+” and “4.” ASK: How many counters did you move altogether? (9) How many inches of snow is that? (9) Write “9” in the last blank. The final picture should look like this:

\[
\begin{align*}
2 &+ 3 + 4 = 9 \\
\end{align*}
\]

For the following exercises, prompt students about how many counters to move, what direction to move them, and how to write an equation to find the answer.
Exercises

a) Ross has a piece of string 10 inches long. He cut off 5 inches. Then he cut off 2 more inches. How many inches long is the string now?

b) In the winter the river was 20 inches deep. In the spring it rose 9 inches. Then in the summer it went down 7 inches. How many inches deep is the river now?

c) Tony’s snow fort is 7 feet long. 6 feet of snow melted. Then he added 8 more feet of snow. How many feet long is the snow fort now?

Answers: a) 10 − 5 − 2 = 3, b) 20 + 9 − 7 = 22, c) 7 − 6 + 8 = 9

Review answering two-step word problems without counters. Write on the board:

Zack kicked a ball 12 feet. His sister kicked the ball 8 feet. His brother kicked the ball 15 feet. How many feet did they kick the ball altogether?

Have students copy the blank equation into their notebooks. Read the problem aloud one sentence at a time and prompt students to help them fill in the blanks and answer the addition. This time, do not have students use counters. (see answer below)

12 + 8 + 15 = 35

Repeat with the following exercises.

Exercises

a) Tess knit a scarf 56 inches long. She undid 4 inches of her knitting. Then she undid 2 more inches. How many inches long is the scarf now?

b) Vicky built a sand castle 16 inches tall. She took 6 inches off the castle. Then she added 31 more inches. How many inches tall is the castle now?

Answers: a) 56 − 4 − 2 = 50, b) 16 − 6 + 31 = 41

Review using part-whole pictures when both parts are known. Draw a blank part-whole picture on the board. ASK: What do we call the numbers in the bottom of a part-whole picture, the parts or the whole? (the parts) What do we call the number in the top, the parts or the whole? (the whole) SAY: In a part-whole picture, the parts add up to the whole. Write on the board above the part-whole picture:

Mindy went down the slide 3 times. Then she went down the slide 2 more times. How many times did she go down the slide altogether?
Read the first sentence aloud, and circle the 3. ASK: Is 3 a part or the whole? (a part) Write “3” in the bottom left of the part-whole picture. Repeat with the next sentence. ASK: What is 3 + 2? (5) Is 5 a part or the whole? (the whole) Write “5” in the top of the part-whole-picture. The final picture should look like this:

\[
\begin{array}{c}
5 \\
3 \\
2
\end{array}
\]

Repeat with the following exercises; have students identify the parts and the whole.

**Exercises**

a) Marla swam across the river 5 times. Then she swam across 2 more times. How many times did Marla swim across the river altogether?

b) John and Alexa paddled for 10 minutes. Then they paddled for 8 more minutes. How many minutes did they paddle altogether?

**Answers**

a) 7  b) 18

Review using part-whole pictures when one part and the whole are known. Write on the board:

Peter threw the basketball 8 times. Then he threw the football some more times. Altogether he threw the balls 10 times. How many times did he throw the football?

Draw a blank part-whole picture below the word problem. Read the first sentence aloud and circle the 8. ASK: Is 8 a part or the whole? (a part) Where do we write 8? (in the bottom) Write “8” in the bottom left of the part-whole picture. Read the second sentence aloud and SAY: This is the other part but we do not know what it is yet, so we will move to the next sentence. Read the third sentence aloud and ASK: Is 10 a part or the whole? (the whole) Where do we write 10? (in the top) Write “10” in the part-whole picture. ASK: Will we find the missing number by adding or subtracting? (subtracting) Write “10 – 8 = ____” beside the part-whole picture. ASK: What is 10 – 8? (2) Write “2” as the answer to the equation and in the part-whole picture. The final picture should look like this:

\[
\begin{array}{c}
10 \\
8 \\
2
\end{array}
\]

10 – 8 = 2

Repeat for the following exercises. For the first problem, ask students to tell you how to fill in a part-whole picture and write the subtraction sentence. For the remaining three problems, have students fill in part-whole pictures and write the subtraction sentences using BLM Equations and Part-Whole Pictures (1).
Exercises

a) Tina read 15 pages in the morning and some more pages in the afternoon. Altogether she read 20 pages. How many pages did Tina read in the afternoon?

b) Sam pitched the ball 26 times on Monday and some more times on Tuesday. Altogether he pitched the ball 29 times. How many times did Sam pitch the ball on Tuesday?

c) Mary ran 50 meters before school and some more meters after school. She ran 65 meters altogether. How many meters did Mary run after school?

d) In the morning Raj climbed 12 feet up a rock wall. In the afternoon he climbed up another rock wall. Altogether he climbed 25 feet. How many feet did he climb in the afternoon?

Answers

a) \[ \begin{array}{c|c}
20 & \hline 15 \\
& \hline 5
\end{array} \quad 20 - 15 = 5 \]

b) \[ \begin{array}{c|c}
29 & \hline 26 \\
& \hline 3
\end{array} \quad 29 - 26 = 3 \]

c) \[ \begin{array}{c|c}
65 & \hline 50 \\
& \hline 15
\end{array} \quad 65 - 50 = 15 \]

d) \[ \begin{array}{c|c}
25 & \hline 12 \\
& \hline 13
\end{array} \quad 25 - 12 = 13 \]

Review two-step word problems with an unknown addend. Write the problem below on the board without the vertical line after the second sentence:

Micky painted a blue line 10 inches long and a red line. Altogether she painted 14 inches of lines. Then she painted another red line 3 inches long. How many inches of red line did she paint?

Read the problem aloud, then draw the line. SAY: I want to figure out the part of the problem before the line. Have students draw a part-whole picture in their notebooks and, as a class, work through the beginning of the problem. ASK: What subtraction sentence can we write? \((14 - 10 = 4)\) How can we write the answer as a sentence? (Micky painted a red line 4 inches long.) Write the sentences on the board. The picture should look like this:

\[ \begin{array}{c|c}
14 & \hline 10 \\
& \hline 4
\end{array} \quad 14 - 10 = 4 \quad \text{Micky painted a red line 4 inches long.} \]

SAY: So, Micky painted a red line 4 inches long and then she painted another red line 3 inches long. ASK: How do we find the number of inches of red line she painted? \((\text{add } 4 + 3)\) Write “4 + 3 = \_” and ASK: How many inches of red line did Micky paint altogether? \((7)\) Write the answer as a sentence. The final picture should look like this:

\[ \begin{array}{c|c}
14 & \hline 10 \\
& \hline 4
\end{array} \quad 14 - 10 = 4 \quad \text{Micky painted a red line 4 inches long.} \]

\[ \begin{array}{c|c}
14 & \hline 10 \\
& \hline 4
\end{array} \quad 4 + 3 = 7 \quad \text{Micky painted 7 inches of red lines.} \]
Repeat for the following exercises. Have students complete a part-whole picture and write a subtraction sentence using **BLM Equations and Part-Whole Pictures (2).**

**Exercises**

a) Rick’s blue pencil is 7 inches long. He has a green pencil too. Altogether his pencils are 10 inches long. Rick found another green pencil 5 inches long. How many inches of green pencils does he have now?

b) May used a piece of clear tape 12 inches long and some masking tape. Altogether she used 17 inches of tape. Then May used 3 more inches of masking tape. How many inches of masking tape did she use?

c) Cathy had 21 meters of satin ribbon and some velvet ribbon. Altogether she had 30 meters. Then Cathy found 10 more meters of velvet ribbon. How many meters of velvet ribbon does she have now?

d) Jack rode uphill for 30 meters and then downhill for some meters. Altogether he rode 45 meters. Then Jack rode downhill 5 more meters. How many meters did he ride downhill?

**Answers**

a) $10 - 7 = \underline{3}$  
$3 + 5 = \underline{8}$  
Rick has 8 inches of green pencils.

b) $17 - 12 = \underline{5}$  
$5 + 3 = \underline{8}$  
May used 8 inches of masking tape.

c) $30 - 21 = \underline{9}$  
$9 + 10 = \underline{19}$  
Cathy has 19 meters of velvet ribbon.

d) $45 - 30 = \underline{15}$  
$15 + 5 = \underline{20}$  
Jack rode 20 meters downhill.

**Review using comparing pictures when you know the number for each person.** Write and draw on the board:

Jim counted 8 snails. Amy counted 3 snails.

\[ \begin{array}{c}
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\vdots \\
\end{array} \]

ASK: Who has more? (Jim) Who has fewer? (Amy) SAY: Remember that we circle the person who has more and we underline the person who has fewer. ASK: What name should we circle? (Jim) What name should we underline? (Amy) Circle and underline the names. SAY: We show the person who has more on the top part of the picture and the person who has fewer on the bottom part of the picture. ASK: How many circles do we draw for Jim? (8) How many circles do we draw for Amy? (3) Draw the circles.
SAY: We draw Xs to find the difference. Draw and count just the Xs and
SAY: There are 5 Xs. That means that Jim counted 5 more snails than Amy.
It also means that Amy counted 5 fewer snails than Jim. Draw a comparing
picture over the grid and then write the sentences on the board. The picture
should look like this:

Jim counted 5 more snails than Amy.
Amy counted 5 fewer snails than Jim.

Write and draw on the board:

Andy cut a 15-inch-long strip of paper. Karen cut a 5-inch-long
strip of paper.

Read the problem aloud and have students identify whose paper is longer
and whose is shorter. (Andy, Karen) ASK: Which name do we circle? (Andy)
Which name do we underline? (Karen) Pointing to the top and bottom lines
to the left of the comparing picture, ASK: Which name do we write on the
top? (Andy) Which name do we write on the bottom? (Karen) Then have
students tell you where to put the numbers in the comparing picture. (15 in
the top and 5 in the bottom left) ASK: Do we add or subtract to find the
missing number? (subtract) What subtraction do we write? (15 − 5) Write
“15 − 5 = ___” beside the picture. ASK: What is 15 − 5? (10) Write “10” in
the equation and in the oval. The final picture should look like this:

Repeat with the following exercises.

Exercises

a) Billy hopped 10 feet. Anna hopped 18 feet.
b) Bo drew a line 23 inches long. Cam drew a line 20 inches long.

Answers

a) Billy hopped 10 feet. Anna hopped 18 feet.

b) Bo drew a line 23 inches long. Cam drew a line 20 inches long.
b) Bo drew a line 23 inches long. Cam drew a line 20 inches long.

\[
\begin{array}{c}
\text{Bo} \quad 23 \\
\text{Cam} \quad 20
\end{array}
\quad 23 - 20 = 3
\]

**Review comparing pictures when you know how many more or fewer.**

Draw on the board:

\[
\begin{array}{c}
5 \\
7
\end{array}
\quad \begin{array}{c}
1 \\
4
\end{array}
\]

Point to each one in turn and ASK: Do we add or subtract to find the missing number? (add, subtract) Write “add” below the first picture and “subtract” below the second picture.

SAY: In the problems we just did, we knew the numbers for both people. Now we will work with problems where we know the number for one person and how many more or fewer. Write and draw on the board:

Alex hopped 2 more meters than Milly.

Milly hopped 5 meters.

Cover the “2” with your finger, then read the first sentence aloud (without saying 2). ASK: Who hopped more meters? (Alex) Who hopped fewer meters? (Milly) Have students decide which name to circle and underline, where to write the names, and the numbers for each person in the comparing picture. Have students decide whether to add or subtract and what addition to write. The final picture should look like this:

\[
\begin{array}{c}
\text{Alex} \quad 7 \\
\text{Milly} \quad 5
\end{array}
\quad 5 + 2 = 7
\]

Repeat with the following exercises.

**Exercises**

a) Cameron jumped 3 fewer feet than Grace. Grace jumped 7 feet.

b) Marco’s scarf is 9 inches longer than Emma’s scarf. Emma’s scarf is 31 inches long.

c) Blanca’s puppet is 4 inches shorter than John’s. John’s puppet is 10 inches tall.

d) Jayden’s skis are 14 inches longer than Fred’s. Fred’s skis are 30 inches long.

**Answers**

a) Cameron jumped 3 fewer feet than Grace. Grace jumped 7 feet.

\[
\begin{array}{c}
\text{Grace} \quad 7 \\
\text{Cameron} \quad 4
\end{array}
\quad 7 - 3 = 4
b) (Marco’s) scarf is 9 inches longer than Emma’s scarf. Emma’s scarf is 31 inches long.

\[
\begin{array}{c|c|c}
& Marco & 40 \\
& Emma & 31 \\
\hline
& 31 + 9 = & 40 \\
\end{array}
\]

c) Blanca’s puppet is 4 inches shorter than John’s. John’s puppet is 10 inches tall.

\[
\begin{array}{c|c|c}
& John & 10 \\
& Blanca & 6 \\
\hline
& 10 - 4 = & 6 \\
\end{array}
\]

d) Jayden’s skis are 14 inches longer than Fred’s. Fred’s skis are 30 inches long.

\[
\begin{array}{c|c|c}
& Jayden & 44 \\
& Fred & 30 \\
\hline
& 30 + 14 = & 44 \\
\end{array}
\]

**Review two-step word problems when you know how many fewer.** Write on the board:

Bill rolled 15 meters of wool into a ball. Lynn rolled 4 fewer meters of wool than Bill. How many meters of wool did they roll altogether?

\[
\begin{array}{c|c|c}
& Bill & 15 \\
& Lynn & 11 \\
\hline
& 15 - 4 = & 11 \\
\end{array}
\]

Read the problem aloud. ASK: Where should I draw a line to show where the first step ends? (after the second sentence) Draw the line. SAY: The first step is “Bill rolled 15 meters of wool into a ball. Lynn rolled 4 fewer meters of wool than Bill.” Work through the first step as a class as you did before to find the missing number. (11) The picture should look like this:

\[
\begin{array}{c|c|c}
& Bill & 15 \\
& Lynn & 11 \\
\hline
& 15 - 4 = & 11 \\
\end{array}
\]

Read the last sentence aloud and SAY: Now we have to find out how many meters of wool they rolled altogether. ASK: How many meters did Bill roll? (15) How many meters did Lynn roll? (11) How do we find how many meters they rolled altogether? (add 15 + 11) Write “15 + 11 = ___” on the board and have students use their notebooks to add and find the answer. (26) The final picture should look like this:

\[
\begin{array}{c|c|c|c|c}
& Bill & 15 & & 15 - 4 = & 11 \\
& Lynn & 11 & 4 & & 15 + 11 = & 26 \\
\end{array}
\]

Repeat with the following exercises.
Exercises

a) Kyle made a string of popcorn 12 inches long. Sandy made a string of popcorn that is 2 inches shorter than Kyle’s. How many inches did they make altogether?

   Kyle: \(12\) inches
   Sandy: \(10\) inches

   \(12 - 2 = 10\) inches
   \(12 + 10 = 22\) inches

b) Glen’s ladder is 20 feet long. Zara’s ladder is 5 feet shorter than Glen’s. How many feet long are the two ladders altogether?

   Glen: \(20\) feet
   Zara: \(15\) feet

   \(20 - 5 = 15\) feet
   \(20 + 15 = 35\) feet

(c) Rani made a kite 32 inches long. David made a kite 2 inches shorter than Rani’s. How many inches long are the two kites altogether?

   Rani: \(32\) inches
   David: \(30\) inches

   \(32 - 2 = 30\) inches
   \(32 + 30 = 62\) inches

(d) Lily made a string of beads 40 inches long. Tessa made a string of beads 10 inches shorter than Lily’s. How long are the two strings of beads altogether?

   Lily: \(40\) inches
   Tessa: \(30\) inches

   \(40 - 10 = 30\) inches
   \(40 + 30 = 70\) inches

Answers

a) Kyle \(12\) inches, Sandy \(10\) inches

\(12 - 2 = 10\) inches
\(12 + 10 = 22\) inches

b) Glen \(20\) feet, Zara \(15\) feet

\(20 - 5 = 15\) feet
\(20 + 15 = 35\) feet

c) Rani \(32\) inches, David \(30\) inches

\(32 - 2 = 30\) inches
\(32 + 30 = 62\) inches

d) Lily \(40\) inches, Tessa \(30\) inches

\(40 - 10 = 30\) inches
\(40 + 30 = 70\) inches

Work through Questions 1–7 on AP Book 2.2 pp. 126–127 as you did for the problems above.

Extensions

(MP.4) 1. Tasha used black tape to make a line 140 ft long. She used yellow tape to make another line. Altogether she used 165 ft of tape. Then Tasha used more yellow tape to make a line 5 ft long. How many feet of yellow tape did she use?

Sample solution

\[
\begin{array}{c}
165 \\
140 \\
25 \\
\hline
165 - 140 = 25 \\
25 + 5 = 30
\end{array}
\]

Tasha used 30 feet of yellow tape.

(MP.4) 2. Carlos walked 316 m along a road. Vicky walked 16 m less than Carlos. How many meters did they walk altogether?

Sample solution

\[
\begin{array}{c}
316 \\
300 \\
16 \\
\hline
316 - 16 = 300 \\
316 + 300 = 616
\end{array}
\]

Altogether, Vicky and Carlos walked 616 meters.

P-62 Teacher Resource for Grade 2
Goals

Students will read and interpret line plots and answer questions about the data presented in the plots. They will complete line plots using measurement data they generate.

Prior Knowledge Required

- Can measure length in inches
- Can measure length to the nearest centimeter
- Can add and subtract within 100
- Can draw and use partial number lines

Materials

- Drinking straws cut to exact lengths
- Inch-centimeter rulers or rulers from BLM Inch-Centimeter Rulers (pp. P-73–74)
- Overhead projector
- Transparency of BLM Hand Sizes (p. P-80)
- Erasable marker

Collecting data for a line plot. Divide students into small groups of two or three. Cut straws into pieces of the following lengths in inches: 3, 4, 4, 5, 5, 5, 5, 7, 7, and 8. Give each group one piece and have every group member measure their straw in inches using an inch-centimeter ruler or a ruler from BLM Inch-Centimeter Rulers. Have students record the length in inches. Ask each group for their measurement and use a table on the board to record the list of measurements in the order that the groups tell you. The table should look something like this:

| Lengths in Inches | 4 | 8 | 5 | 3 | 5 | 5 | 7 | 4 | 5 | 7 |

SAY: The information we collected is called data. We have quite a lot of data so it is hard to think about all of it at the same time.

Organizing data. SAY: Let’s write the data in a different way so it will be easier to think about. Have students help you systematically organize the data. First, find the smallest number (3) by pointing to each number and have students signal thumbs up if you are pointing at the smallest number or thumbs down if you are not. Repeat to find the largest number. (8)

SAY: We will make a number line to show our data. Draw on the board:

SAY: The smallest number is 3, so we write “3” below the tick mark. Write “3” as shown below:

3
SAY: The largest number is 8, so we will make tick marks until we get to 8. Draw more tick marks, number each, until you get to 8, as shown below:

```
3 4 5 6 7 8
```

SAY: Now we are ready to show our data on the number line. Point to the first number in the table, ask what it is, cross it out, and write “X” above that number on the number line. SAY: Every time I draw an X for a number we collected, I cross it out to make sure I do not accidentally use it again. Point to the next number in the table and have students tell you where it goes on the number line. Write the number, but do not cross it out in the table. ASK: Did I forget something? (yes) What is it? (forgot to cross out the number) Continue until you have used all the data. The picture should look like this:

```
Lengths in Inches
  3 4 5 6 7 8
```

SAY: This way of showing the data we collected is called a line plot. Leave this line plot on the board for later use.

**Interpreting data.** SAY: Each X stands for the length of one straw. Now it is easier to think about the data.

Refer students to the line plot on the board for the following questions.

ASK: How long is the shortest straw? (3 inches) How long is the longest straw? (8 inches) What length did we find most often? (5 inches) SAY: The number that has the most Xs is the most common. ASK: How many straws are 4 inches long? (2) How many straws are 8 inches long? (1) Are any straws 6 inches long? (no)

**Exercises:** Use the line plot to answer the questions.

a) How many straws are 3 inches long?
b) How many straws are 4 inches long?
c) How many straws are 5 inches long?
d) How many straws are 6 inches long?
e) How many straws are 7 inches long?
f) How many straws are 8 inches long?

**Answers:** a) 1, b) 2, c) 4, d) 0, e) 2, f) 1
Determining the title and label of a line plot. Point to the line plot on the board and SAY: We need a title for this line plot. The title tells us what the line plot is about. ASK: What did we measure for this line plot? (lengths of straws) Write the title “Lengths of Straws” as shown below. ASK: What do the numbers on the number line measure? (length) What units did we measure in, inches or centimeters or feet? (inches) Write the label “Length (inches)” as shown below. The final picture should look like this:

```
Lengths of Straws

<table>
<thead>
<tr>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Point to the label and SAY: This is called the label of a line plot. The label tells us what the number line measures and in what units. This number line measures length and the unit is inches. When you add a title and a label to a line plot, you can look at the line plot later and know what the line plot was about and what was measured.

**ACTIVITY**

Collecting data and making a line plot from the data. Students will work in pairs. Explain that students will make measurements and collect data. Tape a piece of paper to the board and place your hand on it, as shown below:

SAY: We will measure our hand to the nearest centimeter. Explain that one partner will place a hand on a page in their notebook with the little finger in one corner and then stretch out the fingers; the other partner will mark where the tip of the thumb reaches. Have a volunteer demonstrate making the mark where your thumb is on the paper on the board. Then have students switch roles and repeat. Have each student measure their hand span to the nearest centimeter using an inch-centimeter ruler and record the number in their notebooks.

Once all measurements are done, project a transparency of BLM Hand Sizes. Ask students for the data and plot it. Write “Hands (nearest centimeter)” on the line at the bottom, and explain that this is where we write what we measured. As you did with the Lengths of Straws line plot earlier, ask several questions to help students practice interpreting data.
Extension

Use the data and the line plot to answer the question.

Lengths in Feet

<table>
<thead>
<tr>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
</table>

Lengths of Long Jumps

![Line plot]

a) There is a mistake in the line plot. What is it? Hint: Look at the number line.

b) Draw the line plot correctly.

c) What is the most common length of jump?

d) What is the shortest jump?

e) What is the longest jump?

Answers

a) There is no number 12 on the number line.

b) Lengths of Long Jumps

![Corrected line plot]

c) 15 ft, d) 11 ft, e) 16 ft
MD2-28  Problems and Puzzles
Pages 131–132

STANDARDS
2.MD.A.3, 2.MD.B.5, 2.MD.B.6

VOCABULARY
inch
inches
foot (ft)
feet
longer
meter (m)
meters
shorter

Goals
Students will solve problems about length.

PRIOR KNOWLEDGE REQUIRED
Can add and subtract within 100
Can read and interpret information in a table
Can use comparing pictures

MATERIALS
12-inch ruler or ruler from BLM 12-Inch Rulers (pp. P-69–70)
tape

Adding lengths. Write on the board:

A fork is 5 inches long. How many inches long are two forks?

SAY: We will use a ruler to help us answer the question. Tape a 12-inch ruler to the board. Draw a 5-inch-long line starting from 0, as shown below:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
</table>

inches

SAY: The question asks how long two forks are. We can find the answer by drawing another line 5 inches long to represent another fork. Draw the line, as shown below:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
</table>

inches

ASK: How long are two forks? (10 inches) What addition sentence can we write to show what we just did? \(5 + 5 = 10\) Write on the board:

\[5 + 5 = 10\]

SAY: So two forks are 10 inches long.

Write on the board:

A ladder is 21 feet long. How many feet long are two ladders?

ASK: Why would it be difficult to draw rulers for this question? (the rulers would be too long) What addition sentence can we write to answer the question? \(21 + 21 = \) Write on the board:

\[21 + 21 = \]
SAY: If it is easier, you can write this addition going up and down. Write on the board:

\[
\begin{align*}
21 & \\
+ 21 & \\
\hline
42 &
\end{align*}
\]

Have students copy and then answer the addition in their notebook. Then have them write the answer as a sentence, as shown below:

\[
\begin{align*}
21 & \\
+ 21 & \\
\hline
42 & \text{Two ladders are 42 feet long.}
\end{align*}
\]

**Exercises**

a) A carpet is 14 feet long. How many feet long are two carpets?

b) A parking spot is 12 feet long. How many feet long are two parking spots?

**Bonus:** An Olympic pool is 54 yards long. How many yards long are two Olympic pools?

**Answers:**
a) \(14 + 14 = 28\) ft, b) \(12 + 12 = 24\) ft, Bonus: \(54 + 54 = 108\) yd

**Extensions**

1. An Olympic pool is 50 meters long. A backyard pool is 12 meters long.
   a) How much longer is an Olympic pool than a backyard pool? What equation did you use?
   b) How much longer is an Olympic pool than two backyard pools? What equation did you use?
   c) How much longer are two Olympic pools than one backyard pool? What equation did you use?
   d) How much longer are two Olympic pools than two backyard pools? What equation did you use?

**Answers**
a) \(38\) m longer, \(50 - 12 = 38\)
   b) \(26\) m longer, \(50 - 12 - 12 = 26\)
   c) \(88\) m longer, \(50 + 50 - 12 = 88\)
   d) \(76\) m longer, \(50 + 50 - 12 - 12 = 76\)

2. a) Estimate the length of your desk. Use crayons or your JUMP Math AP Book.

   b) In pairs, explain your choices in part a). Why do you think the tool you chose is the better choice?

**Selected sample answers**

b) • I chose my AP Book because it’s longer so I can measure faster.
   • I chose my fingers because they are shorter so I can get a more precise answer.
12-Inch Rulers (I)

To make 12-inch rulers, cut out the block of rulers from both BLM pages, align the 7 inch marks, tape the two blocks together, and cut out the individual rulers.
12-Inch Rulers (2)
Measuring Lines in Inches

Place a ruler below the line and draw the jumps.

Write the number of inches.

1. ______ inches

2. ______ inches

3. ______ inches

4. ______ inch

5. ______ inches

6. ______ inches

7. ______ inches
Measured Lengths

D D D D D D D D D D

C C C C C C C C C C

B B B B B B B B B B

A A A A A A A A A A
Inch-Centimeter Rulers (I)

To make 12-inch rulers, cut out the block of rulers from both BLM pages, align the 7 inch marks, tape the two blocks together, and cut out the individual rulers.
Inch-Centimeter Rulers (2)
An Exact Number of Inches or Centimeters?

Measure the line in inches and in centimeters.

Write the number.

Circle inches or centimeters.

1. _______ inches or centimeters about _______ inches or centimeters

2. _______ inches or centimeters about _______ inches or centimeters

3. _______ inches or centimeters about _______ inches or centimeters

4. _______ inches or centimeters about _______ inches or centimeters
Centimeters or Inches?

How long is the line? Write cm for centimeters or inches for inches.

1. \[ \underline{5} \]
2. \[ \underline{7} \]
3. \[ \underline{3} \]
4. \[ \underline{4} \]
5. \[ \underline{4} \]
Equations and Part-Whole Pictures (I)

___ ___ = ___  

___ ___ = ___  

___ ___ = ___  

___ ___ = ___  

___ ___ = ___  

___ ___ = ___  

___ ___ = ___  

___ ___ = ___
Equations and Part-Whole Pictures (2)

[Diagram with equations and part-whole pictures]

EQ1 = ___

EQ2 = ___

EQ3 = ___

EQ4 = ___

EQ5 = ___

EQ6 = ___

EQ7 = ___

EQ8 = ___

EQ9 = ___

EQ10 = ___
Representing Word Problems with Counters
Hand Sizes

12 13 14 15 16 17 18 19 20
This Unit in Context

In Grade 1, students learned to tell time to the hour and half hour (1.MD.B.3) using analog clocks, digital clocks, and words like “o’clock” and “half past.” The concept of measuring time is more difficult than other measurement attributes students have seen before, partly because of the cyclical nature of the clock (starting over after 12) and partly because of how time is recorded using both hours and minutes. When measuring length, for example, students start with measuring feet and inches separately, and we only combine the units after students have had some exposure to each.

In this unit, students will learn to tell time to the nearest five minutes (2.MD.C.7). They will also assign times of day to events by placing events on a timeline (which looks like a number line) and distinguishing between events that occur in the a.m. or p.m. (2.MD.C.7). In Grade 3, students will progress to telling time to the nearest minute (3.MD.A.1).

Associating events to times of day is similar to other measurement attributes: in the same way that students associate lengths with objects having that length, they associate events with the time of day that they occur. However, the process of measuring time in this way is fundamentally different from other attributes—there is no starting and ending point from which to measure, only an instantaneous time that we see by looking at the clock (for example, recess starts at 10:30 a.m.).

In Grade 3, students will use their knowledge of associating events with the time they occur to measure how long an event takes by subtracting the start time of the event from the end time of the event (3.MD.A.1). It is at this stage where similarities between time and other measurement attributes become apparent. For example, just as we can place a ruler along an object to see how many centimeters or inches are taken up by the object (regardless of whether we start at zero), we can look at what the clock says when an event starts and what it says when the event ends to see how much time has passed.

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP1 to MP6. Here are some examples of how students can show that they have met a standard.

MP3: In MD2-31 Extension 4, students construct a viable argument when they explain why skip counting by 5s cannot produce only even numbers. Students also analyze and critique the reasoning of others.

MP4: In MD2-30 Extension 4, students model mathematically when they use diagrams and number sentences to represent and solve a multi-step, real-world problem involving multiple units of measure.

MP5: In MD2-34 Extension 6, students strategically choose and use tools, such as a clock or a timeline, to solve a real-world problem involving elapsed time.
MP6: In MD2-33 Extension 6, students attend to precision when they draw a clock face representing 6:00, and when they use the words longer and shorter to explain how the hour and minute hands must be drawn in order to represent the correct time.
Unit 6 Measurement and Data: Time

Introduction

In this unit, students will use analog and digital clocks to tell and write time to the nearest 5 minutes, using a.m. and p.m. They will read and create timelines. Students will also solve simple word problems about elapsed time.

Recurring games. Variations on Picking Pairs and Memory are used several times in this unit. See p. E-1 for a full description of these games.

Materials. Throughout this unit, you will need an analog clock with two hands that you can set to show different times for demonstration purposes (e.g., a toy clock).

In Activity 1 of Lesson MD2-29, students use BLM Make Your Own Clock (p. Q-39) to make their own clocks. They will then use these clocks both in subsequent lessons and while completing questions in the AP Book that ask students to use toy clocks. Provide assistance to students who have trouble making the clock.
# The Hour Hand

**MD2-29**

**STANDARDS**
2.MD.C.7

**VOCABULARY**
- analog clock
- clock
- clock face
- digital clock
- hour
- hour hand
- minute hand
- o’clock

**Goals**

Students will become familiar with the numbers and hands on a clock face, especially the hour hand.

Students will tell time to the hour in the form “__ o’clock” and “__:00,” using both digital and analog clocks.

**PRIOR KNOWLEDGE REQUIRED**

Can use number lines

**MATERIALS**

- analog clock with two hands
- masking tape, string, or a Hula-hoop
- cards numbered from 1 to 12
- analog clock with three hands
- BLM Make Your Own Clock (p. Q-39)
- pair of scissors, paper plate, glue stick, pencil, and paper fastener (one of each per student)
- digital clock
- BLM Matching Analog to Digital (1) (p. Q-40)
- overhead projector
- transparency of BLM Clock Faces (p. Q-43)
- erasable marker
- BLM Clock Faces (p. Q-43)

**Comparing a clock to a number line.** Show students an analog clock with two hands, or a clock made from BLM Make Your Own Clock. SAY: This is a clock. Draw a clock face with the numbers 1 to 12 in the correct positions on the board, but do not include clock hands. SAY: The front of a clock includes the numbers 1 to 12 written in a circle, like this. This part of a clock is called the clock face. Pointing to each number on the clock face from 1 to 12 in turn, SAY: The clock face has numbers all around beginning with 1 and ending with 12.

Beside the clock face, draw a number line and label it from 0 to 15. Discuss how the clock face is like a number line that goes in a circle. Ask students what comes after a given number from 1 to 12, first on the number line and then on the clock face. For example, ASK: What comes after 3 on the number line? (4) What number comes after 3 on the clock face? (4) Explain how the number 12 is special because the next number on a number line is 13 but the next number on a clock face is 1. Emphasize that a clock face is like a number line except that the clock face goes only from 1 to 12 and then starts again at 1.

Repeat the exercise, but this time ask what number comes before a given number, first on the number line and then on the clock face. End
with the number 1 and explain how the number 1 is special because the number before 1 on a number line is 0 but the number before 1 on a clock face is 12.

The numbers on a clock face. Point to the clock face on the board. SAY: Look closely at the clock face and try to remember where all the numbers go. ASK: Which number is at the top? (12) Which number is at the bottom? (6) Pointing to the 3, ASK: Which number is all the way on this side? (3) Pointing to the 9, ASK: Which number is all the way on this side? (9)

Make a large circle on the floor using a Hula-hoop, masking tape, or string, and place cards numbered from 1 to 12 face down in the correct positions around the clock. Gather the class around the clock face. Tell students where the top of the clock face is. Cover the clock on the wall or make sure students face away from it, and erase the clock face on the board. Have volunteers predict the number on a card of their choice, then turn the card over.

ASK: Which numbers were easier to remember? Why do you think they were easier to remember? (sample answers: 12 and 6, 3 and 9) SAY: The numbers at the top, bottom, left, and right are usually the easiest to remember. Take away all the cards and ASK: Where does 12 go? (at the top) Have a volunteer place it in the correct position on the clock face on the floor. Repeat with 6, 3, and 9. SAY: Once we have 3, 6, 9, and 12 in place, the other numbers are a little easier. ASK: What number comes before 3? (2) What number comes after 3? (4) Have volunteers place those numbers. Repeat for 6 and 9. End with 12. Remind students that the clock face shows only numbers 1 to 12.

Exercise: Write the missing numbers in order from smallest to biggest.

12 1
5 6 7
10
11
Answer: 2, 3, 4, 8, 9

The differences between the hands on a clock. Show students an analog clock with three hands. Point to each hand and SAY: These are called clock hands or just hands. As a class, discuss how the three hands are different. Record students’ answers. Depending on the clock you have, answers might include:

- Two hands are thicker, one hand is thinner.
- The thin hand moves or only the thin hand looks like it’s moving.
- The hands are different lengths or one of the thick hands is longer than the other.
- Two hands are black and one is red.
All the hands are moving. SAY: All the hands on a clock move, but two of the hands move so slowly that it does not look like they are moving. We can compare this to the motion of the Sun. We do not see the Sun move, but it is in a different place after school than it was when school started. You might have students note where the Sun is at the start of the school day and then again at the end of the school day. **NOTE:** Although we usually refer to this movement as the Earth’s motion relative to the Sun rather than the Sun’s motion relative to the Earth, students at this level will naturally see this motion as the Sun’s motion.

Some clocks show only two hands—the minute hand and the hour hand. SAY: Some clocks show three hands, while other clocks show only two hands. Show students the analog clock with only two hands. SAY: The fast-moving hand is not shown on this clock. Explain to students that the hand that moves very fast on the clock is called the fast hand. Point to the short hand on the clock and SAY: The short hand is called the **hour hand**. Point to the long hand and SAY: The long hand is called the **minute hand**.

**NOTE:** In these lessons, we use the term “fast-moving hand” or “fast hand” instead of “second hand” to avoid confusion between “second” as a unit of time and “second” as an ordinal number.

**ACTIVITY 1**

Make your own clock. Students use a paper plate, a copy of BLM Make Your Own Clock, scissors, a paper fastener, and a pencil and follow these steps to make their own clocks:

1. Cut out the circle from the BLM and glue it to the inside of the paper plate.
2. Use a sharpened pencil to poke a hole in the center of the clock face.
3. Write the numbers in the correct positions on the clock face.
4. Cut out the hands from the BLM and attach the hands to the plate with the paper fastener.

Students can use the clock they create to show times in later lessons.

We say “o’clock” when the hour hand points directly at a number. Using the analog clock that has two hands, point the hour hand directly at 9 and the minute hand directly at 12. **ASK:** Which number does the short hand point at? (9) **What is the short hand called?** (the hour hand) Write “hour hand” on the board. **SAY:** When the hour hand points directly at a number, the long hand points to 12.

Show 3:00 on the clock. Point out that the hour hand points at 3 and the minute hand points at 12. Then rotate the minute hand slowly and point out that as the minute hand moves, the hour hand no longer points directly at 3. Continue until the time says 4:00 and **SAY:** Now the hour hand points
directly at 4 and the minute hand points to 12 again. Repeat for 5:00 and 6:00. Continue rotating the minute hand and ask students to signal by raising their hands when the time reaches 7:00, 8:00, and so on.

SAY: When the hour hand points directly at a number, we say o’clock. Show 5:00 on the clock and SAY: The hour hand points directly at 5. So we say it is 5 o’clock. Repeat with 3:00. (3 o’clock) Repeat with different “o’clock” times. Then say specific “o’clock” times and have volunteers show the hour hand in the correct position on the clock. Remind students to make sure the minute hand points at 12. Say times sequentially at first and then in random order. When showing 12 o’clock, ensure students understand that both the hour hand and the minute hand point at 12.

Writing ___ o’clock in a different way. ASK: Have you seen a clock or a watch that shows the time in a different way? How did it show the time? SAY: Some clocks and watches do not have hands. They show the time using only numbers. Show students a digital clock with the time set to 9:00. Write “9:00” on the board and SAY: The clock shows 9 and two zeros. This means 9 o’clock. Write “9 o’clock” on the board, as shown below:

9:00 9 o’clock

SAY: A clock that shows the time using only numbers is called a digital clock. On a digital clock, the “o’clock” time is written as __ :00. Point to an analog clock and SAY: A clock that shows the time with hands and numbers written in a circle is called an analog clock.

Show different times to the hour (in sequence) on the analog clock with two hands and have students tell what time it is. For each question, ask a volunteer to come to the board and write the name using the two forms, ___ o’clock and __ :00. Repeat but show times in random order.

Exercises: Write the time two ways.

a) 

b) 

c) 

Answers: a) 7 o’clock, 7:00; b) 10 o’clock, 10:00; c) 2 o’clock, 2:00

Is it o’clock or not o’clock? Use the analog clock with two hands to show different times—some that show a time on the hour and some that do not show a time on the hour (the hour hand does not point directly at a number and the minute hand does not point directly at 12). Ask students to identify whether the time is o’clock or not o’clock. They can signal their answers by using thumbs up for o’clock and thumbs down for not o’clock.
ACTIVITY 2

Matching Analog and Digital Times. Have students play Picking Pairs and Memory with the cards on BLM Matching Analog to Digital (1) (see unit introduction).

Drawing the time to the hour. Project a transparency of BLM Clock Faces on the board. Point to the first clock and SAY: I want to show 3 o’clock on this clock face. I will not draw the fast-moving hand, I will draw only the hour hand and the minute hand. ASK: What number should the hour hand point at? (3) Draw a short line or arrow that starts at the center of the clock and points at 3. ASK: What number does the minute hand point at? (12) SAY: For o’clock times, the long hand always points at 12. Draw a long straight line or arrow that points at 12. SAY: The long hand is so long that it almost touches 12. The short hand is much shorter—it points at but does not touch the numbers. Repeat with 5 o’clock, 9 o’clock, and 11 o’clock.

For the following exercises, encourage students to use the clocks they made in Activity 1 to help them. For Exercise 1, give each student a copy of BLM Clock Faces.

Exercises

1. Draw the time.
   a) 6 o’clock   b) 8:00   c) 2 o’clock   d) 10:00
   **Answers**
   a) the hour hand points at 6, the minute hand points at 12
   b) the hour hand points at 8, the minute hand points at 12
   c) the hour hand points at 2, the minute hand points at 12
   d) the hour hand points at 10, the minute hand points at 12

2. Fill in the blanks.
   a) It is 4 o’clock. The hour hand points to ___. The minute hand points to ___.
   b) It is 7 o’clock. The hour hand points to ___. The minute hand points to ___.
   c) It is 1:00. The hour hand points to ___. The minute hand points to ___.
   **Bonus**: It is 12 o’clock. The hour hand points to ___. The minute hand points to ___.
   **Answers**: a) 4, 12; b) 7, 12; c) 1, 12; Bonus: 12, 12

Introduce hours. SAY: It always takes the same amount of time for the hour hand to move from one number to the next number on an analog clock. The amount of time it takes the hour hand to move from one number to the next is called an hour. Pointing to the hour hand, SAY: That is why this hand is called the hour hand. It moves from one number to the next in one hour.
Provide some examples of activities that take about one hour (e.g., the time scheduled for lunch at school, the time it takes to watch a short movie, the time it takes for a soccer practice). Use any classes at your school that are close to an hour as a benchmark. You can also use two consecutive classes that are close to half an hour each.

**An hour later.** Using the analog clock that has two hands, set the hour hand so that it points at 2. Remind students that, in the course of an hour, the hour hand moves ahead one number. ASK: What number will the hour hand point to an hour from now? (3) Repeat with several examples using the phrases “an hour from now,” “an hour later,” and “in one hour.” Show the direction the hour hand moves around the analog clock from 12 to 1 to 2 and so on, all the way back to 12.

Encourage students to use the clocks they made in Activity 1 to help them with the following exercises.

**Exercises:** What number will the hour hand point to 1 hour later?

a) The hour hand points at 3.  
b) The hour hand points at 9.  
c) The hour hand points at 7.  
**Bonus:** The hour hand points at 12.

**Answers:** a) 4, b) 10, c) 8, Bonus: 1

**Solving word problems.** Write on the board:

1. Gym class starts at 10:00 and lasts for 1 hour. What time does the class end?
2. Roy starts a swimming lesson at 9:00. The lesson takes 1 hour. What time does the lesson end?

Underline important phrases involving time, such as “for 1 hour,” “takes 1 hour,” and “starts at 10:00.” Read and solve the problems together as a class. (11:00, 10:00)

**Exercises**

a) Bill starts reading at 7:00. He stops an hour later. At what time did he stop reading?

b) Kim has soccer practice at 5 o’clock. Practice lasts for an hour. At what time is practice over?

**Answers:** a) 8:00 or 8 o’clock, b) 6 o’clock or 6:00
Extensions

NOTE: Encourage students to use the clocks they made in Activity 1 to help them with these extensions.

1. How many hours have passed?
   a) The hour hand moved from 1 to 3.
   b) The hour hand moved from 2 to 5.
   c) The hour hand moved from 4 to 8.
   d) The hour hand moved from 3 to 11.

   Answers: a) 2, b) 3, c) 4, d) 8

2. Fill in the blank to show that 1 hour has passed.
   a) The hour hand moved from 2 to ___.
   b) The hour hand moved from ___ to 5.
   c) The hour hand moved from ___ to 10.
   d) The hour hand moved from 8 to ___.
   e) The hour hand moved from ___ to 12.

   Bonus: The hour hand moved from ___ to 1.

   Answers: a) 3, b) 4, c) 9, d) 9, e) 11, Bonus: 12

3. Fill in the blank to show that 2 hours have passed.
   a) The hour hand moved from 3 to ___.
   b) The hour hand moved from ___ to 7.
   c) The hour hand moved from ___ to 10.
   d) The hour hand moved from 4 to ___.
   e) The hour hand moved from ___ to 12.

   Bonus: The hour hand moved from ___ to 1.

   Answers: a) 5, b) 5, c) 8, d) 6, e) 10, Bonus: 11

4. Jane has a piano lesson. Next she has basketball practice and then dance class. She starts at 4:00. Each activity takes 1 hour. When is she done?

   Answer: 7:00
MD2-30  The Minute Hand

STANDARDS
2.MD.C.7, 2.NBT.A.2

VOCABULARY
analog clock
clock
clock face
digital clock
hour
hour hand
minute
minute hand
o’clock

Goals
Students will become familiar with the motion of the minute hand relative to the hour hand.
Students will learn about the relationship between where the minute hand points and the number of minutes past the hour (for intervals of five minutes).

PRIOR KNOWLEDGE REQUIRED
Is familiar with a clock face and the hands on a clock
Can distinguish between the three hands on a clock and knows their names (hour hand, minute hand, and fast hand)
Can count by 5s

MATERIALS
analog clock with three hands
analog clock with two hands
clocks made in Activity 1 of Lesson MD2-29
digital clock
BLM Clock Faces (p. Q-43, see Extension 1)

Review analog clock faces and hands. Show students an analog clock with three hands. ASK: How many hands are on this clock? (3) Point to the second hand and ASK: What is this hand called? (the fast hand) Point to the minute hand and ASK: What is this long hand called? (the minute hand) Point to the hour hand and ASK: What is this short hand called? (the hour hand)

Review counting by 5s. Have the whole class count by 5s to 60. Then have students say the next multiple of 5 in order, starting at 5: one student says “5,” the next student says “10,” and so on. When they reach 60, start again with another student saying “5.” Continue so each student has a turn.

How the minute hand moves every minute. Point to the tick marks between the numbers on the clock. SAY: Let’s see how many tick marks there are between two numbers on a clock. Have students count together as you point in turn to each of the five tick marks, starting after 12 and ending at 1. Repeat with the tick marks between 1 and 2.

SAY: When the fast hand moves all the way around the clock, the minute hand moves from one tick mark to the next. Verify this by watching the clock for a minute. Have students call out the numbers 1 through 12 as the second hand passes these numbers to keep them engaged. Point out the direction in which the fast hand moves around the clock from 12 to 1 to 2 and so on, all the way back to 12. SAY: All three hands move in this direction and pass the numbers in this order. The fast hand moves the
fastest. The hour hand moves the slowest. The minute hand moves slower than the fast hand, but faster than the hour hand.

SAY: The amount of time that it takes the fast hand to move all the way around the clock is the same amount of time that it takes the minute hand to move from one tick mark to the next tick mark. Draw on the board:

![Clock diagram]

SAY: This amount of time is called a *minute*. The minute hand moves from one tick mark to the next tick mark in one minute. That is why we call it the minute hand. Now I will move the minute hand once around the clock. Watch the hour hand and tell me what it does. (it moves to the next number) Have students compare the motion of the minute hand to that of the hour hand. (the hour hand moves from one number to the next every hour; the minute hand moves from one tick mark to the next every minute)

**How the minute hand moves every hour.** SAY: The minute hand goes all the way around the clock in one hour. Show 4:00 on the analog clock with two hands. Move both hands to show the movement from 4:00 to 5:00. Draw a clock on the board with both hands at 4:00, followed by the end position of both hands one hour later at 5:00, as shown below:

![Clock diagram]

SAY: It looks like the minute hand didn’t move, but it actually went around the circle back to where it started.

**Counting by 5s to determine the number of minutes after the hour.** Draw a clock on the board with a dotted minute hand pointing at 12 and a solid minute hand pointing at 3. The hour hand should point at 10. SAY: Let’s figure out how many minutes pass when the minute hand moves from 12 to 3. Point to the tick marks on an analog clock with two hands. SAY: Let’s draw these tick marks on our clock picture. Draw tick marks on the clock on the board. The picture should look like this:
Remind students that one minute passes each time that the minute hand moves from one tick mark to the next. As a class, count the number of minutes that pass, emphasizing every fifth number (when the minute hand passes 1, 2, and 3). SAY: The minute hand takes the same amount of time—5 minutes—to pass from any number on the clock to the next number.

ASK: How many minutes pass from 12 to 1? (5) Write “5” beside the 1 on the clock on the board. Repeat for 12 to 2, and 12 to 3. (10, 15) SAY: So, 15 minutes pass when the minute hand moves from 12 to 3. Erase the clock hands on the picture and ASK: How many minutes pass when the minute hand moves from 12 to 4? (20) Write “20” beside the 4. Continue in this manner and end with the minute hand moving from 12 to 11. (55) ASK: What number are we counting by? (5s) Explain that, by noticing the pattern, we made it easier to count the number of minutes that pass.

Remind students that, at any o’clock time, the hour hand points right at a number and the minute hand points to 12. At each hour, the minute hand starts at 12 and goes around the circle. Show the minute hand pointing at different numbers on the analog clock. For each one, ASK: How many minutes have passed since the minute hand was at 12? Students should count by 5s to find the answer.

Have students use the clocks they made in Activity 1 of Lesson MD2-29. Ask them to show you where the minute hand points after 15 minutes, if it started at 12. (at 3) ASK: Where does it point after 20 minutes? (at 4) After 30 minutes? (at 6) After 45 minutes? (at 9)

Have students use the clocks they made in Activity 1 of Lesson MD2-29 for the following exercises.

**Exercises:** How many minutes is it after the hour?

a) The minute hand points at 4. b) The minute hand points at 7.

c) The minute hand points at 1. d) The minute hand points at 5.

e) The minute hand points at 8. f) The minute hand points at 11.

**Answers:** a) 20, b) 35, c) 5, d) 25, e) 40, f) 55

**ACTIVITY**

**How many minutes have passed?** Students play in pairs using the clocks they made in Activity 1 of Lesson MD2-29. Player 1 points the minute hand to a number and Player 2 counts by 5s to determine how many minutes have passed since the minute hand pointed at 12. Students then switch roles.

SAY: When we say a time that is not an o’clock time, we can use the words “past” or “after.” For example, if 20 minutes have passed since 5 o’clock, we say “20 minutes past 5” or “20 minutes after 5.”
Have students complete Questions 1–6 on AP Book 2.2 p. 137.

Writing the digital time using the number of minutes after the hour.

SAY: When we write time using only numbers, we write the last hour that the hour hand passed. Then we count the number of minutes after the hour and write the number of minutes. Set the analog clock that has two hands to show 7:10. ASK: Which two numbers is the hour hand between? (7 and 8) What is the last number the hour hand passed? (7) SAY: Since 7 is the last number that the hour hand passed, we start by writing 7. Write on the board:

7 : ___

ASK: How many minutes is it after 7 o’clock? (10) Have a volunteer finish writing the time. (7:10) Show this time on a digital clock. Repeat for 7:50.

SAY: Even though the hour hand is closer to 8 than 7, we do not write 8. We write 7 because 7 is the last number that the hour hand passed. Counting by 5s from 1 to 10, we see that 50 minutes have passed since 7:00, so it is 7:50.

Write “7 : ___ ___” on the board again. Show students 7 o’clock on an analog clock. ASK: How many minutes is it after 7 o’clock? (0) SAY: Because it is zero minutes after 7 o’clock, we just write 7:00. Fill in the blanks on the board, as shown below:

7 : 0 0

SAY: We have two spaces to show the minutes. That’s why we write 2 zeros for 7 o’clock. Zero minutes have passed since 7.

Show 7:05 on the analog clock with two hands. ASK: How many minutes have passed since 7:00? (5) SAY: Remember that we have two spaces to write the number of minutes. Write “7 : ___ ___” on the board again.

SAY: Since we need to write a number in each space, we write “0” and “5.” Fill in the blanks on the board, as shown below:

7 : 0 5

SAY: We write zero in the first place and five in the second place. Show 7:05 on the digital clock. ASK: What happens if we write five in the first place? Write “7 : 5 ___” on the board. SAY: We need to write a number for each place. What number do we write for the second place? Students may suggest writing zero. Write “0” in the second space and ASK: How many minutes does this show after 7 o’clock? (50) SAY: We want to show 5 minutes past 7, not 50 minutes past 7. That’s why we need to write zero and five instead of five and zero. Cross out or erase the incorrect time.

Give students more practice reading times shown on an analog clock and have volunteers write the times in numbers on the board. For example, 8:20, 7:45, 9:10, 12:40, 6:15, 10:30, 1:25, 12:35, 4:00, 11:05. Eventually, draw only one blank instead of two blanks for the minutes and tell students that they still need to write two digits for the number of minutes.
Exercises: Write the number of minutes past the hour.

a)  

b)  

c)  

Answers: a) 30, b) 40, c) 05

Extensions

1. Give each student a copy of BLM Clock Faces. Have students draw where the minute hand points for a given number of minutes past the hour. Explain that they need to skip count by 5s on the clock (starting from 12 to 1, then from 1 to 2, and so on) until they reach the given number of minutes.

   a) 10 minutes  
   b) 45 minutes  
   c) 25 minutes  
   d) 50 minutes  

   Answers: a) 2, b) 9, c) 5, d) 10

   NOTE: Encourage students to use the clocks they made in Activity 1 of Lesson MD2-29 to help answer Extensions 2 and 3.

2. Emma looked at the clock and saw the minute hand pointing at 12. Later she looked at the minute hand again. What number does the minute hand point to?

   a) 15 minutes later  
   b) 35 minutes later  
   c) 55 minutes later  
   d) 60 minutes later  
   e) 65 minutes later  
   f) 90 minutes later  

   Answers: a) 3, b) 7, c) 11, d) 12, e) 1, f) 6

3. How many minutes have passed?

   a) The minute hand moves from 12 to 1.  
   b) The minute hand moves from 12 to 4.  
   c) The minute hand moves from 1 to 5.  
   d) The minute hand moves from 2 to 7.  
   e) The minute hand moves from 4 to 7.  
   f) The minute hand moves from 5 to 11.  

   Bonus: The minute hand moves from 11 to 2.  

   Answers: a) 5, b) 20, c) 20, d) 25, e) 15, f) 30, Bonus: 15
4. Braden puts 4 small paper clips and 5 large paper clips all in a row. The total length is 37 cm. He measured a small paper clip and found that it was 3 cm long. How can Braden figure out how long each large paper clip is without using a ruler? Show your work with pictures or number sentences. Explain what each part of the picture or what each number sentence means in the situation.

**Solution:** The small paper clips are \(3 + 3 + 3 + 3 = 12\) cm long in total. \(37 - 12 = 25\), so the 5 large paper clips are 25 cm long in total. \(5 + 5 + 5 + 5 + 5 = 25\), so each large paper clip is 5 cm long.

Look for students to make sense of the problem at each step, to use correct number sentences to model the situation (MP.4), and to interpret the results of their calculation at each step (MP.2).

Redirecting students: If students struggle with how to begin (MP.1), encourage them to draw a picture that shows all the information that is given with one piece of information at a time, rereading the problem as needed.
MD2-31  Time to the 5 Minutes on an Analog Clock
Pages 139–142

STANDARDS
2.MD.C.7, 2.NBT.A.2

VOCABULARY
analog clock
clock
digit
digital clock
hour
hour hand
minute
minute hand
o’clock

Goals
Students will tell the time on an analog clock when the minute hand points directly at a number.
Students will write the time using numbers (e.g., 4:25) and numbers and words (e.g., 25 minutes after 4).

PRIOR KNOWLEDGE REQUIRED
Is familiar with a clock face and the hands on a clock
Can distinguish between the three hands on a clock and knows their names (hour hand, minute hand, and fast hand)
Can count by 5s

MATERIALS
analog clock with two hands
pair of dice per student pair
clocks made in Activity 1 of Lesson MD2-29

Between the hour. SAY: When the hour hand does not point directly at an hour, we say it points between hours. Show different times not on the hour on an analog clock and have students say which two numbers the hour hand is between.

Exercises: Where is the hour hand pointing?

a) 

between   and   

b) 

between   and   

c) 

between   and   

d) 

between   and   

e) 

between   and   at   

f) 

between   and   at   

Answers: a) 4 and 5, b) 9 and 10, c) 6 and 7, d) 10 and 11, e) at 7, f) at 11

What is the hour? Remind students that, if the hour hand points between two numbers, the hour is the last number that the hour hand passed. For example, if the hour hand points between 8 and 9, the hour is 8. Show
the hour hand pointing between various numbers on an analog clock (sometimes closer to the smaller number, sometimes in the middle, and sometimes closer to the larger number) and have students tell you the hour.

**Exercises:** What is the hour?

a) The hour hand points between 3 and 4.
b) The hour hand points between 8 and 9.
c) The hour hand points between 1 and 2.
d) The hour hand points between 7 and 8.
e) The hour hand points between 5 and 6.
f) The hour hand points between 11 and 12.

**Bonus:** The hour hand points between 12 and 1.

**Answers:** a) 3, b) 8, c) 1, d) 7, e) 5, f) 11, Bonus: 12

**Writing the time using numbers in the form “ ____ : ____ .”**

SAY: Now you are ready to tell and write the time shown on an analog clock. To tell time, we look at the hour hand first and then the minute hand. Set the analog clock to show 10:15. SAY: I will write the time shown on the analog clock using numbers. Draw on the board:

```
[ ] [ ] : [ ] [ ]
```

ASK: Between which two numbers is the hour hand pointing? (10 and 11) What is the hour? (10) Write “10” in the first two boxes. ASK: What number is the minute hand pointing at? (3) SAY: Let’s count by 5s to find how many minutes it is after the hour. Point to 12 and then use your finger to jump from 12 to 1, 1 to 2, and 2 to 3, counting 5 each time. (5, 10, 15) ASK: How many minutes is it after the hour? (15) Write “15” in the last two boxes. The final picture should look like this:

```
[1] [0] : [1] [5]
```

SAY: When we say the time, we say the hour first, then the minutes. For this time, we say "ten fifteen." Repeat with different times, such as 11:20, 12:25, 5:45, 7:30. Have volunteers read the time and write the time on the board.

SAY: We use two boxes for the hour because the hour might be a two-digit number. ASK: Which hours are two-digit numbers? (10, 11, 12) SAY: If the hour is a one-digit number, we leave the first box blank. ASK: Which hours are one-digit numbers? (1 to 9) If the number of minutes is a one-digit number, such as five, what do we write? (05) Repeat with various times showing five minutes past the hour, such as 11:05, 3:05, 5:05, 12:05.
Exercises: Write the time. Include the hour and the minutes.

a)  

b)  

c)  

Answers: a) 4:30, b) 9:20, c) 6:40

ACTIVITY 1

How many minutes have passed? Give each pair of students a pair of dice and the clocks they made in Activity 1 of Lesson MD2-29. Player 1 rolls the dice. Player 2 adds the numbers showing on the dice and uses the sum to set the minute hand of the clock. For example, if Player 1 rolls 3 and 4, Player 2 sets the minute hand to point at 7. Both players count by 5s and write the minutes past the hour (for example, “35 minutes”). Players then switch roles and continue.

Writing the time in the form “___ minutes after ____.” SAY: We know how to write the time using only numbers. Now we will write the time using numbers and words. We do that by writing how many minutes it is after the hour. Set the analog clock to show 8:25. Write on the board:

___ minutes after ___

ASK: Which two numbers is the hour hand between? (8 and 9) What is the hour? (8) Write “8” in the second blank. ASK: How many minutes is it after 8 o’clock? (25) PROMPT: At 8 o’clock, the minute hand was at 12. Count by 5s to find the number of minutes. Write “25” in the first blank, as shown below:

25  minutes after  8

SAY: When we write the time using numbers and words, we write the minutes first and then the hour. Repeat with many examples (such as 10:05, 3:40, 7:15, 11:10) and have volunteers fill in the blanks.

Exercises: What time is it? Fill in the blanks.

a)  

b)  

___ minutes after ___  

___ minutes after ___
c) 3 minutes after 12

d) 15 minutes after 6

**Answers:** a) 30 minutes after 1, b) 35 minutes after 4, c) 10 minutes after 10, d) 15 minutes after 6

**ACTIVITY 2**

**What time is it?** Give each pair of students a pair of dice and the clocks they made in Activity 1 of Lesson MD2-29. Player 1 rolls the dice, adds the results, and sets the hour hand to point at the sum. Player 2 rolls the dice, adds the results, and sets the minute hand to point at the sum. Both players write the time in the form “__ minutes after __.”

For example, if Player 1 rolls 7 and Player 2 rolls 9, the clock should be set at 7:45. Players switch roles and continue playing.

Remind students that on a real clock, the hour hand does not point directly at the number unless the minute hand is pointing at 12. For example, if the time is 7:45, the hour hand would be between 7 and 8, not pointing directly at 7.

**Writing the time given a description of an analog clock.** Write on the board:

The hour hand is between 1 and 2.
The minute hand points at 4.
What time is it?

Have a volunteer read the problem aloud. ASK: When the hour hand is between two numbers, which number is the hour? (the last number that the hour hand passed) What is the hour? (1) How many minutes is it after 1 o’clock? (20) PROMPT: Count by 5s to find the answer. ASK: What is the time? (20 minutes after 1 or 1:20) Write on the board:

20 minutes after 1 1:20

Repeat with several similar examples. Have volunteers write the times on the board in two different ways. Provide blanks to help students (___ minutes after __, and ___ : ___)
Exercises: Write the time.

a) The hour hand is between 6 and 7. The minute hand points at 3. What time is it? ___ minutes after ___ ___ : ___ 

b) The hour hand is between 10 and 11. The minute hand points at 7. What time is it? ___ minutes after ___ ___ : ___ 

Answers: a) 15 minutes after 6, 6:15; b) 35 minutes after 10, 10:35

Extensions

NOTE: Encourage students to use the clocks they made in Activity 1 of Lesson MD2-29 to help them with Extensions 1, 2, and 4.

1. What is the time 15 minutes before?
   a) 5:45   b) 6:30   c) 8:20   d) 4:15
   Bonus
   e) 20 minutes after 6   f) 7:00
g) 5 minutes after 5

   Answers: a) 5:30, b) 6:15, c) 8:05, d) 4:00, Bonus: e) 6:05, f) 6:45, g) 4:50

2. Write the time in numbers.
   a) 15 minutes before 8:00   b) 20 minutes before 6:00
   c) 45 minutes before 12:00   Bonus: 60 minutes before 9:15

   Answers: a) 7:45, b) 5:40, c) 11:15, Bonus: 8:15

3. The digital clock shows that the hour is 8.
   
   If you add the four numbers in the boxes, you get 15. What is the missing number? What time does the clock show?

   Answers: 5, 8:25

(MP3) 4. Jo started at 0 and skip counted by 5s. All her numbers were even.
   a) Did Jo skip count correctly? How do you know?
   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

   Selected sample answer: a) no, skip counting by 5s starting at 0 should alternate between even and odd numbers
MD2-32 Time to the 5 Minutes on a Digital Clock

Pages 143–144

STANDARDS
2.MD.C.7

VOCABULARY
analog clock
clock
clock face
digit
digital clock
hour
hour hand
minute
minute hand
o’clock

Goals
Students will tell the time shown on a digital clock, where the number of minutes is a multiple of 5.
Students will write the time in numbers and in words, and they will draw the missing minute hand on an analog clock.

PRIOR KNOWLEDGE REQUIRED
Is familiar with a clock face and the hands on a clock
Can distinguish between the three hands on a clock and knows their names (hour hand, minute hand, and fast hand)
Can count by 5s
Can write time to five minutes in numbers, and in numbers and words

MATERIALS
analog clock with two hands
digital clock
BLM Time: Digital Clocks (pp. Q-44–45)
BLM Matching Analog to Digital (2) (p. Q-41)
BLM Clock Faces (p. Q-43)

Review analog and digital clocks. Point to an analog clock and ASK: What kind of clock is this? (analog) SAY: An analog clock shows the time using a clock face with numbers in a circle and clock hands. Point to a digital clock and ASK: What kind of clock is this? (digital) SAY: A digital clock shows the time using numbers only.

Writing the time shown on a digital clock in different ways. Show students a digital clock set to 10:25. ASK: What time does the digital clock show? (ten twenty-five and 25 minutes after 10) Write on the board:

10:25
25 minutes after 10

ASK: How can we write the number 25 using words? (twenty-five) Have a volunteer write “twenty-five” on the board. Write “minutes after” beside “twenty-five.” ASK: How can we write the number 10 using words? (ten) Have a volunteer write “ten” on the board, as shown below:

10:25
25 minutes after 10
twenty-five minutes after ten

Repeat for the following times: 8:15, 3:10, 4:35, 11:40, 12:30, 1:55, and 5:05. Have volunteers write the time in all three forms. Have the class read the time out loud in all three forms.
SAY: If the hour has only one digit, like 4, some digital clocks show “0” before the hour. Draw on the board:

![4:35]

SAY: When we read the time, we say 4:35. We do not say the zero. When we write the time, we write 4:35. We do not write the zero.

Exercises

1. Write the time in numbers only. Then write the time in numbers and words.
   a) ![9:35]
   b) ![4:15]
   c) ![1:30]
   d) ![1:45]

   **Answers:** a) 9:35, 35 minutes after 9; b) 4:15, 15 minutes after 4; c) 11:30, 30 minutes after 11; d) 1:45, 45 minutes after 1

2. Write the time in numbers only. Then write the time in words only.
   a) ![4:25]
   b) ![8:05]
   c) ![9:55]
   d) ![1:40]

   **Answers:** a) 4:25, twenty-five minutes after four; b) 8:05, five minutes after eight; c) 9:55, fifty-five minutes after nine; d) 1:40, forty minutes after one

**Showing the time from a digital clock on an analog clock.** Show students a digital clock set to 8:20. Ask volunteers to say the time and then write the time on the board, using numbers only, numbers and words, and words only. (8:20, 20 minutes after 8, twenty minutes after eight) Show students an analog clock and SAY: Let’s show the same time on this clock. ASK: What is the hour? (8) Is it exactly 8 o’clock or is it past the hour? (past the hour) Will the hour hand point right at 8 or will it point between 8 and 9? (between 8 and 9) Position the hour hand between 8 and 9. Point to the times written on the board and ASK: How many minutes is it after 8 o’clock? (20) SAY: Let’s count by 5s to see where the minute hand should point. Count by 5s from the number 1 to the number 4. ASK: Where will the minute hand point? (at 4) Position the minute hand to point at 4.

Repeat with several examples, such as 9:15, 10:05, 1:30, 2:10, 7:25, and 6:45.
**ACTIVITIES 1–2**

1. **Matching analog and digital times.** Have students complete BLM Time: Digital Clocks individually. They should draw a line to match the time on the analog clock with the time on the digital clock. (see answers below)

2. **Matching analog and digital times by playing games.** Have students play Picking Pairs and Memory with the cards from BLM Matching Analog to Digital (2) (see unit introduction).

Give each student a copy of BLM Clock Faces for the following exercises. Explain that they only need to draw the minute hand for each given time.

**Exercises:** The digital clock shows the time. Draw the minute hand on the analog clock.

- a) [5:45]
- b) [8:20]
- c) [8:55]
- d) [9:05]

**Answers:** The minute hand should point at the: a) 9, b) 4, c) 11, d) 1
Extensions

1. Give each student a copy of BLM Clock Faces. Students will draw both the hour hand and the minute hand on a clock face for the given time. Remind students that the hour hand needs to point between two numbers, except for o’clock times.

   a) \[ \text{hour hand points between 10 and 11, minute hand points at 2} \]
   b) \[ \text{hour hand points between 2 and 3, minute hand points at 7} \]
   c) \[ \text{hour hand points between 9 and 10, minute hand points at 10} \]
   d) \[ \text{hour hand points at 4, minute hand points at 12} \]

   \[ \text{Answers} \]
   a) hour hand points between 10 and 11, minute hand points at 2
   b) hour hand points between 2 and 3, minute hand points at 7
   c) hour hand points between 9 and 10, minute hand points at 10
   d) hour hand points at 4, minute hand points at 12

2. Give each student a copy of BLM Clock Faces. Students draw both the hour hand and the minute hand on a clock face for the given time. Remind students that the hour hand needs to point between two numbers, except for o’clock times.

   a) 25 minutes after 11
   b) 5 minutes after 5
   c) fifteen minutes after eight
   d) forty-five minutes after nine

   \[ \text{Answers} \]
   a) hour hand points between 11 and 12, minute hand points at 5
   b) hour hand points between 5 and 6, minute hand points at 1
   c) hour hand points between 8 and 9, minute hand points at 3
   d) hour hand points between 9 and 10, minute hand points at 9

3. Have students calculate how much time has passed between the given times. Students count by 5s, starting from the number of minutes past the hour in the first time and ending at the number of minutes past the hour in the second time.

   a) 7:20 and 7:25
   b) 10:30 and 10:45
   c) 8:20 and 8:40
   d) 1:10 and 1:30
   e) 3:45 and 3:50
   f) 3:15 and 3:55
   g) 11:05 and 11:40
   h) 10:15 and 10:45

   \[ \text{Bonus} \]
   i) 5:00 and 5:20
   j) 6:10 and 6:50
   k) 8:05 and 8:55

   \[ \text{Answers:} \]
   a) 5 minutes, b) 15 minutes, c) 20 minutes, d) 20 minutes,
   e) 5 minutes, f) 40 minutes, g) 35 minutes, h) 30 minutes,
   Bonus: i) 20 minutes, j) 40 minutes, k) 50 minutes
STANDARDS
2.MD.C.7, 2.G.A.3

VOCAKLARY
analog clock
clock
clock face
half an hour
half past
halfway
hour
hour hand
minute
minute hand
o’clock

Goals
Students will tell the time to the half hour using both analog and
digital clocks.
Students will learn to read and write times using the form “half past ___.”

PRIOR KNOWLEDGE REQUIRED
Is familiar with a clock face and the hands on a clock
Can distinguish between the three hands on a clock and knows their
names (hour hand, minute hand, and fast hand)
Can count by 5s
Can write time to 5 minutes in numbers and in numbers and words
Understands the fraction one half

MATERIALS
analog clock with two hands
string or ribbon
tape
scissors
marker
clocks made in Activity 1 of Lesson MD2-29
BLM Matching Analog to Digital (1) and (3) (pp. Q-40, Q-42)
BLM Clock Faces (p. Q-43)

Review whole and half. Draw a rectangle on the board. SAY: I am going to
draw a line to split the rectangle into two equal pieces. Continue drawing
on the board:

Ask a volunteer to shade one half of the rectangle. Point to the shaded
half and ASK: Is this shaded piece half of the rectangle? (yes) Point to the
unshaded half and ASK: Is this unshaded piece half of the rectangle? (yes)
If we put the shaded half and the unshaded half together, do we get the
whole rectangle? (yes) Repeat this exercise using a square, a triangle, and
a circle that is large enough to become a clock face later. Have volunteers
identify the halves and the wholes. Make sure to divide the circle in half with
a vertical line, as shown below.
Halfway around the clock. Write the numbers 1 to 12 on the circle on the board. Ask: At the beginning of an hour, where does the minute hand point? (at 12) Draw a minute hand with dashed lines pointing at 12. Have students signal thumbs up or thumbs down for the next questions. Trace your finger around the circle counterclockwise from 12 to 9. Ask: Do the hands on the clock move this way? (thumbs down) Trace your finger around the circle clockwise from 12 to 3. Ask: Do the hands move this way? (thumbs up) Say: The minute hand moves from 12 to 1 to 2 and all the way back to 12 at the end of an hour. Show the motion on an analog clock. Say: When the minute hand points at 6, the minute hand is halfway between the start of the hour and the end of the hour. Draw an arrow to show the movement of the minute hand around the clock and draw a solid minute hand pointing at 6, as shown below:

![Clock Diagram](image)

Ask: Which half of the circle has the minute hand passed through, the shaded half or the unshaded half? (for the picture above, it is the shaded half)

Say: Let’s use a string to show halfway around the clock. Put an analog clock on a table and then place string around the clock starting at the 12, using tape to keep it in place. Cut the string once it gets all the way around the clock and remove the string. Have a volunteer find the halfway mark on the string by folding the string in half. Use a marker to draw a mark at the halfway point on the string. Ask: Where do you think the halfway point will be on the clock when I tape the string to the clock again? (at 6) Tape the string to the clock starting and ending at 12. Ask: Where is the halfway mark? (at 6)

The minute hand moves halfway around the clock when the hour hand moves halfway from one number to the next. Set the time on the analog clock to 2 o’clock. Adjust the time from 2 o’clock to 3 o’clock as the class watches. Say: While the hour hand is moving from 2 to 3, the minute hand is moving all the way around the clock from 12 back to 12. Repeat for 3 o’clock to 4 o’clock. Turn the time back to 2 o’clock and say: I want to move the hour hand halfway to 3 o’clock. Start adjusting the time and have the class stop you when you get halfway. Ask: Where is the minute hand pointing now? (at 6) Say: When the minute hand is halfway around from 2 o’clock to 3 o’clock, we say that the time is half past two. Write “half past 2” on the board.

Say: When the hour hand points halfway between two numbers, the minute hand always points at 6 because the minute hand has gone halfway around the circle. This is called half an hour. It takes half an hour for the hour hand to move halfway from 2 o’clock to 3 o’clock. It also takes half an hour for the minute hand to move halfway around the clock.
Writing “half past” in two ways. Set the time on the analog clock to 3:30. SAY: Half an hour after 3 o’clock is called half past 3. Let’s check how many minutes there are in half an hour. Count by 5s as a class as you point to the numbers 1 through 6 on the clock. (30 minutes) SAY: Since there are 30 minutes in half an hour, we can write half past 3 as 3:30. Write on the board:

half past 3
3:30

Repeat for several examples, such as 8:30, 2:30, 5:30, and 11:30. Have volunteers write the time in two ways: half past ___ and ___ : 30.

Have students use the clocks they made in Activity 1 of Lesson MD2-29 for Exercise 2 below.

Exercises

1. Write the time in two ways.
   a)  b)  c)

   half past ___  half past ___  ______________
   ___ : 30  ___ : 30  ___ : ___

   Answers: a) half past 4, 4:30; b) half past 9, 9:30; c) half past 6, 6:30

2. Use a clock to show the times. Circle the two that are the same.
   a) 1:30  b) half past 11  c) half past 7
   d) 12:30  e) half past 1  f) 10:30

   Answer: a) and e) are the same

Halfway between. On an analog clock, show an hour hand that points between 7 and 8. First, have the hour hand closer to 7, then closer to 8, and then exactly halfway between 7 and 8. For each position, ASK: Which number is the hour hand closer to? When the hour hand points exactly halfway between 7 and 8, SAY: The hour hand is not closer to 7 or 8. It is halfway between. Show some other times with the hour hand exactly halfway between two numbers and have students describe the time as halfway between ___ o’clock and ___ o’clock.

Draw a clock face on the board. Draw the hour hand only for several “half past” times and have volunteers draw dotted lines to extend the hour hand to help read the time. Say the time using “half past” and have students show you the hour hand on the clocks they made in Activity 1 of Lesson MD2-29.
**Identifying “half past” and “o’clock” times.** Show different times on the hour and half hour on an analog clock and have students identify the time. (For example, 7:00, 4:30, 12:30, 6:00, 3:30.) ASK: How can you tell if a clock shows half past or o’clock? (the minute hand points to 12 for o’clock and it points to 6 for half past) Where does the hour hand point for o’clock? (directly at a number) Where does the hour hand point for half past? (halfway between two numbers) Show several times on the hour and the half hour again on the analog clock and have students write the time in two ways (___:30 and half past ____, or ____:00 and ____ o’clock).

**Exercises:** Write the time. Use the words “half past” or “o’clock.”

<table>
<thead>
<tr>
<th>a)</th>
<th>b)</th>
<th>c)</th>
</tr>
</thead>
</table>

![Clock images]

**Answers:** a) half past 11, b) 7 o’clock, c) half past 1

**ACTIVITY**

Have students play Picking Pairs and then Memory with cards from BLM Matching Analog to Digital (1) and (3) (see unit introduction).

**Showing “half past” on an analog clock.** Set the time on an analog clock to 3:00. Move the minute hand around the clock starting at 3:00 and ending at 4:30. Count the times out loud at the hour and half hour: 3:00, 3:30, 4:00, 4:30. As you move the hand, point out the position of the hour hand and the minute hand for times on the hour versus times on the half hour.

Have students use the clocks they made in Activity 1 of Lesson MD2-29 to show half past 12, half past 1, continuing sequentially until they reach half past 12 again. Then repeat for times on the half hour in random order. Ensure that students show the hour hand pointing halfway between two numbers and the minute hand pointing directly at 6. Repeat with a mix of half past and o’clock times. For o’clock times, ensure that students show the hour hand pointing directly at a number and the minute hand pointing directly at 12.

**Where should the minute hand point?** Draw a clock with only an hour hand pointing directly at a number on the board. ASK: Is it o’clock or half past? (o’clock) Where should I draw the minute hand? (at 12) Now draw the hour hand pointing halfway between two numbers. ASK: Is it o’clock or half past? (half past) Where should I draw the minute hand? (at 6) Draw various times on the clock using only an hour hand. Have volunteers draw the minute hand pointing either at 12 or 6. After a volunteer draws the minute hand in the correct place, have another volunteer write the time as half past ___ or ___ o’clock.
Give each student a copy of **BLM Clock Faces** for Exercise 1, below.

**Exercises**

1. Draw the hands of the clock. Write the time. Use **half past** or **o'clock**.
   
   - a) 4:30       b) 6:00       c) 2:30       d) 10:00

   **Answers:** a) the hour hand is between 4 and 5 and the minute hand points at 6, half past 4; b) the hour hand points at 6 and the minute hand points at 12, 6 o'clock; c) the hour hand is between 2 and 3 and the minute hand points at 6; half past 2; d) the hour hand points at 10 and the minute hand points at 12, 10 o'clock

   **Bonus:** Write the time in numbers.
   
   - a) The hour hand is half way between 5 and 6. The minute hand points at 6.
   - b) The hour hand is half way between 10 and 11. The minute hand points at 6.
   - c) The hour hand points at 9. The minute hand points at 12.
   - d) The hour hand points at 12. The minute hand points at 12.
   - e) The hour hand is half way between 6 and 7. The minute hand points at 6.

   **Answers:** a) 5:30, b) 10:30, c) 9:00, d) 12:00, e) 6:30

**Extensions**

1. The times are in the afternoon and evening. Write the times in order.
   
   - a) 4:30, 2:30, 5:30
   - b) 9:30, 10:30, 1:30
   - c) 6:30, 5:30, 11:30
   - d) 1:30, 5:00, 4:30
   - e) 3:30, 7:00, 3:00

   **Bonus**
   
   - a) 2:30, 4:30, 5:30
   - b) 1:30, 9:30, 10:30
   - c) 5:30, 6:30, 11:30
   - d) 1:30, 4:30, 5:00
   - e) 3:00, 3:30, 7:00

   **Answers:** a) 2:30, 4:30, 5:30; b) 1:30, 9:30, 10:30; c) 5:30, 6:30, 11:30; Bonus: d) 1:30, 4:30, 5:00; e) 3:00, 3:30, 7:00

2. Where do the hour hand and the minute hand point?
   
   - a) 5:30
   - b) half past 10
   - c) 7 o'clock
   - d) 8:30
   - e) 9:00
   - f) half past 5

   **Answers**
   
   - a) the hour hand points between 5 and 6, the minute hand points at 6
   - b) the hour hand points between 10 and 11, the minute hand points at 6
   - c) the hour hand points at 7, the minute hand points at 12
   - d) the hour hand points between 8 and 9, the minute hand points at 6
   - e) the hour hand points at 9, the minute hand points at 12
   - f) the hour hand points between 5 and 6, the minute hand points at 6
3. Which two parts of Extension 2 show the same time?
   
   **Answer:** a) and f)

4. Write the time in numbers. Then write the time using **half past**.
   
   a) It is 30 minutes after 4 o’clock.
   
   b) 30 minutes have passed after 1:00
   
   c) 30 minutes have passed after 11 o’clock
   
   d) 30 minutes have passed after 12:00
   
   **Answers:** a) 4:30, half past 4; b) 1:30, half past 1; c) 11:30, half past 11; d) 12:30, half past 12

5. Write the time in numbers. Then write the time using **o’clock**.
   
   a) 30 minutes have passed since 5:30
   
   b) 30 minutes have passed since 9:30
   
   c) 30 minutes have passed since 11:30
   
   **Bonus:** 30 minutes have passed since half past 12
   
   **Answers:** a) 6:00, 6 o’clock; b) 10:00, 10 o’clock; c) 12:00, 12 o’clock; 
   
   **Bonus:** 1:00, 1 o’clock

6. a) Draw a clock showing 6:00.

   b) Did you draw the two hands the same length? Why or why not?

   c) Helen looks at your clock and says the time is 12:30. What mistake do you think she made?

   **Selected answers**
   
   b) I made the hand pointing at 6 shorter because that’s how you can tell it shows the hours. I made the hand pointing at 12 longer because it shows o’clock. If I didn’t do that, someone might not know what time I mean.
   
   c) She might have thought the long hand shows the hours.
MD2-34  Times of Day
Pages 147–149

STANDARDS
2.MD.C.7

VOCABULARY
analog clock
a.m.
clock
half an hour
half hour
half past
halfway
hour
hour hand
midnight
minute
minute hand
noon
o’clock
p.m.
timeline

Goals
Students will identify times of the day using a.m. and p.m.
Students will read and draw timelines.

PRIOR KNOWLEDGE REQUIRED
Is familiar with a clock face and the hands on a clock
Can distinguish between the three hands on a clock and knows their names (hour hand, minute hand, and fast hand)
Can count by 5s
Can write time to five minutes in numbers, and in numbers and words
Can read and draw a number line

MATERIALS
analog clock with two hands
BLM Where is the Hour Hand? (p. Q-46, see Extension 5)

Introduce a.m. and p.m. Write “9:00” on the board. SAY: The time says 9:00. I wonder if it is nighttime or daytime? It could be either. At 9:00 in the morning, you are at school. At 9:00 at night, you are likely in bed or getting ready for bed.

Write “12:00” on the board. ASK: What time is it? (12 o’clock) Is it nighttime or daytime? (could be either) SAY: 12:00 can mean noon, which is the middle of the school day and the time we eat lunch. 12:00 can also mean midnight, which is the middle of the night when most people are asleep.
Write “a.m.” and “p.m.” on the board. SAY: We write a.m. for times between 12 o’clock midnight and 12 o’clock noon. We write p.m. for times between 12 o’clock noon to 12 o’clock midnight. Draw on the board:

Writing the time using a.m. and p.m. Write on the board:

Tim ate breakfast at 8:00.
The plane lands at 3:15 in the afternoon.
The train arrives at 11:45 in the morning.
Rani visits the library at 5:30.
Amit goes to the dentist at 1:15.
Vicky eats ice cream at 4:30.
3 hours after midnight is 3:00.
7 o’clock in the morning is 7:00.
Half past 9 in the morning is 9:30.

Q-30  Teacher Resource for Grade 2
SAY: We write a.m. or p.m. after the time to identify whether it is morning or afternoon. Have students indicate a.m. or p.m. for each time. They can signal the answer by pointing to the correct side of the picture above. (a.m., p.m., a.m., p.m., p.m., p.m., a.m., a.m., a.m.)

Write on the board:

- Lunch time starts at ________.
- School ends at ________.
- The library closes at ________.
- The school bus arrives at ________.

Use an analog clock to show each time. Have students write the time in numbers in the blanks and add a.m. or p.m.

**Exercises:** Write the time in numbers and use a.m. or p.m.

a) The math lesson ends at half past 10.

b) Karate class starts at 7 o’clock.

**Bonus:** Sal’s little sister has a nap during the day from half past 11 to half past 1.

**Answers:** a) 10:30 a.m., b) 7:00 p.m., Bonus: 11:30 a.m. to 1:30 p.m.

Have students write something they do in the a.m. and something they do in the p.m. in their notebooks. Have them give the time for each activity.

**Examples:** I wake up at 6:50 a.m. I go to bed at 9:00 p.m.

**Exercises**

1. Is it a.m. or p.m.?

   a) 2 o’clock in the afternoon  
   b) 9 o’clock in the morning
   c) 8 o’clock in the evening  
   d) 10 o’clock in the morning

   **Bonus**
   e) 1 hour after midnight  
   f) 2 hours after noon
   g) 3 hours before noon  
   h) 1 hour before midnight

   **Answers:** a) p.m., b) a.m., c) p.m., d) a.m., e) a.m., f) p.m., g) a.m., h) p.m.

2. Josh has a busy day. Write a.m. or p.m. for the time.

   a) He arrives at school at 8:30.  
   b) He goes to bed at 10:00.
   c) He goes to an after school club at 4:00.  
   d) He goes outside for morning recess at 10:00.

   **Answers:** a) a.m., b) p.m., c) p.m., d) a.m.
Introduce timelines. Have students tell you some things that happen at school in the morning. On the board, write several suggestions that occur on the hour or half hour, but make sure that they are not listed in chronological order. SAY: I want to organize this list of activities so that they are in the order that they happen. For example, ASK: Do you arrive at school first or do you go for morning recess first? (arrive at school) Remind students that when they order numbers, they can mark them on a number line and then read them from left to right.

SAY: We can use a similar tool for times of day. It is called a timeline. Draw a number line on the board, leaving enough space to write the numbers as times on the hour and every half hour between the hours:

\[
\begin{array}{c|c|c|c|c}
8 & 9 & 10 & 11 \\
\end{array}
\]

SAY: This is a number line from 8 to 11. We can make a timeline by writing each number as a time. Add “:00 a.m.” beside each number (for example, 8 becomes 8:00 a.m., 9 becomes 9:00 a.m., and so on). SAY: Now this is a timeline. Add tick marks halfway between the numbers, and extend the line and add a tick mark for 11:30 a.m. Point to the tick mark halfway between 8:00 a.m. and 9:00 a.m. and ASK: What time comes exactly halfway between 8:00 a.m. and 9:00 a.m.? (8:30 a.m.) Repeat with the remaining tick marks for half hours. The finished timeline should look like this:

\[
\begin{array}{c|c|c|c|c|c|c|c|c}
8:00 & 8:30 & 9:00 & 9:30 & 10:00 & 10:30 & 11:00 & 11:30 \\
a.m. & a.m. & a.m. & a.m. & a.m. & a.m. & a.m. & a.m. \\
\end{array}
\]

SAY: This is a timeline from 8:00 in the morning to 11:30 in the morning. ASK: How much time passes between 8:00 a.m. and 8:30 a.m.? (half an hour or 30 minutes) How much time passes between 8:30 a.m. and 9:00 a.m.? (half an hour or 30 minutes) Repeat for the remaining intervals on the timeline. Direct students’ attention to the events they listed on the board. ASK: What happens at 8:00 a.m.? (for example, depending on the schedule at your school, leave home, arrive at school, or bell rings) Write the event above 8:00 a.m. on the timeline and continue in the same manner to fill in the events above the remaining tick marks on the timeline.

Have students refer to the completed timeline on the board for the following exercises.

**Exercises**

a) What happens at 8:30 a.m.?  

b) What happens at 11:00 a.m.?  

c) What happens at 10:00 a.m.?  

d) What happens at half past 10 in the morning?
**Bonus:** Draw a timeline to show what you might do on Saturday at each time.

<table>
<thead>
<tr>
<th>8:00 a.m.</th>
<th>8:30 a.m.</th>
<th>9:00 a.m.</th>
<th>9:30 a.m.</th>
<th>10:00 a.m.</th>
<th>10:30 a.m.</th>
<th>11:00 a.m.</th>
<th>11:30 a.m.</th>
</tr>
</thead>
</table>

Draw a similar timeline for the afternoon, but leave some times blank. Ask volunteers to fill in the missing times, including the p.m. label. Repeat the exercise of naming events that happen at school at different times.

**An hour is an hour no matter where the minute hand starts.** ASK: How long does it take the minute hand to move from 12 to 12? (1 hour) Show this on an analog clock. Repeat for the minute hand going from 6 to 6.

SAY: It does not matter where the minute hand starts—when the minute hand goes all the way around and back to where it started, one hour has passed. ASK: How many hours pass between 12:00 and 3:00? (3 hours) Show the movement of the hour hand on the clock, counting one hour at a time. Repeat for the following times: between 4:00 and 6:00 (2 hours), between 5:00 and 9:00 (4 hours), and between 1:00 and 2:00 (1 hour).

Then show examples where the time goes from half past an hour to half past another hour, where the minute hand points to 6 at the start time and end time. ASK: How many hours pass between 1:30 and 2:30? (1 hour) Repeat for the following times: between 3:30 and 5:30 (2 hours), and between 7:30 and 11:30 (4 hours).

**Counting on by hours, on the hour.** Write on the board:

<table>
<thead>
<tr>
<th>2:00 p.m.</th>
<th>3:00 p.m.</th>
<th>4:00 p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td>10:00 a.m.</td>
<td>11:00 a.m.</td>
</tr>
</tbody>
</table>

SAY: When you count on by hours, the number for the hours goes up by one each time and the numbers for the minutes are always “00.” Draw on the board:

<table>
<thead>
<tr>
<th>Time Now</th>
<th>An Hour Later</th>
<th>An Hour Later</th>
<th>An Hour Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00 p.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Point to the “Time Now” column. SAY: It is 2:00 p.m. now. ASK: What time will it be one hour later? (3:00 p.m.) Prompt students by showing them the motion of an hour from 2:00 to 3:00 on an analog clock. Point out that the number of hours plus 1 gives 3. Write “3:00 p.m.” in the second column. ASK: Starting at 3:00 p.m., what time will it be an hour later? (4:00 p.m.) Write “4:00 p.m.” in the third column. Repeat for the final column. (5:00 p.m.) Repeat in the second row, starting at 9:00 a.m. Add two rows to the table and repeat starting at 4:00 a.m. and 7:00 p.m.
Counting on by hours, on the half hour. Write on the board:

- 4:30 p.m. 5:30 p.m. 6:30 p.m.
- 8:30 a.m. 9:30 a.m. 10:30 a.m.

SAY: When you count on by hours starting on the half hour, the number for the hours goes up by one each time and the numbers for the minutes are always “30.” Using the table above, repeat the previous exercise for the following start times: 5:30 a.m., 7:30 p.m., and 1:30 a.m. (see completed table below)

<table>
<thead>
<tr>
<th>Time Now</th>
<th>An Hour Later</th>
<th>An Hour Later</th>
<th>An Hour Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:30 a.m.</td>
<td>6:30 a.m.</td>
<td>7:30 a.m.</td>
<td>8:30 a.m.</td>
</tr>
<tr>
<td>7:30 p.m.</td>
<td>8:30 p.m.</td>
<td>9:30 p.m.</td>
<td>10:30 p.m.</td>
</tr>
<tr>
<td>1:30 a.m.</td>
<td>2:30 a.m.</td>
<td>3:30 a.m.</td>
<td>4:30 a.m.</td>
</tr>
</tbody>
</table>

Exercises: Count on by hours.

a) 1:00 p.m., 2:00 p.m.,

b) 7:00 a.m., 8:00 a.m.,

c) 3:30 a.m., 4:30 a.m.,

d) 6:30 p.m., 7:30 p.m.,

Bonus

e) 1:00 p.m., 2:00 p.m.,

f) 2:30 a.m., 3:30 a.m.,

Answers: a) 3:00 p.m., 4:00 p.m.; b) 9:00 a.m., 10:00 a.m.; c) 5:30 a.m., 6:30 a.m.; d) 8:30 p.m., 9:30 p.m.; Bonus: e) 3:00 p.m., 4:00 p.m., 5:00 p.m., 6:00 p.m., 7:00 p.m., 8:00 p.m.; f) 4:30 a.m., 5:30 a.m., 6:30 a.m., 7:30 a.m., 8:30 a.m., 9:30 a.m.

Counting on by half hours. Write on the board:

- 2:00 p.m., 2:30 p.m., 3:00 p.m., 3:30 p.m., 4:00 p.m., 4:30 p.m.

SAY: The time goes up by 30 minutes (or half an hour) each time.

ASK: What patterns do you see? (the minutes change between 00 and 30; the hour repeats twice and then increases by 1) Write on the board:

- 6:30 a.m., 7:00 a.m.,
- 1:00 p.m., 1:30 p.m.,

ASK: What time is it half an hour later or a half hour later? (7:30 a.m., 8:00 a.m., 8:30 a.m., 9:00 a.m.; 2:00 p.m., 2:30 p.m., 3:00 p.m., 3:30 p.m.) Have volunteers fill in the blanks.
Draw on the board:

<table>
<thead>
<tr>
<th>Time Now</th>
<th>A Half Hour Later</th>
<th>A Half Hour Later</th>
<th>A Half Hour Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:30 a.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:00 p.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:30 a.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have volunteers fill in the table. (5:00 a.m., 5:30 a.m., 6:00 a.m.; 7:30 p.m., 8:00 p.m., 8:30 p.m.; 9:00 a.m., 9:30 a.m., 10:00 a.m.)

**Exercises**

1. Count on by half hours.
   a) 1:30 p.m., 2:00 p.m., ________, ________
   b) 6:00 a.m., 6:30 a.m., ________, ________
   c) 5:30 a.m., 6:00 a.m., ________, ________
   d) 8:00 p.m., 8:30 p.m., ________, ________

**Bonus**

   e) 1:00 p.m., 1:30 p.m., ________, ________, ________.
      ________, ________, ________.
   f) 2:30 a.m., 3:00 a.m., ________, ________, ________.
      ________, ________, ________.

**Answers:**
   a) 2:30 p.m., 3:00 p.m.; b) 7:00 a.m., 7:30 a.m.; c) 6:30 a.m., 7:00 a.m.; d) 9:00 p.m., 9:30 p.m.; Bonus: e) 2:00 p.m., 2:30 p.m., 3:00 p.m., 3:30 p.m., 4:00 p.m., 4:30 p.m.; f) 3:30 a.m., 4:00 a.m., 4:30 a.m., 5:00 a.m., 5:30 a.m., 6:00 a.m.

2. a) A train leaves at 7:00 p.m. A train leaves every hour after that. Give the times for the next 4 trains.
   b) A bus leaves at 9:00 p.m. A bus leaves every half hour after that. Give the times for the next 4 buses.

**Answers:**
   a) 8:00 p.m., 9:00 p.m., 10:00 p.m., 11:00 p.m.; b) 9:30 p.m., 10:00 p.m., 10:30 p.m., 11:00 p.m.

**Word problems in the form “What time is it ____ hours later?”** Write on the board:

Hanna arrives at school at 8.00 a.m.
She has recess 2 hours later.
What time is recess?

Have a volunteer read the problem. Ask: How do we find out what time recess is? Students might suggest counting on from 8, listing the hours as they count on from 8, or adding 8 + 2. Ensure all three possibilities are
mentioned in the discussion. **ASK:** What time is \(8 + 2\)? (10) What time is recess? (10:00 a.m.) Repeat for several examples involving 1, 2, or 3 hours passing. Do not go over 12 hours.

**Exercises**

a) Micky goes to dance class at 9:00 a.m. The class lasts for 1 hour. What time does the class end?

b) Jin goes to soccer practice at 4:00 p.m. The practice lasts 2 hours. What time does practice end?

c) Lily goes to a movie at 5:00 p.m. The movie lasts for 3 hours. What time does the movie end?

**Bonus:** Ross goes to soccer practice 2 hours after school ends. School ends at 3:00 p.m. What time does Ross go to practice?

**Answers:** a) 10:00 a.m., b) 6:00 p.m., c) 8:00 p.m., Bonus: 5:00 p.m.

**Extensions**

1. Answer the question.

   a) Anwar goes to a hockey game at 4:30 p.m. The game lasts for 2 hours. What time does the game end?

   b) Clara serves dinner at a soup kitchen for one hour. She starts at 6:30 p.m. What time does she finish?

   c) Mona starts lunch 3 hours after she arrives at school. She arrives at school at 8:30 a.m. What time does Mona start lunch?

   **Answers:** a) 6:30 p.m., b) 7:30 p.m., c) 11:30 a.m.

2. Show students how to count on by hours and half hours for sequences of times that change from a.m. to p.m. or from p.m. to a.m.

   Examples: 10:00 a.m. 11:00 a.m. 12:00 p.m. 1:00 p.m. 11:30 p.m. 12:00 a.m. 12:30 a.m. 1:00 a.m.

   Have students continue the following sequences by counting on by hours or by half hours.

   a) 9:00 a.m., 10:00 a.m., 11:00 a.m., _____, _____, _____

   b) 10:30 p.m., 11:00 p.m., 11:30 p.m., _____, _____, _____

   c) 10:00 a.m., 10:30 a.m., 11:00 a.m., _____, _____, _____

   d) 9:30 p.m., 10:30 p.m., 11:30 p.m., _____, _____, _____

   **Bonus:** 9:30 a.m., 10:00 a.m., 10:30 a.m., 11:00 a.m., _____, _____, _____, _____
**Answers:**

a) 12:00 p.m., 1:00 p.m., 2:00 p.m.;
b) 12:00 a.m., 12:30 a.m., 1:00 a.m.;
c) 11:30 a.m., 12:00 p.m., 12:30 p.m.;
d) 12:30 a.m., 1:30 a.m., 2:30 a.m.;
Bonus: 11:30 a.m., 12:00 p.m., 12:30 p.m., 1:00 p.m., 1:30 p.m.

3. **Identifying the number of elapsed hours.** Draw a clock face on the board. Ask a volunteer to show where the hour hand points when school starts. Have another volunteer show where the hour hand points when school ends. Use the clock to find about how many hours long the school day is. For example, **SAY:** The hour hand is closest to 9 when school starts, so let’s pretend it points at 9. We will not get the exact answer, but we will get close to the correct answer. Draw the hour hand pointing to 9. **ASK:** What number is the hour hand closest to when school ends? (3) Draw another hour hand pointing at 3. Draw jumps to count the number of intervals the hour hand passes when it travels from 9 to 3. The picture should look like this:

![Clock Diagram](image)

**Answer:** The school day is about 6 hours long.

4. **Solving word problems involving elapsed time.** Read the word problems together as a class. Draw clocks to help solve them.

   a) Gym class starts at 10:00 a.m. and ends at 12:00 p.m. How long does gym class last?

   b) The movie starts at 11:00 a.m. and ends at 2:00 p.m. How long does the movie last?

**Answers:**

a) 2 hours, b) 3 hours

5. Have students complete **BLM Where is the Hour Hand?** over the course of a school day.

   **Sample answers:** 1. 9, 2. 10, 3. between 10 and 11, 4. 12, 5. 1, 6. between 3 and 4

   (MP4, MP5)

6. Tony started to practice piano at 4:15. He practiced for 20 minutes, took a break for 10 minutes, then practiced for 30 more minutes. What time did he finish? Use a clock or a timeline to solve the problem. Explain your solution.

   **Sample solutions**
   - I used a clock. Since Tony starts at 4:15, the hour is 4. I counted by 5s from the number 12 on the clock until I got to 15 at the number 3. I counted by 5s from the 3 until I got to 20 minutes at the number 7. I counted by 5s from the 7 until I got to 10 minutes at the 9. Finally,
I counted by 5s from the 9 until I got to 30 minutes at the 3 again. Since I passed 12, the finishing hour is 5, and since I landed on the 3 at the end, Tony finishes at 15 minutes after 5, or 5:15.
• I used a timeline. I wrote the time in minutes that passed above the timeline:

```
  20  10  30
```

4:15

I added the minutes at the top and got 60 minutes. 60 minutes is an hour, so I added an hour to the start time to get the finish time. Tony finishes at 5:15.

Whole-class follow-up: Allow volunteers to present their solutions. Compare the two solutions shown above. ASK: Which way is easier to understand? (some students might find it easier to use the clock to understand the time passing, others may see it more clearly on a timeline) Which way is faster? (using the timeline)
Make Your Own Clock
Matching Analog to Digital (I)
Matching Analog to Digital (2)

1. 8:15
2. 9:25
3. 10:30
4. 11:35
5. 12:40
6. 1:45
7. 2:50
8. 3:55
9. 4:00
10. 5:05
11. 6:10
12. 7:20
Matching Analog to Digital (3)

1:30  6:00  10:30
2:30  8:00  12:30
3:30  9:00  11:30
4:30  10:00 12:00
5:30  11:00 11:00

NAME ___________________________ DATE ___________________________
Clock Faces
Match the analog clock to the digital clock.

1. [Analog clock images] 

   - 12:45
   - 6:15
   - 2:45
   - 10:15
   - 4:45
Match the analog clock to the digital clock.

2.

- Analog: 5:15
  - Digital: 5:15
- Analog: 6:45
  - Digital: 6:45
- Analog: 8:15
  - Digital: 8:15
- Analog: 3:45
  - Digital: 3:45
- Analog: 11:15
  - Digital: 11:15
Where is the Hour Hand?

☐ Draw the hour hand.

1. When does school start?

2. When does recess start?

3. When does recess end?

4. When does lunch start?

5. When does lunch end?

6. When does school end?
This Unit in Context

In Grade 1, students were introduced to the major US coins (pennies, nickels, dimes, and quarters). In this unit, students continue to work with coins and will be introduced to dollar bills. They will use their knowledge of skip counting by 5s and 10s starting from any multiple of 5 and 10 (first learned in 2.2 Units 3 and 4) to add coins. They will add and subtract coins and dollar bills, which will expand the collection of objects that they can add and subtract; this further builds their flexibility of thinking about addition and subtraction, which began when they added and subtracted lengths in 2.1 Unit 8. This flexibility will be helpful in later grades when they learn to add and subtract fractions (4.NF.B.3), decimals (5.NBT.B.7), and algebraic expressions (7.EE.A.1).

Students will continue to solve word problems involving real-life situations in higher grades, which often include money (see, for example, 3.OA.A.3 and 4.MD.A.2). As students learn more about number sense in higher grades, their ability to work with coins and dollar bills will also expand. Fluency with money is also required to understand interest, taxes, and discounts in Grade 7 (7.RP.A.3).

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP.1 to MP.6 and MP.8. Here are some examples of how students can show that they have met a standard.

MP.1: In MD2-38 Extension 5, students need to find all the values less than 25 cents that require at least 5 coins to make. Students make sense of this problem when they read the problem carefully more than once in order to understand what exactly they are being asked to find. Students persevere to solve the problem when they use an organized approach to try the possibilities and use their knowledge of coin values and addition to test the possibilities efficiently.

MP.6: In MD2-38 Extension 2, students attend to precision when they use equality and inequality symbols to explain why they disagree with incorrect reasoning involving comparisons with coins.

MP.8: In MD2-39 Extension 3, students look for and express regularity in repeated reasoning when they find a pattern in a series of questions, and when they use the pattern to write a rule about how to find the number of dollars that can be made with a two-digit number of dimes.
Unit 7 Measurement and Data: Money

Introduction

In this unit, students will become familiar with pennies, nickels, dimes, quarters, and one dollar bills. They will learn to count money and to write its value in both cent and dollar notation. They will also learn to add and subtract money. The unit concludes with word problems involving money.

Learning how to skip count by 25s, 10s, and 5s is essential to working with coins. This is taught in the first lesson, but daily practice may be necessary to master these skills.

Two different pictures have been used to illustrate coins in this unit. Both are stylized versions of actual coins. Where the pictures of coins are shown with the name of the coin, teachers are meant to use coins from BLM Enlarged Coins (p. R-52). For example:

Coins that appear with their value can be drawn exactly as shown. For example:

Students need to be familiar with the pictures in order to do the problems in the AP Book. These pictures are easier for students to draw. The lesson plans in this unit begin with having coin pictures of relative size. Once students are comfortable with the different coins and their pictures, you can draw the coin pictures the same size.

Recurring Games. A variation on I Have ____., Who Has ____? is used in this unit. See 2.1 Unit 4 pp. E-1–2 for a full description of this game.

In addition to the BLMs provided at the end of this unit, the following Generic BLM, found in section U, is used in Unit 7:

BLM Game Cards (1) (p. U-2)
MD2-35  Skip Counting by Different Numbers

STANDARDS
2.NBT.A.2

VOCABULARY
skip count

Goals
Students will skip count by 25s, 10s, 5s, and 1s within a problem in order to prepare for counting money

PRIOR KNOWLEDGE REQUIRED
Can skip count by 5s and 10s

MATERIALS
laminated circles, squares, and hexagons to affix to the board (optional)
erasable marker (optional)
pattern blocks (5 hexagons, 5 squares, and 5 rhombuses per student pair)
counters or circles (5 per student pair)

Practicing skip counting by 5s and 10s. SAY: The work we will do today will help us when we work with money. As a class, count aloud by 10s to 100 as a warm up. Then count by 5s to 100.

Skip counting by two numbers. SAY: We will count by different numbers. We will always start skip counting by the larger number, then we will switch to counting by the smaller number. Let’s start with 5 and 1. I will show you on my hand what number to count by. As long as I am holding up all 5 fingers like this (hold up your hand with palm out and fingers spread), we will count by 5s. When I switch to 1 finger, we will count by 1s. Make sure the cue to count is obvious: make a fist, then open your hand for 5. Have students count together for the sequences shown below:

5, 10, 15, 20, 21, 22, 23       5, 10, 11, 12, 13, 14
5, 10, 15, 16, 17

Draw the shapes below on the board, and leave them there for the duration of the lesson. (You can also use laminated shapes and erasable marker instead of drawing shapes.) Leave enough space to the left of the symbols for two more.

SAY: We will use a different shape to show counting for each number. The diamonds mean to skip count by 5s. The circles mean to skip count by 1s. Draw on the board:
ASK: What do we start counting by? (5s) Write “5” in the first diamond.
volunteers fill in the last two diamonds. SAY: We will switch to circles now.
ASK: What do we count by when we see a circle? (1s) What comes after 20
when counting by 1s? (21) Write “21” in the first circle. Have volunteers fill
in the next two circles, as shown below:

\[5 \quad 10 \quad 15 \quad 20 \quad 21 \quad 22 \quad 23\]

Repeat with the following shapes:

\[\square \quad \square \quad \square \quad \bigcirc \quad \bigcirc \quad \bigcirc \quad \bigcirc\]

**Exercises:** Skip count by 5s, then by 1s.

a)  

\[\square \quad \square \quad \bigcirc \quad \bigcirc \quad \bigcirc \quad \bigcirc\]

b)  

\[\square \quad \bigcirc \quad \bigcirc\]

**Answers**

a)  

\[5 \quad 10 \quad 11 \quad 12 \quad 13 \quad 14\]

b)  

\[5 \quad 6 \quad 7\]

SAY: Let’s bring in 10s now. We will skip count together. If I hold up all
10 fingers, we skip count by 10s. If I hold up 5 fingers, we skip count by 5s.
ASK: What does 1 finger mean? (count by 1s) SAY: We will start with 10s
and 1s. Skip count by 10s and 1s as a class. For example, count 10, 20,
30, 31, 32, 33, 34, or 10, 20, 30, 40, 50, 51, 52, 53. When students have had
enough practice (at least two examples), SAY: Let’s skip count by 10s and
5s. Do a few examples of 10s and 5s. For example, count 10, 20, 30, 35, 40,
45, 50, 55, or 10, 20, 25, 30, 35, 40.

Draw a square to the left of the diamond on the board. SAY: We will use
a square to show counting by 10s. Write “10” in the square, as shown
in the margin.

Draw on the board:

\[\square \quad \square \quad \square \quad \bigcirc \quad \bigcirc \quad \bigcirc \quad \bigcirc\]

SAY: The squares mean to skip count by 10s, so we start by counting by
10s. ASK: What do we switch to for circles? (1s) Have a volunteer fill in
numbers in the shapes while the class counts. Make sure students don’t
count too quickly. The picture should look like this:

\[10 \quad 20 \quad 30 \quad 31 \quad 32 \quad 33 \quad 34\]
Draw on the board:

ASK: What do the diamonds mean? (count by 5s) Have another volunteer fill in numbers in the shapes while the class counts. The final picture should look like this:

For the following exercises, do not have students draw the shapes; have them write numbers only.

Exercises

1. Skip count by 10s, then by 1s.
   a) 
   b) 

   Answers
   a)  
   b)  

2. Skip count by 10s, then by 5s.
   a) 
   b) 

   Answers
   a)  
   b)  

Skip counting by all three numbers: 10s, 5s, and 1s. SAY: Now we will skip count by 10s, 5s, and 1s. Remember, we always go from largest to smallest: 10s, then 5s, then 1s. Using the hand signals described before, have students count by 10s, 5s, and 1s for a few numbers within 100. Ask volunteers to lead a count (let volunteers decide when to switch gestures).

NOTE: Less confident students should skip count using only two numbers.
Exercises: Count by 10s, then 5s, then 1s.

a)

b)

Answers:

a)

b)

Skip counting by 25s. SAY: Now we will skip count by 25s. Write on the board:

25

ASK: What is 25 + 25? Suggest that students write the addition to help them add. (50) Write “50” beside 25. ASK: What is 50 + 25? (75) Write “75” beside 50. ASK: What is 75 + 25? You can write the addition if it helps. (100) Write “100” beside 75. The final picture should look like this:

25     50     75     100

Chant “25, 50, 75, 100” together. Leave the line of numbers on the board for the remainder of the lesson. ASK: What is 100 + 25? (125) Write “125” below 25. ASK: If 25 + 25 is 50, what do you think 125 + 25 is? (150) Repeat two more times to reach 200. The final picture should look like this:

25      50      75     100

125     150     175     200

ASK: What should the next line be? (225, 250, 275, 300)

Draw a hexagon to the left of the square on the board. SAY: To show adding 25, we will use a hexagon. The picture should look like this:

25  10  5  1

Draw on the board:

Remind students that the squares stand for 10s. SAY: Start counting by 25s. As you point to each shape, have the class say the numbers. When you are done, have a volunteer write them, as shown below:

25  50  75  85  95
Skip counting by all four: 25s, 10s, 5s, and 1s. Draw on the board:

Pointing to the hexagon, ASK: What do we count by when we see this shape? (25s) Repeat for the square, diamond, and circle. (10s, 5s, and 1s, respectively) Count together as a class. Have a volunteer fill in the numbers as you count or after you are done. The picture should look like this:

Repeat with the following shapes:

The final picture should look like this:

ACTIVITY

Have students work in pairs. Distribute pattern blocks and counters. Have students create patterns for each other to count hexagons (25s), squares (10s), diamonds (5s), and circles (1s). Tell students to organize the blocks from largest to smallest value.

Extensions

1. Repeat the activity but allow students to place the pattern blocks in any order.

2. Add using the pictures.

   a) 
   b) 
   c) 

Answers

   a) 
   b) 
   c)
3. Which picture in Extension 2 was easiest to add? Why?

**Answer:** Answers may vary. Students may prefer part a) because it is most familiar. They may prefer part c) because it has the most multiples of 10.

4. Put the shapes in the order that they are easiest to count.

Sample answers

![Shapes] (MP1, MP6)

5. a) How many different ways can you make 25 using 5s and 10s?

b) Explain how you know you found all the ways in part a).

Sample answers

a) ![Shapes] or ![Shapes] or

b) If I use three 10s, I get 30, which is more than 25, so I have to use fewer than three 10s. If I use two 10s, I get 20, so I need one 5. If I use 1 ten, I need three 5s. If I use no 10s, I need five 5s. I tried all the possible number of 10s, so I know I found all the ways to make 25 using 10s and 5s.

6. Show how to make the total with the number of shapes.

<table>
<thead>
<tr>
<th>Total</th>
<th>Number of Shapes</th>
<th>Draw the Shapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 15</td>
<td>2</td>
<td>![Shapes]</td>
</tr>
<tr>
<td>b) 35</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>c) 40</td>
<td>3</td>
<td>![Shapes]</td>
</tr>
<tr>
<td>d) 50</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Answers**

b) ![Shapes]  

c) ![Shapes]  

d) ![Shapes]
Goals
Students will learn the names and values of coins.
Students will add coins of the same value and express the value in cent notation.

PRIOR KNOWLEDGE REQUIRED
Can count by 5s, 10s, and 25s up to 200

MATERIALS
real penny, nickel, dime, and quarter
play coins or cutouts from BLM Coins (p. R-51), 5 pennies, 9 nickels, 9 dimes, and 5 quarters per 1 or 2 students
cutouts from BLM Enlarged Coins (p. R-52) to affix to the board
BLM Coins on a Chart (p. R-53)
scissors and glue
BLM Money Game (p. R-54)
BLM Game Cards (1) (p. U-2)
dice for every 1 or 2 students
tokens or counters

NOTE: There are many suggestions for games and activities in this lesson. Your students are trying to learn three things simultaneously—the appearance, name, and value of each coin. It is important that they have ample opportunity to handle and work with coins.

Introduce the name and value of each coin. SAY: We have two kinds of money, paper and coins. These are the coins. Hold up a real set of coins. SAY: We will use play coins that look real. Give each student play coins or cutouts from BLM Coins—one penny, nickel, dime, and quarter each. Have students use the coins to answer questions. Encourage students to look at the coins. ASK: What do they say? What is the same? What is different? SAY: Every coin is worth a different amount. Look at the biggest coin. ASK: What picture does it show? (an eagle and a head) SAY: Look at the side with the eagle. Read the edges of the coin. (United States of America, quarter dollar) Affix a quarter from BLM Enlarged Coins to the board, and write the name and the value, as shown below:

 quarter

25¢

SAY: We count how much coins are worth in cents. This coin is called a quarter, and it is worth 25 cents. This sign (point to the cent sign) is called cent.
a cent sign. It looks like a “c” with a line through it. It is an easy way to write cents. Write “25¢ = 25 cents” on the board.

Repeat with the smallest coin, the dime. The picture should look like this:

```
quarter    dime
25¢    10¢
```

Repeat with the nickel, and then the penny. Note that the nickel and penny say “5 cents” and “1 cent,” not nickel and penny. The final picture should look like this:

```
quarter    dime    nickel    penny
25¢    10¢    5¢    1¢
```

ACTIVITIES 1–3

1. Have students cut out the coins on BLM Coins on a Chart and glue them in the squares showing their value. Have them write the name of each coin. (see answers below)

```
<table>
<thead>
<tr>
<th></th>
<th>1¢</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5¢</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>1¢</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5¢</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10¢</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25¢</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
```

2. This game can be played individually or co-operatively in pairs. Each game will require the game board from BLM Money Game, a die, play coins, and a token or counter for each player. The goal is to fill the board with play coins. To begin, players place their tokens on any coin and place their play coins in the center of the board. Players take turns rolling a die and moving their token according to the number rolled in whichever direction they choose. Two players cannot be in the same square at the same time. When a token lands on any square that depicts a real coin, the player puts the matching play coin on top of the picture. If there is already a play coin in the square, the player can roll again. When a token lands on an incorrect coin (e.g., square nickel), the player can place any play coin of their choice in the square.
3. **Play I Have ____, Who Has ____?** (see unit introduction) in groups of four. In advance, make cards using **BLM Game Cards (1)**. For “I have,” write the name of a coin. For “Who has,” write the value of a coin in cents. Example:

```
I have a quarter.
Who has 10¢
```

**Counting nickels.** SAY: The value of a coin is how much it is worth. The value of a penny is 1¢. ASK: What is the value of a nickel? (5¢) How many pennies do you need to have 5¢? (5) SAY: 5 pennies are worth the same as 1 nickel. Sometimes we say 5 pennies “make” a nickel.

SAY: I have some nickels. Since a nickel is worth 5¢, I can count by 5s to find how much money I have. Affix to the board:

```
nickel nickel nickel nickel nickel
```

ASK: If we have four nickels, how do we find out how many cents we have? (count by 5s) Count by 5s as a class to get 20¢. As you count, write the value. The picture should look like this:

```
5¢ 10¢ 15¢ 20¢
```

For the following exercises, have students do part a) and then add extra nickels to create part b). If possible, distribute nine play nickels for students to use. Have students work in pairs, if necessary.

**Exercises:** Count by 5s.

a) nickel nickel nickel nickel nickel nickel

b) nickel nickel nickel nickel nickel nickel nickel nickel nickel

**Answers:** a) 5, 10, 15, 20, 25, 30¢; b) 5, 10, 15, 20, 25, 30, 35, 40, 45¢

**Counting dimes.** ASK: What is the value of a dime? (10¢) How many pennies make a dime? (10) How many nickels do you need to make a dime? (2)
Exercises: Count by 10s.

a) dime dime dime dime dime dime
   
   b) dime dime dime dime dime dime dime dime dime
   
   Answers: a) 10, 20, 30, 40, 50, 60¢; b) 10, 20, 30, 40, 50, 60, 70, 80, 90¢

Counting quarters. ASK: What is the value of a quarter? (25¢) How many pennies make a quarter? (25) How many nickels make a quarter? (5) Count by 5s on your fingers to show this. ASK: Can you make a quarter with dimes? (no)

Practice skip counting by 25s to 100. Then practice skip counting by 25s from 100 to 200.

Exercises: Count by 25s.

a) quarter quarter quarter

b) quarter quarter quarter quarter quarter

Answers: a) 25, 50, 75¢; b) 25, 50, 75, 100, 125¢

Comparing value. Affix to the board:

ASK: How much is the dime worth? (10¢) How much are all the nickels worth? (15¢) Do they have the same value? (no) Which is more? (the nickels)

Repeat with the following picture:

Exercises: Are the values the same? Write yes or no.

a) dime nickel nickel

b) nickel penny penny penny penny
c) quarter | nickel | nickel | nickel | nickel | nickel

**Answers:** a) yes, b) no, c) yes

**Extensions**

1. Use coins to make a snowman. A snowman is made of three big snowballs. Put the largest coin on the bottom and the smallest coin on top.
   a) Which coins did you use?
   b) What is the value of each snowball?
   c) Which snowball is worth the most?

   **Sample answers**
   a) dime, nickel, quarter
   b) 10¢, 5¢, and 25¢
   c) the bottom snowball

2. There is a 50¢ coin too, but they are not very common. How many of the coin do you need to make a 50¢ coin?
   a) pennies  b) nickels  c) dimes  d) quarters

   **Answers:** a) 50, b) 10, c) 5, d) 2

3. Write the total amount in cents.
   a) one 50¢ coin  b) two 50¢ coins
   c) three 50¢ coins  d) four 50¢ coins

   **Answers:** a) 50¢, b) 100¢, c) 150¢, d) 200¢

4. Ravi trades the set of coins for 50¢ coins worth the same amount. How many coins does he have now?
   a) 8 quarters  b) 15 dimes  c) 10 nickels  d) 100 pennies

   **Answers:** a) 4, b) 3, c) 1, d) 2
Goals
Students will count coins of different values by arranging them from greatest to least value.

PRIOR KNOWLEDGE REQUIRED
Can count by 25s, 10s, and 5s to 200
Knows the value of a penny, nickel, dime, and quarter

MATERIALS
cutouts from BLM Enlarged Coins (p. R-52) to affix to the board
play coins or cutouts from BLM Coins (p. R-51)

Counting money with two different kinds of coins. ASK: What do we count by to find the value of some nickels? (5s) What do we count by if we have some pennies? (1s) What do we do if we have both nickels and pennies? (count by 5s, then by 1s) Affix to the board:

5 10

ASK: What do we start counting by? (5s) Ask a volunteer to count by 5s for the nickels, as shown below:

5 10

ASK: What do we count by now? (1s) What do we start at? (10 or 11) SAY: We add the 1 to 10¢ that we already have to get 11. Write “11.” Have a volunteer continue counting. Write the total and the cent sign, as shown below:

5 10 11 12 13 14

Repeat with the following coins:
The final picture should look like this:

```
5c 10c 15c 16c 17c
```

SAY: When we do the exercises, we will draw the coins like this. Draw on the board:

```
5c 1c
```

SAY: They don’t look very much like a nickel or a penny, but you can tell what they are by the numbers in them. You can write the value and then put a circle around it, or draw a circle and then write the value inside—whichever you find easier.

For the exercises below, have students write the progression for the addition but do not have them copy the coins.

**Exercises:** Count the cents.

a) 5¢ 1¢ 1¢ 1¢ 1¢

b) 5¢ 5¢ 5¢ 5¢ 1¢ 1¢

**Answers:** a) 5, 6, 7, 8, 8; b) 5, 10, 15, 20, 21, 22, 22

ASK: What do we count by when we count dimes? (10s) Affix to the board:

```
dime dime dime nickel nickel
```

ASK: Where do we stop counting by 10? Have a volunteer draw a line on the board separating dimes from nickels, as shown below:

```
dime dime dime nickel nickel
```

Ask a volunteer to count the dimes, then another one to count the nickels. Write the total as shown below:

```
dime dime dime nickel nickel
```

10 20 30 35 40 40¢
Exercises: Count the money by coin value.

a) 
\[
\begin{array}{ccccccc}
10\text{¢} & 10\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} \\
\end{array}
\]

\begin{array}{|c|c|c|c|}
\hline
\text{quarter} & \text{quarter} & \text{quarter} & \text{dime} & \text{dime} \\
25 & 50 & 75 & 85 & 95 \\
\hline
\end{array}

\text{¢}

b) 
\[
\begin{array}{cccccc}
10\text{¢} & 10\text{¢} & 10\text{¢} & 1\text{¢} & 1\text{¢} & 1\text{¢} \\
\end{array}
\]

\begin{array}{|c|c|c|c|}
\hline
\text{quarter} & \text{quarter} & \text{nickel} & \text{nickel} \\
25 & 50 & 55 & 60 \\
\hline
\end{array}

\text{¢}

Answers: a) 10, 20, 30, 35, 40, 45, 55; b) 10, 20, 30, 40, 41, 42, 43, 43

ASK: What do we count by when we count quarters? (25s). Practice counting by 25s to 100. Then repeat the above for the following sets of coins. The final pictures should look like this:

\[
\begin{array}{ccccccc}
\text{quarter} & \text{quarter} & \text{quarter} & \text{dime} & \text{dime} & \text{dime} & \text{nickel} \\
25 & 50 & 75 & 85 & 95 & 95\text{¢} \\
\end{array}
\]

\[
\begin{array}{ccccccc}
\text{quarter} & \text{quarter} & \text{nickel} & \text{nickel} \\
25 & 50 & 55 & 60 & 60\text{¢} \\
\end{array}
\]

Exercises: Count the money by coin value.

a) 
\[
\begin{array}{cccc}
25\text{¢} & 10\text{¢} & 10\text{¢} & 10\text{¢} \\
\end{array}
\]

\begin{array}{|c|c|c|c|}
\hline
\text{quarter} & \text{quarter} & \text{dime} & \text{dime} & \text{dime} & \text{nickel} \\
25 & 50 & 60 & 70 & 80 & 85 \\
\hline
\end{array}

\text{¢}

b) 
\[
\begin{array}{cccc}
25\text{¢} & 25\text{¢} & 25\text{¢} & 1\text{¢} \\
\end{array}
\]

\begin{array}{|c|c|c|c|}
\hline
\text{quarter} & \text{quarter} & \text{dime} & \text{dime} & \text{dime} & \text{nickel} \\
25 & 50 & 60 & 70 & 80 & 85 \\
\hline
\end{array}

\text{¢}

Answers: a) 25, 35, 45, 55, 55; b) 25, 50, 75, 76, 77, 77

Counting money with many different kinds of coins. SAY: This time we will use three kinds of coins. Affix to the board:

\[
\begin{array}{ccccccc}
\text{quarter} & \text{quarter} & \text{dime} & \text{dime} & \text{dime} & \text{nickel} \\
25 & 50 & 60 & 70 & 80 & 85 \\
\end{array}
\]

Have volunteers draw a vertical line where the coins change. Have students find the total value in their notebook, then ask a volunteer to write the answer on the board. The picture should look like this:

\[
\begin{array}{ccccccc}
\text{quarter} & \text{quarter} & \text{dime} & \text{dime} & \text{dime} & \text{nickel} \\
25 & 50 & 60 & 70 & 80 & 85 \\
\end{array}
\]

\text{¢}
Repeat for the coins shown below. The final picture should look like this:

```
quarter | dime | dime | penny | penny | penny | 25 35 45 46 47 48 49 50 50¢
```

SAY: Now we will use all four kinds of coins. Affix to the board:

```
quarter (dime) (dime) nickel nickel nickel penny penny penny
```

Have students find the total value. Ask a volunteer to write the answer on the board, as shown below:

```
quarter (dime) (dime) nickel nickel nickel penny penny penny
```

25 35 45 50 55 60 61 62 63 63¢

**Arranging coins in order of value to count.**

SAY: In real life, people do not tape their coins to a board. Coins are usually kept mixed up in a pocket or change purse. One way to count money is to arrange it, starting with quarters, then nickels, then dimes, and then pennies.

Affix the coins, and draw a line on the board, as shown below:

```
quarter

penny
dime

```

ASK: Are there any quarters in this pile? (yes) Move the quarter to the line. SAY: I will start by counting quarters, so I put the quarters at the beginning of the line. The picture should look like this:

```
quarter

penny
dime

```

ASK: What do we count next? (dimes) Are there any dimes? (yes) Move it to the line, as shown below:

```
quarter
dime

penny

```
SAY: All we have left is a penny. Move it to the end of the line. Have
students add the coin values in their notebooks, then ask a volunteer to
write the answer on the board, as shown below:

quarter   dime   penny   36¢
25  35  36

Repeat with the following example, but this time have volunteers move
coins to the line:

quarter   nickel   nickel

The final picture should look like this:

quarter   nickel   nickel   35¢
25  30  35

**ACTIVITY**

Distribute a variety of play coins (less than a dollar) to each student.
Students sort and then count their coins. They record the sequence
in their notebooks. When they are done, have them trade coins with a
partner. When both are done, have them check their work.

**Bonus:** A pair that finishes early can count both piles of coins together.

**Exercises:** Draw the coins in order from largest to smallest value. Add to
find the total value.

a) 25¢ 10¢ 1¢

b) 1¢ 25¢ 5¢

**Bonus:** Lynn has 2 quarters, 3 nickels, and 2 pennies. How many cents
does she have?

**Answers:** a) 25, 35, 45, 46¢; b) 25, 50, 60, 65, 66¢; Bonus: 67¢
Extensions

1. Sal has coins in his pocket. He takes out all but one coin. What coin is left in his pocket?

<table>
<thead>
<tr>
<th>Coins in Pocket</th>
<th>Coins that Sal Takes Out</th>
<th>Coins Left in Pocket</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 55¢</td>
<td>25¢ 5¢ 10¢ 10¢</td>
<td></td>
</tr>
<tr>
<td>b) 65¢</td>
<td>25¢ 10¢ 5¢</td>
<td></td>
</tr>
<tr>
<td>c) 95¢</td>
<td>2 quarters, 3 nickels, 1 dime, 10 pennies</td>
<td></td>
</tr>
</tbody>
</table>

Answers: a) nickel, b) quarter, c) dime

NOTE: Distribute a large number of play coins to individual or pairs of students for Extension 2.

2. a) Sort your coins by type. Count how many coins you have of each type. Then find the value of each type of coin.

b) Which type of coin do you have the most of? Do these coins have the greatest value? If not, why not? If so, give an example where more coins have less value. Explain.

Selected sample answer: b) Fewer coins may be worth more because each coin is worth more. For example, 1 quarter is worth more than 10 pennies.

3. Amit has 8 pennies, 3 nickels, 4 dimes, and 1 quarter. Starting with the pennies, he trades groups of smaller value coins for coins of greater value. Example: He trades 2 nickels for 1 dime.

When he is done, how many of each type of coin does he have?

Bonus: How many coins did he have before trading any? How many coins does he have after trading? How many fewer coins will he have after trading?

Answers
3 pennies, 1 dime, and 3 quarters

Bonus: He starts with 16 coins. Now he has 7. Amit has \(16 - 7 = 9\) fewer coins after trading.
Goals
Students will group coins in 10s and 25s and then count the money.
Students will represent amounts in cents using appropriate coins.

PRIOR KNOWLEDGE REQUIRED
Can count by 5s, 10s, and 25s

MATERIALS
cutouts from BLM Enlarged Coins (p. R-52) to affix to the board
red and blue chalk or pens
red and blue colored pencils for each student
play coins or cutouts from BLM Coins (p. R-51): 32 pennies, 6 nickels, 3 dimes, and 1 quarter per student pair
BLM Counting Coins (p. R-55)

Grouping coins in 10s. Affix six nickels to the board. Have a volunteer arrange them in a line and find the total value by counting on. The picture should look like this:

5 10 15 20 25 30¢

ASK: Is it easier to count by 5s or by 10s? (10s) How many nickels make a dime? (2) SAY: If we group the nickels into groups of two instead of lining them up, we can count by 10s. Erase the numbers and rearrange the coins, as shown below:

Use blue chalk to circle the first two nickels and ASK: What is the value of these 2 coins? (10) Circle two more pairs using blue. SAY: Each group is worth 10¢. So we have 10, 20, 30¢. The final picture should look like this:

10 20 30¢
SAY: This is a good way to count coins if you have mostly dimes and nickels. Affix to the board:

\[
\begin{array}{ccccccc}
\text{dime} & \text{nickel} & \text{nickel} & \text{dime} & \text{dime} & \text{nickel} \\
\text{nickel} & \text{nickel} & \text{dime} & \text{dime} & \text{nickel} & \text{nickel} \\
\end{array}
\]

Have a volunteer circle groups of 10¢ using blue. Then have a second volunteer count the money. The picture should look like this:

\[
\begin{array}{ccccccc}
\text{dime} & \text{nickel} & \text{nickel} & \text{dime} & \text{dime} & \text{nickel} \\
\text{nickel} & \text{nickel} & \text{dime} & \text{dime} & \text{nickel} & \text{nickel} \\
10 & 20 & 30 & 40 & 50 & 55\text{¢} \\
\end{array}
\]

**Exercises:** Circle groups of 10¢ using blue. Count the money.

a)  
\[
\begin{array}{ccccccc}
5\text{¢} & 5\text{¢} & 10\text{¢} & 5\text{¢} & 10\text{¢} \\
5\text{¢} & 5\text{¢} & 10\text{¢} & 5\text{¢} & 10\text{¢} \\
\end{array}
\]

b)  
\[
\begin{array}{ccccccc}
10\text{¢} & 5\text{¢} & 10\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} \\
5\text{¢} & 5\text{¢} & 10\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} \\
\end{array}
\]

**Answers**

a)  
\[
\begin{array}{ccccccc}
5\text{¢} & 10\text{¢} & 10\text{¢} & 5\text{¢} & 5\text{¢} & 10\text{¢} \\
10 & 20 & 30 & 40 & 50\text{¢} \\
\end{array}
\]

b)  
\[
\begin{array}{ccccccc}
10\text{¢} & 5\text{¢} & 10\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} & 5\text{¢} \\
10 & 20 & 30 & 40 & 50 & 55\text{¢} \\
\end{array}
\]

**Grouping coins in 25s.** SAY: Another way to count money is to make groups of 25¢.
**Activity 1**

Distribute coins (5 nickels, 2 dimes, and 1 quarter) to student pairs. **SAY:** There are 4 different ways to make exactly 25¢ using nickels, dimes, and quarters. Find all 4 ways. Have students draw their answers. Make sure they understand that they will need to reuse the coins.

Have volunteers draw the possible combinations on the board and circle each combination using red. The final picture should look like this:

![Diagram of coin combinations]

**Exercises:** Circle groups of 25¢ using red. Count the money.

![Diagram of circle groups of 25¢]

**Answers**

![Diagram of answers]

Draw on the board:

![Diagram of board drawing]

**SAY:** This time, let’s do both. We will start by circling as many groups of 25¢ as we can. Then we will circle groups of 10¢. Starting from the left, have volunteers circle groups of 25¢ using red. The picture should look like this:

![Diagram of red circle groups]

**Exercises:** Circle groups of 25¢ using red. Count the money.
Then have volunteers circle groups of 10¢ using blue. The picture should look like this:

![Diagram showing groups of 10¢ circled with blue]

Finally, count the money as a class, then record the total, as shown below:

![Diagram showing the total of the money]

**ACTIVITY 2**

Distribute a variety of play coins (less than a dollar) to each pair of students. Students sort the money and make as many groups of 25¢ as possible. Then they make as many groups of 10¢ as possible with the remainder. Finally, they count the money.

Draw on the board:

![Diagram showing coins arranged for demonstration]

SAY: We will circle as many groups of 25¢ as we can. Let’s start on the left. Point to the dime and two nickels, and count 10, 15, 20. ASK: How much more do we need? (5) How can we make 5 near here? (use 5 pennies) Have a volunteer circle the first group of 25 using red, as shown below:

![Diagram showing the first group of 25¢ circled]

Continue until all groups of 25¢ are circled, prompting as needed. Then circle the groups of 10¢ using blue, as shown below:

![Diagram showing the final grouped money]
SAY: The groups are not lined up from greatest to least value, but we will count them in order anyway. ASK: How many groups of 25¢ do we have? (3) Count the 25s and record, as shown below:

| 1¢ | 1¢ | 1¢ | 1¢ | 1¢ | 1¢ |
| 5¢ | 5¢ |
| 10¢ |
| 25¢ |

25  50   75

ASK: How many groups of 10¢ do we have? (1) SAY: We add it next. Write “85” in the sequence. ASK: What do we have left? (1 penny) Point to the penny and SAY: 86. Then add this to the sequence, as shown below:

| 1¢ | 1¢ | 1¢ | 1¢ | 1¢ | 1¢ | 1¢ | 1¢ | 1¢ | 1¢ |
| 5¢ | 5¢ |
| 10¢ |
| 25¢ |

25  50   75  85  86¢

Have students complete **BLM Counting Coins**. (see answers below)

1. 

![Diagram](image1)

| 25 | 50 | 60 | 70 | 71 | 72¢ |

2. 

![Diagram](image2)

| 25 | 50 | 75 | 85 | 86 | 87¢ |

3. Bonus

![Diagram](image3)

| 25 | 50 | 75 | 100 | 110 | 115 | 116¢ |
Enough money? SAY: When you buy something at a store, you need to have enough money. If you have too much, that is okay. But if you have too little, that is a problem. Draw on the board:

![Coins image]

Point at the coins and SAY: This is how much money I have. ASK: How much money is it? (60¢) Can I buy the ball? (no)

Repeat with a few other examples. Have students signal thumbs up or down if they have enough money. Ensure that some purchases are possible.

Making an amount using the fewest coins. Write “21¢” on the board. SAY: I want to make exactly 21¢ using the fewest coins. ASK: Why might I want to do this? (it’s lighter to carry fewer coins) SAY: I will use fewer coins if I use coins that are worth as much as possible. ASK: Can I use any quarters to make 21¢? (no) Can I use dimes? (yes) What is the most dimes I can use? (2) Draw two dimes on the board. ASK: What is the value of two dimes? (20¢) Write “10, 20” below the dimes. ASK: How much more do I need? (1¢) Draw the extra penny, and write “21¢.” The final picture is shown in the margin.

Repeat with 28¢. (1 quarter and 3 pennies)

Exercises: Draw coins to make the amount using the fewest coins.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>13¢</td>
<td>b</td>
</tr>
</tbody>
</table>

Answers: a) 1 dime and 3 pennies; b) 1 dime, 1 nickel, and 1 penny; c) 1 quarter, 2 dimes, and 2 pennies

Making amounts with exact numbers of coins. Write “17¢” on the board.

One at a time, invite four volunteers to draw different combinations of nickels and pennies that add to 17¢: (17 pennies, 1 nickel and 12 pennies, 2 nickels and 7 pennies, 3 nickels and 2 pennies) Draw a table on the board and record the combinations, as shown below:

<table>
<thead>
<tr>
<th>Nickels</th>
<th>Pennies</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

SAY: This table shows all the combinations we came up with so far. Let’s add dimes. Add a column for dimes. SAY: We have not used any dimes yet. Fill in zeros in the dimes column. Add two blank rows to the table. ASK: What other combinations can we make using dimes? (1 dime and 7 pennies; 1 dime, 1 nickel, and 2 pennies) The completed table is show on the next page.
ASK: What’s the smallest number of coins we can use to make 17¢?
(4: 1 dime, 1 nickel, and 2 pennies) Can we make 17¢ using exactly 5 coins? (yes: 3 nickels, 2 pennies) SAY: If we exchange a dime for 2 nickels, we will use 1 more coin. ASK: Can we make 17¢ using exactly 6 coins? (no) 7 coins? (no) 8 coins? (yes: 1 dime, 7 pennies) Allow students time to think through each question.

Encourage students to work with play coins for the following exercises.

**Exercises**

1. Use a table to show all the ways to make 32¢ using quarters, dimes, nickels, and pennies.

<table>
<thead>
<tr>
<th>Dimes</th>
<th>Nickels</th>
<th>Pennies</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**2.** How can you make 32¢ using the given number of coins?

a) 4 coins b) 5 coins c) 6 coins **Bonus:** 15 coins
**Answers:** a) 1 quarter, 1 nickel, and 2 pennies; b) 3 dimes and 2 pennies; c) 2 dimes, 2 nickels, and 2 pennies; Bonus: 1 dime, 2 nickels, and 12 pennies

**Extensions**

1. Provide students with play coins of different values, and have them count the money.

   (MP3, MP6)  

2. Peter has 6 nickels and Jane has only quarters. Jane has more money than Peter.

   a) Nina says that Jane must have exactly 2 quarters. Do you agree with Nina? Explain. Use the symbols <, =, or > in your explanation.

   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

   **Sample answers:** a) I disagree with Nina. 
   
   \[5 + 5 + 5 + 5 + 5 + 5 = 30,\]
   
   so Peter has 30¢. If Jane has one quarter, she would have less money than Peter since 25 < 30. If Jane has 2 quarters, she would have more than Peter since 50 > 30. Jane has more money than Peter if she has exactly 2 quarters or more than 2 quarters, so Nina is incorrect.

   3. Kim has one of each coin. How much money does she have?

   **Answer:** 1 penny + 1 nickel + 1 dime + 1 quarter = 41¢

   4. a) How many pennies can you have before you can change pennies for a nickel?

   b) How many nickels can you have before you can change nickels for a dime?

   c) How many dimes can you have before its value is more than one quarter?

   **Answers:** a) 4; b) 1; c) 2

   (MP1)  

5. a) Find all the values less than 25¢ that you need at least 5 coins to make.

   b) Explain how you know you found all the possibilities in part a).

   **Answers:** a) 9¢, 14¢, 18¢, or 23¢; b) I went in order from 1¢ to 24¢ and found the smallest number of coins for each amount
**MD2-39 The Dollar**

**Goals**
Students will learn that a dollar has the value of 100 cents.
Students will determine if an amount is more or less than a dollar, and represent a dollar using coins.

**PRIOR KNOWLEDGE REQUIRED**
Can count by 5s, 10s, and 25s

**MATERIALS**
real or play dollar bill
cutouts from BLM Enlarged Coins (p. R-52)
play coins or cutouts from BLM Coins (p. R-51): 5 nickels, 5 dimes, and 3 quarters per student
BLM Making a Dollar (p. R-56)

**Counting coins beyond 100¢.** Write on the board:

\[
93¢
\]

ASK: If I have 93¢ and I get one more penny, how much will I have? (94¢)
Write “94¢.” ASK: What is one more? (95¢) Write “95¢” and draw seven blanks, as shown below:

\[
93¢ \ 94¢ \ 95¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢
\]

SAY: Let’s keep adding pennies. Have the class recite the rest of the numbers and then fill in the blanks, as shown below:

\[
93¢ \ 94¢ \ 95¢ \ 96¢ \ 97¢ \ 98¢ \ 99¢ \ 100¢ \ 101¢ \ 102¢
\]

SAY: Let’s practice adding nickels now. Write on the board:

\[
\]

ASK: What is 90 plus 5? (95) Write “95.” Have the class recite the rest of the numbers and then fill in the blanks, as shown below:

\[
90¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢ \ \_¢
\]

Repeat with dimes starting at 80¢ and then at 85¢. The final picture should look like this:

\[
80¢ \ 90¢ \ 100¢ \ 110¢ \ 120¢ \ 130¢
\]

\[
85¢ \ 95¢ \ 105¢ \ 115¢
\]
Exercises

1. Add 5s. 85¢ ¢ ¢ ¢ ¢ ¢ ¢
   
   Answers: 90, 95, 100, 105, 110, 115

2. Add 10s. 95¢ ¢ ¢ ¢
   
   Answers: 105, 115, 125

SAY: Let’s skip count by 25¢ now. Write “25¢” on the board. Count by 25s as a class from 25 to 200. When you are finished, have volunteers write the cents in a sequence on the board, as shown below:

   25¢ 50¢ 75¢ 100¢ 125¢ 150¢ 175¢ 200¢


Introduce the dollar. SAY: 100¢ is called a dollar. Hold up a real or play dollar bill. SAY: We call paper money bills. This is a 1 dollar bill. It is worth 100¢. ASK: How many quarters do you need to make 1 dollar? (4). SAY: Dimes are worth 10¢ and dollars are worth 100¢. ASK: How many dimes do you need to make 1 dollar? (10) How many pennies do you need to make 1 dollar? (100)

Draw three quarters on the board. ASK: Is this more or less than a dollar? (less) How much is this worth? (75¢) Write the amount below each coin, as shown below:

   25¢ 25¢ 25¢ 25¢ 50¢ 75¢

SAY: 75 is less than 100 so this is less than a dollar. Add three dimes to the picture on the board. ASK: How much is this worth now? (105¢) Have a volunteer count it out and write the sequence on the board. The final picture should look like this:

   25¢ 25¢ 25¢ 10¢ 10¢ 10¢ 10¢ 25¢ 50¢ 75¢ 85¢ 95¢ 105¢

ASK: Is this more or less than a dollar? (more)

Exercises: Add to find the value of the coins. Is the value more or less than a dollar? Write more or less.

   a) 25¢ 25¢ 10¢ 10¢ 5¢ 5¢
   
   Answers: a) 80¢, less

   b) 25¢ 25¢ 25¢ 10¢ 5¢ 5¢ 5¢ 5¢
   
   Answers: b) 105¢, more
**Making dollars with coins.** Affix the following coins, and draw a line on the board, as shown below:

![coin diagram](image)

SAY: This is the money I had in my pocket. The bus costs a dollar to ride. I want to pay exactly 1 dollar. I need to figure out which coins to use. ASK: How should I start? (with quarters) If the coins are affixed, move the quarters over one at a time, counting as you go until you reach 100¢. The final picture should look like this:

![final picture](image)

Affix the following coins, and draw a line on the board, as shown below:

![second coin diagram](image)

First move the three quarters over one at a time. Keep track of the total as you go. Then ASK: What should I use now? (dimes) Move over one dime and ASK: How much money do we have? (85¢) What should we use next? (a dime) Move over one more dime. ASK: How much money do we have now? (95¢) SAY: I wonder what I should move next. ASK: How much money will we have if we move one more dime? (105¢) Is that more or less than a dollar? (more) So what should we move instead? (a nickel) The final picture should look like this:

![third final picture](image)

Recount the ordered coins: 25, 50, 75, 85, 95, a dollar.
ACTIVITY

Distribute play coins or cutouts from BLM Coins (five nickels, five dimes, and three quarters) to students. Have students place 3 quarters in the middle of their desks and the rest to one side. ASK: How much money do you have in the middle of your desk? (75¢) SAY: Take some more money from the pile to make exactly 1 dollar. There are three different ways of doing it with the coins you have. Try to find them all. Give students time to work with the coins and then have volunteers draw the solutions on the board. (3 quarters, 2 dimes, and 1 nickel; 3 quarters, 1 dime, and 3 nickels; 3 quarters and 5 nickels)

Have students repeat the activity starting with 2 quarters. Tell students there are three different ways to make 1 dollar. (2 quarters and 5 dimes; 2 quarters, 4 dimes, and 2 nickels; 2 quarters, 3 dimes, and 4 nickels)

Have students repeat the activity starting with 1 quarter. Students will need all the dimes and nickels to make a dollar.

Have students complete BLM Making a Dollar. (see answers below)

Extensions

1. Add extra coins to make a dollar. Use as few coins as possible.
   a) Start with 3 quarters, 1 dime, and 2 pennies.
   b) Start with 3 quarters, 3 nickels, and 3 pennies.
   c) Start with 2 quarters, 6 pennies, and 1 dime.
   **Answers:** a) 3 pennies and 1 dime; b) 2 pennies and 1 nickel; c) 4 pennies, 1 nickel, and 1 quarter

2. How many dollars can you make with these coins?
   a) 4 quarters
   b) 8 quarters
   c) 20 quarters
   **Bonus:** 10 quarters
   **Answers:** a) 1, b) 2, c) 5, Bonus: 2 (and 2 quarters left over)
3. a) How many dollars can you make with the coins?
   i) 10 dimes  
   ii) 30 dimes  
   iii) 50 dimes  
   **Bonus:** 23 dimes

b) Write a rule to find the number of dollars you can make with dimes if the number of dimes you have is a 2-digit number.

**Answers:** a) i) 1, ii) 3, iii) 5, Bonus: 2 with 3 dimes left over; b) if the number of dimes you have is a 2-digit number, the tens digit tells you the number of dollars you have.

Redirecting students: If students struggle to come up with a rule, have them fill in the blank in this sentence:

If the number of dimes you have is a 2-digit number, the _______ tells you the number of dollars you have.

Encourage students to look for a pattern in their answers to part a) in order to complete the rule. (tens digit)
Goals

Students will use dollar notation to express amounts of money greater than 99¢.

PRIOR KNOWLEDGE REQUIRED

Can count by 5s, 10s, and 25s
Can use coins to make a dollar

MATERIALS

play dollar bills to affix to the board (optional)
BLM Dollar Notation (p. R-57)

Counting and writing dollars. ASK: How many cents make one dollar? (100) Write on the board:

100¢ = 1 dollar

SAY: You have learned the special sign for writing cents—the “¢” with a line through it. We have a sign for dollars too. It is called a dollar sign. It looks like an “S” with a line through it. Write “$” on the board, as shown below:

100¢ = 1 dollar = $

SAY: This is 1 dollar. Write “1” as shown below:

100¢ = 1 dollar = $1

SAY: The cent sign comes after the number but the dollar sign comes before the number.

Draw four dollar bills on the board:

$1 $1 $1 $1

SAY: Let’s count the money in cents and then in dollars. ASK: How many cents make 1 dollar? (100) What do we count by to find out how many cents these dollars are worth? (100s) SAY: Let’s count by hundreds. Point to each dollar in turn and have students count: 100, 200, 300, 400. When you are done, write the amounts in cents, as shown below:

$1 $1 $1 $1

100¢ 200¢ 300¢ 400¢
ASK: What is each bill worth in dollars? (1) So how do we count the money in dollars? (by 1s) Point to each bill in turn and SAY: 1 dollar, 2 dollars, 3 dollars, 4 dollars. Write the amounts in dollars, as shown below:

<table>
<thead>
<tr>
<th>100¢</th>
<th>200¢</th>
<th>300¢</th>
<th>400¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1</td>
<td>$2</td>
<td>$3</td>
<td>$4</td>
</tr>
</tbody>
</table>

**Exercises:** Write how much the money is worth in dollars and in cents.

a) 

| $1 | $1 | $1 |

b) 

| $1 | $1 | $1 | $1 | $1 | $1 | $1 |

**Answers:** a) $3, 300¢; b) $7, 700¢

**Making more than 100 cents using dollars, dimes, and pennies.**

Write “156” on the board. ASK: How would we make this using base ten blocks? (1 hundred, 5 tens, and 6 ones) Draw the blocks. Pointing to the hundred, ASK: In blocks, this is worth 100. What is worth 100 in money? (1 dollar) Draw a dollar bill below the hundred. Pointing to the tens, ASK: In blocks, each of these is worth 10. What is worth 10 in money? (a dime) Draw 5 dimes below the tens blocks. Pointing to the ones, SAY: In blocks, each of these is worth 1. ASK: What is worth 1 in money? (a penny) Draw the pennies on the board, as shown below:

```
156

$1

10¢ 10¢ 10¢ 1¢ 1¢ 1¢

10¢ 10¢ 1¢ 1¢ 1¢
```

Count the money together and write “156¢” beside the money.

Repeat with 234. The final picture should look like this:

```
234

$1 $1

10¢ 10¢ 1¢ 1¢

10¢ 10¢ 1¢ 1¢
```

**Exercises:** Draw the number in blocks. Draw the amount in dollars, dimes, and pennies. Write the amount in cents.

a) 142  

b) 423
Answers

a) $1 10¢ 10¢ 10¢ 10¢ 1¢ 1¢ 142¢

b) $1 $1 $1 $1 10¢ 10¢ 1¢ 1¢ 1¢ 1¢ 423¢

Writing more than 100 cents using dollar notation. Write on the board:

153¢

ASK: How would you make 153¢ using dollars, dimes, and pennies? (1 dollar, 5 dimes, and 3 pennies) Draw the coins. ASK: Is this more or less than 1 dollar? (more) Is it more or less than 2 dollars? (less) SAY: We can write values that are between dollars using dollar signs too. We write the dollar sign first. Write it on the board. SAY: Next we write how many dollars we have. This time it’s 1 dollar. Point to the dollar and write “1.” SAY: Next we put a point—a small dot. Draw the point. SAY: Then we write how many dimes we have. ASK: How many dimes do we have? (5) Write “5.” SAY: Then we write the pennies. Write “3.” The picture should look like this:

$1 10¢ 10¢ 10¢ 10¢ 1¢ 1¢ 1¢ 1¢

$1.53

SAY: When we write money using the cent sign (indicate 153¢), it is called cent notation. When we write money using the dollar sign (indicate $1.53), it is called dollar notation.

Repeat for 321¢ with volunteers.

Repeat for 205¢ with volunteers. Point out that they need to write a zero where the dimes go.

Distribute BLM Dollar Notation and have students complete the table. (see answers below)

<table>
<thead>
<tr>
<th>Cent Notation</th>
<th>Dollars</th>
<th>Dimes</th>
<th>Pennies</th>
<th>Dollar Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>173¢</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>$1.73</td>
</tr>
<tr>
<td>128¢</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>$1.28</td>
</tr>
<tr>
<td>296¢</td>
<td>2</td>
<td>9</td>
<td>6</td>
<td>$2.96</td>
</tr>
<tr>
<td>895¢</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>$8.95</td>
</tr>
<tr>
<td>746¢</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>$7.46</td>
</tr>
<tr>
<td>410¢</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>$4.10</td>
</tr>
<tr>
<td>508¢</td>
<td>5</td>
<td>0</td>
<td>8</td>
<td>$5.08</td>
</tr>
<tr>
<td>900¢</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>$9.00</td>
</tr>
</tbody>
</table>
Write “$3.25” on the board. ASK: How would you write this in cents? (325¢)

Writing dollars and cents in dollar notation. Draw on the board:

\[
\begin{array}{cccc}
$1 & 25¢ & 1¢ & 1¢ \\
\end{array}
\]

ASK: How much is the bill worth? (1 dollar) How much are the coins worth? (27¢) Write “1 dollar” below the bill and “27¢” below the coins. SAY: When the coins make less than 1 dollar, we can write the value in dollar notation easily. First you write the dollars. Write “1.” SAY: Next you write the point. Draw the point. SAY: Then you write the cents. Write “27.” SAY: Don’t forget to write the dollar sign. Write “$.” The picture should look like this:

\[
\begin{array}{cccc}
$1 & 25¢ & 1¢ & 1¢ \\
\end{array}
\]

1 dollar 27¢ $1.27

Repeat with 2 dollars and 30¢, but prompt for the final answer. ($2.30)
Repeat with 4 dollars and 2¢. Before asking for the final answer, remind students that there are always two numbers after the point. ($4.02)

Exercises: Write the value of the dollars. Write the value of the coins. Write the total value in dollar notation.

a) $1 $1 $1 25¢ 5¢
b) $1 $1 10¢ 1¢

Bonus: $1 5¢

Answers: a) 3 dollars, 30¢, $3.30; b) 2 dollars, 11¢, $2.11; Bonus: 1 dollar, 5¢, $1.05

SAY: Using dollar notation, we can write 1 dollar two ways. Write on the board:

1 dollar = $1 = $1.00

SAY: These are both correct, but we usually write it the second way.

Writing coins in dollar notation. Draw on the board:

\[
\begin{array}{cccccccc}
25¢ & 25¢ & 25¢ & 10¢ & 10¢ & 10¢ \\
\end{array}
\]

ASK: Are these coins worth more or less than a dollar? (more) Can we make a dollar in coins? (yes) How? (with 4 quarters) Draw a line below the quarters and write “$1” below it. ASK: How many cents do we have left? (20) Write “20¢” below the dimes. ASK: How do we write the total amount in dollar notation? ($1.20) Write “$1.20” on the board. The final picture is shown on the next page.
Repeat with 4 quarters, a nickel, and a penny. ($1.06)

**Exercises:** Write the value of the coins in dollar notation.

a) \[25¢\] \[25¢\] \[25¢\] \[25¢\] \[10¢\] \[5¢\] \[1¢\]  

b) \[25¢\] \[25¢\] \[25¢\] \[25¢\] \[25¢\] \[5¢\] \[1¢\]  

c) \[25¢\] \[25¢\] \[25¢\] \[25¢\] \[5¢\] \[1¢\] \[1¢\]  

**Answers:** a) $1.16, b) $1.31, c) $1.07

SAY: We can't always make exactly a dollar with our coins even when they make more than a dollar. Draw on the board:

\[25¢\] \[25¢\] \[25¢\] \[10¢\] \[10¢\] \[10¢\] \[10¢\]  

ASK: Can we make exactly 1 dollar with these coins? (no) Give students time to answer the question. ASK: How much are the coins worth in cents? (115¢) Is this worth more or less than a dollar? (more) Can we write the amount in dollar notation? (yes: $1.15)

**Exercises**

1. Count the coins. Write the total amount in dollar notation.

   a) \[25¢\] \[25¢\] \[25¢\] \[10¢\] \[10¢\] \[10¢\] \[1¢\]  

   **Answers:** a) $1.06, b) $1.17

2. Write the total amount in dollar notation.

   a) John has 3 quarters and 5 dimes.  
   b) Emma has 2 quarters, 6 dimes, and 3 nickels.  

   **Answers:** a) $1.25, b) $1.25
Extensions

1. Circle groups of 25¢. Add the coins. Then draw extra coins to make 1 dollar.

![Diagram showing circles of 25¢, 10¢, 5¢, and 1¢.]

Answer

![Diagram with 10¢, 25¢, 10¢, 5¢, and 1¢ circles.]

\[= 72¢\]

2. Write the amount in dollar notation. Example: 1098¢ = $10.98.

a) 1256¢  
b) 2437¢  
c) 5694¢  

Bonus: 12345¢

Answers: a) $12.56, b) $24.37, c) $56.94, Bonus: $123.45

3. Draw bills and coins to make the amount. Use as few bills and coins as possible.

a) $1.67  
b) $2.43  
c) $5.50

Answers

a) $1 25¢  
b) $1 25¢ 10¢  
c) $1 25¢ 25¢

(MP2, MP5)

4. Use any tools, such as a clock, coins, or base ten blocks, to answer the question quickly. Explain how you solved the problem.

a) If you skip count by 5s twelve times, the answer is __________.

b) If you skip count by 10s ten times, the answer is __________.

c) If you skip count by 25s four times, the answer is __________.

Answers: a) I used a clock because to count by 5 minutes twelve times, you count using the twelve numbers on the clock. When the minute hand goes all the way around the clock, that makes 60 minutes. So if I skip count by 5s twelve times, the answer is 60. 
b) I used base ten blocks. There are 10 tens blocks in a hundreds block, so if I skip count by 10s ten times the answer is 100. 
c) I used coins. A quarter is worth 25 cents and you need four quarters to make 100 cents. So if I skip count by 25s four times, the answer is 100.
Goals
Students will add money using the strategies they used to add any other numbers (counting on and place value).

PRIOR KNOWLEDGE REQUIRED
Can count to find the value of coins
Can add two-digit numbers with regrouping by using place value

MATERIALS
- cutouts from BLM Enlarged Coins (p. R-52, optional)
- play coins or cutouts from BLM Coins (p. R-51)
- BLM Making Change (p. R-58)

NOTE: In this lesson, you can either draw simplified coins on the board as shown, or affix play coins or cutouts from BLM Enlarged Coins.

Introduce adding money. SAY: Just like how we add other numbers, we can use two common ways to add money. We can skip count, and we can use the standard algorithm to write an addition. Since we can hold money in our hands, skip counting is sometimes easier.

Adding money by skip counting. SAY: Suppose I have 21¢ in my bag and I find some more change. Draw on the board:

```
21¢ 10¢ 10¢ 10¢ 1¢ 1¢
```

SAY: I want to find how much money I have by counting on. ASK: What would I add to find the total value of the money? (21) Write “21¢” under the bag. Point to the dime and ASK: What do I start counting by? (10) What is 21 and 10? (31) Prompt for each number. When you finish counting the dimes, ASK: What am I counting by now? (1) Complete the counting on sequence, as shown below:

```
21¢ 10¢ 10¢ 10¢ 1¢ 1¢
21 31 41 51 52 53¢
```

Repeat for a bag with 33¢ and the change shown below. The final picture should look like this:

```
33¢ 10¢ 10¢ 5¢ 5¢ 5¢
33 43 53 58 63 68¢
```
Exercises: Add the money.

a) 54¢ 5¢ 5¢ 5¢ 1¢ 1¢ 1¢

b) 17¢ 10¢ 10¢ 5¢ 5¢ 5¢ 1¢

Answers: a) 54, 59, 64, 69, 70, 71, 72; b) 17, 27, 37, 42, 47, 52, 53

Adding quarters. SAY: This time we will use quarters too. ASK: What do we count by for quarters? (25s) Draw on the board:

25¢ 25¢ 25¢ 10¢ 1¢ 1¢

ASK: What do we start counting by? (quarters) Have volunteers add to find the value. The picture should look like this:

25 50 75 85 86 87¢

Repeat for a bag with 50¢ and the change shown below. The final picture should look like this:

50¢ 25¢ 5¢ 5¢ 1¢

50 75 80 85 86¢

Exercises: Add the money.

a) 25¢ 25¢ 10¢ 10¢ 5¢ 5¢ 1¢

b) 50¢ 25¢ 10¢ 5¢ 5¢ 1¢ 1¢ 1¢

Bonus

75¢ 25¢ 25¢ 5¢ 1¢ 1¢

Answers: a) 25, 50, 60, 70, 75, 80, 81; b) 50, 75, 85, 90, 95, 96, 97, 98; Bonus: 75, 100, 125, 130, 131, 132
Adding a pile of money. ASK: When we count money, do we start with nickels, dimes, quarters, or pennies? (quarters) In what order do we count the rest? (dimes, nickels, pennies) Draw on the board:

```
19¢ 10¢ 10¢ 1¢ 1¢ 10¢
```

SAY: Some of these coins are out of order. Let’s rearrange the coins so that we can count the money. Have a volunteer put the dimes first. Have a second volunteer count the money. (19, 29, 39, 49, 50, 51¢)

Repeat with dimes and nickels and three coins out of order. Repeat with dimes, nickels, and pennies in random order.

**Exercises:** Draw the coins in order. Add to find the value.

a) 

```
25¢ 10¢ 25¢ 1¢ 5¢ 10¢
```

b) 

```
27¢ 5¢ 10¢ 1¢ 5¢ 5¢
```

**Answers:** a) 25, 50, 60, 70, 76; b) 27, 37, 42, 47, 52, 53

Draw on the board:

```
43¢ 10¢ 1¢ 10¢
```

SAY: These coins are all mixed up. Let’s put them in order so that we can count them. Ask a volunteer to line up the coins. Have a second volunteer do the addition, as shown below:

```
43¢ 10¢ 10¢ 5¢ 1¢ 1¢
```

43 53 63 68 69 70¢

When your students have a good understanding of the concept, repeat with another example and have students add as they arrange the coins.

**ACTIVITY**

In advance, cut out the bags on BLM Making Change and give one to each student. Students draw (without looking) four or five coins from a bag of play coins containing dimes, nickels, and pennies. They add to find how much money they have altogether.
Adding money using place value. SAY: We can add money the same way we add other numbers. Draw on the board:

\[
\begin{array}{c}
37\text{¢} \\
+ 21\text{¢} \\
58\text{¢}
\end{array}
\]

SAY: We start with 37¢ in the bag. Write “37” beside the picture. ASK: How much money do we have in coins? (21¢) Write “+ 21,” and have a volunteer add. Include the ¢ sign, as shown in the margin.

SAY: Now let’s find the total by adding the coins one at a time. Start at 37, pointing to each dime and then the penny. (37, 47, 57, 58) ASK: Did we get the same answer? (yes)

**Exercises:** Count the coins. Add the value of the coins to the value of the bag. Check your answer by adding the coins one at a time.

a) \[
\begin{array}{c}
42\text{¢} \\
1\text{¢} \\
10\text{¢} \\
10\text{¢}
\end{array}
\]

b) \[
\begin{array}{c}
37\text{¢} \\
1\text{¢} \\
25\text{¢} \\
10\text{¢}
\end{array}
\]

c) \[
\begin{array}{c}
23\text{¢} \\
1\text{¢} \\
5\text{¢} \\
10\text{¢}
\end{array}
\]

**Bonus:** \[
\begin{array}{c}
69\text{¢} \\
25\text{¢} \\
25\text{¢} \\
10\text{¢} \\
10\text{¢}
\end{array}
\]

Answers: a) 42 + 21 = 63¢, b) 37 + 36 = 73¢, c) 23 + 16 = 39¢,
Bonus: 69 + 45 = 114¢

**Extensions**

1. Amir finds 27¢ in his backpack, 2 dimes and 4 pennies in his pocket, and 41¢ under his bed. He buys two limes that cost 33¢ each. How much money does he have now? Show your work and explain what each step means in the story problem.

   **Answer:** 2 dimes and 4 pennies make 20 + 4 = 24¢. Amir has 27 + 24 + 41 = 92¢. Each lime costs 33¢, so Amir pays 33 + 33 = 66¢ for the limes. 92 − 66 = 26, so Amir has 26¢ now.

2. A guppy costs 17¢, a goldfish costs 23¢, and a tetra costs 29¢.

   a) Amy has 42¢. Which 2 fish can she buy?
   b) Billy has 57¢. Which 2 fish can he buy?
   c) How much money do you need to buy one of each fish?

   **Answers:** a) 1 guppy and 1 goldfish or 2 guppies, b) any two fish (except 2 tetras), c) 69¢

3. Sharon got $1.26 for her first tooth. She got $1.35 for her second tooth. How much did she get altogether?

   **Answer:** $2.61
MD2-42  Subtracting Money
Pages 171–172

STANDARDS
2.OA.A.1, 2.MD.C.8,
2.NBT.A.2, 2.NBT.B.5

VOCABULARY
cent
cent sign (¢)
change
dime
dollar
multiple of 10
nickel
penny
quarter

Goals
Students will subtract to find the change using strategies they used to subtract any other numbers (counting on, place value, and adding distances).

PRIOR KNOWLEDGE REQUIRED
Can add to find the value of coins
Can subtract two-digit numbers using skip counting and place value

MATERIALS
cutouts from BLM Enlarged Coins (p. R-52, optional)

NOTE: Students are not required to do unit conversions (i.e., converting from dollars to cents and vice versa).

Introduce making change. SAY: What if you have a dime to spend and you want to buy a sticker that costs 4¢. Draw on the board a sticker with a 4¢ label. ASK: Should you give your whole dime? Would that be fair? (no) How can you spend 4¢ if you only have a dime? (get money back from the cashier) SAY: The money that you get back when you give too much money is called change. ASK: How much change would you get back if you bought the sticker using your dime? (6¢) Choose a few more items with prices under 10¢, and ASK: How much change will you get back? How do you find the answer? (subtraction)

Making change by counting on. SAY: Suppose you have a quarter to spend. Draw a quarter on the board and an item that costs 19¢. ASK: What subtraction will help find how much change I should get? (25 − 19) Write the subtraction on the board. Have a volunteer count on to subtract. (6¢)
The final picture should look like this:

\[
\begin{align*}
19¢ & \quad 25¢ \\
\text{25} - \text{19} & = 6¢
\end{align*}
\]

Repeat for an item that costs 3¢. (25 − 3 = 22¢)

Draw a quarter and a dime on the board. SAY: Suppose we have a quarter and a dime, which makes 35¢. Do two more examples for prices of 31¢ and 27¢. (35 – 31 = 4¢ and 35 – 27 = 8¢)
Exercises: How much change will you get back? Count on to find the answer.

a) \[\text{22¢} - \text{25¢} = \text{3¢}\]

b) \[\text{43¢} - \text{25¢} = \text{7¢}\]

c) \[\text{65¢} - \text{25¢} - \text{25¢} - \text{10¢} - \text{10¢} = \text{5¢}\]

Bonus: \[\text{96¢} - \text{100¢} = \text{4¢}\]

Making change by subtracting using place value. SAY: We can also find how much change we get by subtracting the same way we do for other numbers. Draw on the board:

\[
\begin{array}{ccc}
\text{32¢} & \text{25¢} & \text{25¢} \\
\hline
\text{4} & \text{10} & \text{c} \\
\text{3} & \text{2} & \text{c} \\
\hline
\text{1} & \text{8} & \text{c}
\end{array}
\]

We will get back 18¢.

Repeat with three quarters and a 59¢ ball. The final picture should look like this:

\[
\begin{array}{ccc}
\text{59¢} & \text{25¢} & \text{25¢} \\
\hline
\text{6} & \text{15} & \text{c} \\
\text{5} & \text{9} & \text{c} \\
\hline
\text{1} & \text{6} & \text{c}
\end{array}
\]

We will get back 16¢.

Exercises: Micky pays for a fish. Subtract to find her change. Write the answer as a sentence.

a) \[\text{17¢} - \text{10¢} - \text{10¢} = \text{7¢}\]

b) \[\text{61¢} - \text{25¢} - \text{25¢} - \text{25¢} = \text{6¢}\]
c) 79¢
25¢
25¢
25¢
10¢

Bonus:
62¢
$1

Answers: a) She will get back 3¢. b) She will get back 14¢. c) She will get back 16¢. Bonus: She will get back 38¢.

Counting on past 10 to make change. SAY: We already used counting on to make change. Now we will do a different kind of counting on using distances to make change. Suppose that Zack buys a sticker that costs 37¢ and he has 2 quarters. Draw on the board:

Draw a distance picture as shown below. SAY: We start at 37¢. That goes on the left end. ASK: What are we subtracting from? (50¢) Where do we write 50? (on the right end) SAY: We count on to the nearest multiple of 10. ASK: What multiple of 10 comes after 37¢? (40¢) Write “40¢.” Have volunteers find the distances. Then add the distances and write the statement. The final picture should look like this:

Repeat with a 54¢ item and a dollar bill. Remind students that $1 = 100¢.
The final picture should look like this:

Exercises: Yu buys a sticker. Find her change by counting on. Write the answer as a sentence.
a) 38¢
25¢
b) 87¢

Bonus:
56¢
25¢
25¢

Answers: a) She will get back 12¢. b) She will get back 13¢. Bonus: She will get back 19¢.
Extensions

NOTE: The following extensions build toward making change using pennies, dimes, and quarters. Extensions 1 to 4 should be done in order. Extension 5 can be done either before or after. Extension 6 should be assigned only after Extensions 4 and 5 are completed.

1. Since we use 25¢ coins, it is helpful to know the multiple of 25 that comes after. Write the multiples of 25 from 0 to 100.

   **Answer:** 0, 25, 50, 75, 100

2. Write the multiple of 25 that comes after. Use your list of multiples to help.

   a) 17   b) 26   c) 37   d) 52   e) 62
   f) 73   g) 79   h) 81   i) 95

   **Answers:** a) 25, b) 50, c) 50, d) 75, e) 75, f) 75, g) 100, h) 100, i) 100

3. For the numbers in Extension 2, find the multiple of 25 that comes before.

   **Answers:** a) 0, b) 25, c) 25, d) 50, e) 50, f) 50, g) 75, h) 75, i) 75

4. Subtract from the next multiple of 25.

   a) 17   b) 9    c) 22   d) 26
   e) 41   f) 52   g) 64   h) 71
   i) 77   j) 86   k) 92

   **Answers:** a) 8, b) 16, c) 3, d) 24, e) 9, f) 23, g) 11, h) 4, i) 23, j) 14, k) 8

5. Show how to make the answers to Extension 4 parts a), b), and f) in pennies, nickels, and dimes.

   **Answers:** a) 1 nickel and 3 pennies; b) 1 dime, 1 nickel, and 1 penny; f) 2 dimes and 3 pennies

6. How many more quarters do you need to make a dollar?

   a) 3 quarters   b) 2 quarters   c) 1 quarter   d) 0 quarters

   **Answers:** a) 1, b) 2, c) 3, d) 4
NOTE: Extension 7 is very challenging.

7. Make change from 1 dollar by counting on to the nearest multiple of 25, then counting quarters to 100. Example: 57¢

\[
\begin{array}{c|c|c|c}
\text{57¢} & \text{75¢} & \text{100¢} \\
\hline
\text{18¢} & \text{1 quarter} \\
\end{array}
\]

Change: 3 pennies, 1 nickel, 1 dime, 1 quarter

a) 47¢ 50¢ 100¢

b) 17¢ 25¢ 100¢

c) 69¢ 75¢ 100¢

Answers: a) 3 pennies, 2 quarters; b) 3 pennies, 1 nickel, 3 quarters; c) 1 penny, 1 nickel, 1 quarter
GOALS
Students will solve word problems involving money.

PRIOR KNOWLEDGE REQUIRED
Can add and subtract money amounts using place value

MATERIALS
- cutouts from BLM Enlarged Coins (p. R-52, optional)
- play coins or cutouts from BLM Coins (p. R-51): 3 pennies, 1 nickel, 2 dimes, and 2 quarters per student

Money word problems with addition. Write on the board:

Rani has 25¢.
She found 1 dime and 2 pennies.
Now Rani has ___¢.

Read the whole story aloud. ASK: Is the 25¢ a part of Rani's money or all of it? (a part) How do we know? (because she finds more later) Where do we write 25¢ in the part-whole picture? (on the bottom) Write “25¢” in the part-whole picture.

Read the second line aloud. ASK: Is this a part of her money or the total? (a part) Draw the coins in the bottom, as shown below:

Rani has 25¢
She found 1 dime and 2 pennies.
Now Rani has ___¢.

ASK: How much money is 1 dime and 2 pennies? (12¢) How do we find how much Rani has now? (add) Have volunteers write the addition and then add, as shown below:

\[
\begin{align*}
25¢ + 12¢ &= 37¢ \\
\end{align*}
\]

Give each student 2 quarters, 2 dimes, 1 nickel, and 3 pennies. Have them draw a large part-whole picture in their notebook. Write the story that follows on the board, read it aloud, and have students work at their desk to solve it. Once they are done, have a volunteer write the solution. The final picture is shown on the next page.
Raj has 2 quarters.
Anna has 2 dimes, 1 nickel, and 3 pennies
They have _78¢_ together.

\[
\begin{align*}
50¢ \\
+ 28¢ \\
\hline
78¢
\end{align*}
\]

**Money word problems with subtraction.** Write on the board:

Rani has 75¢.
She buys an apple for 53¢.
Now Rani has ___¢.

Read the whole story aloud. ASK: Is the 75¢ a part of Rani’s money or all of it? (all of it) How do we know? (because she spends some later) Where do we write 75¢ in the part-whole picture? (on the top) Write “75¢” in the part-whole picture. Read the second line aloud. ASK: Is this a part of her money or the total? (a part) Write “53¢” in the bottom, as shown below:

\[
\begin{align*}
75¢ \\
53¢ \\
\hline
22¢
\end{align*}
\]

ASK: How do we find how much she has now? (subtract) Have volunteers write the subtraction, and then subtract, as shown below:

\[
\begin{align*}
75¢ \\
- 53¢ \\
\hline
22¢
\end{align*}
\]

Write the following story on the board, read it aloud, and have students work at their desks to solve it. They can use numbers or coins. Once they are done, have a volunteer write the solution. The final picture should look like this:

Tony has 65¢.
He gives his sister 1 dime.
Tony has ___¢ left.

\[
\begin{align*}
65¢ \\
10¢ \\
\hline
55¢
\end{align*}
\]

Have students complete **Questions 1–4** on AP Book 2.2 p. 173.
Comparing money to 1 dollar. Write on the board:

Sally has these coins.

ASK: Do you think Sally has more or less than 1 dollar? (answers may vary) What can we do to find out? (count the money) Ask students how many there are of each type of coin and have them take those out. (2 quarters, 3 dimes, and 2 nickels) Have students count the money. (90¢) Write “90¢” on the board below the coins. ASK: Does Sally have more or less than 1 dollar? (less) How much less? (10¢) What did you do to find the answer? (subtract)

Repeat with the picture below:

Ted has these coins.

(3 quarters, 3 dimes, 3 nickels, and 2 pennies, totaling $1.22 or 22¢ more than a dollar)

Write on the board:

Anna has 2 quarters, 3 pennies, 3 nickels, and 2 dimes. She wants to buy stickers that cost 75¢. Does she have enough money?

Read the problem aloud. ASK: What do we need to know to answer the question? (how much money Anna has) Have students find how much money she has. (88¢) Write “Anna has 88¢.” on the board. ASK: Does she have enough money to buy the stickers? (yes) Write “Yes, she has enough money.”, as shown below:

Anna has 2 quarters, 3 pennies, 3 nickels, and 2 dimes. She wants to buy stickers that cost 75¢. Does she have enough money?

Anna has 88¢. Yes, she has enough money.

ASK: How much change will Anna get back? Write the question on the board. Have students find the answer individually. Then share the solution as a class. (13¢)

Repeat with the following problem:

Jayden has 8 pennies and 3 nickels.
Clara has 2 dimes and a quarter.
Who has more? How much more?

ASK: To answer the questions, what do we need to do? (find out how much each person has) Have students find how much each person has. (Jayden has 23¢, Clara has 45¢) Write the amount beside the respective sentence.
ASK: Who has more? (Clara) How do we find how much more money Clara has? (subtract) Have students find the answer before taking it up as a class. The answer should look like this:

- Jayden has 8 pennies and 3 nickels. 23¢
- Clara has 2 dimes and a quarter. 45¢

Who has more? How much more? Clara has 22¢ more than Jayden.

Have students complete Questions 5–10 on AP Book 2.2 p. 174.

Extensions

1. Jake has 17¢ and Sara has some money, too. Together they have 31¢. At 4 o’clock, Sara finds three quarters.
   a) How much money does Sara have now? Show your work and explain what each step means in the story problem.
   b) Which piece of information did you not need to use?

   **Answers**
   a) Jake and Sara have 31¢ altogether, so Sara has 31 – 17 = 14¢ before she finds the quarters. 25 + 25 + 25 = 75¢, so Sara has 75 + 14 = 89¢ now.
   b) I did not need to use the fact that Sara finds the three quarters at 4 o’clock.

2. Jake has a dollar. He buys stickers that cost 59¢. Then he gets 35¢ for his allowance. How much money does Jake have now?
   **Answer:** 100¢ – 59¢ = 41¢, 41¢ + 35¢ = 76¢. Jake has 76¢ now.

3. Sara has 2 quarters and some dimes. She has 6 coins altogether. How much money does Sara have?
   **Answer:** 6 – 2 = 4. 2 quarters and 4 dimes = 50¢ + 40¢ = 90¢. Sara has 90¢.
Coins

- United States of America
- One Cent
- Five Cents
- One Dime
- United States of America
- Quarter Dollar

[Images of United States coins: one cent, five cents, one dime, quarter dollar]
Enlarged Coins

- **United States of America**: ONE CENT
- **United States of America**: FIVE CENTS
- **United States of America**: ONE DIME
- **United States of America**: QUARTER DOLLAR
## Coins on a Chart

Cut out the coins. Glue them to the chart where they belong.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
</tr>
</tbody>
</table>
Money Game
Counting Coins

☐ Circle all groups of 25¢ using red.
☐ Circle all groups of 10¢ using blue.
☐ Count the money.

1.

25¢

10¢

5¢

2. 

25¢

10¢

5¢

3. BONUS

10¢

1¢

5¢
Making a Dollar

☐ Shade coins to make a dollar.

1.

25¢  10¢  25¢  5¢

5¢  5¢  5¢  25¢

2.

25¢  10¢  10¢  5¢

10¢  10¢  10¢  25¢

3.

5¢  25¢  10¢  10¢  5¢

5¢  5¢  10¢  25¢  5¢

4.

5¢  10¢  10¢  5¢

5¢  5¢  10¢  25¢  5¢
## Dollar Notation

□ Complete the table.

<table>
<thead>
<tr>
<th>Cent Notation</th>
<th>Dollars</th>
<th>Dimes</th>
<th>Pennies</th>
<th>Dollar Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>173¢</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>$1.73</td>
</tr>
<tr>
<td>128¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>296¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>895¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>746¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>410¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>508¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cent Notation</th>
<th>Dollars</th>
<th>Dimes</th>
<th>Pennies</th>
<th>Dollar Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>173¢</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>$1.73</td>
</tr>
<tr>
<td>128¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>296¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>895¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>746¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>410¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>508¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Making Change

23¢  47¢  48¢  49¢  13¢

14¢  15¢  16¢  17¢  18¢

19¢  21¢  22¢  24¢  26¢

27¢  28¢  29¢  31¢  32¢

33¢  34¢  44¢  36¢  37¢

38¢  39¢  41¢  42¢  43¢
Unit 8  Geometry: Shapes

This Unit in Context

In Kindergarten, students learned how to distinguish basic shapes (circles, squares, triangles, and rectangles) regardless of their orientation or size (K.G.A.2), and focused on attributes such as identifying and quantifying sides and corners (K.G.B.4). In Grade 1, students learned to distinguish between defining attributes and non-defining attributes of shapes and built and drew shapes (circles, squares, triangles, and rectangles) based on defining attributes (1.G.A.1). In this unit, students will extend this work to include quadrilaterals, pentagons, hexagons, and cubes (2.G.A.1). They will use their understanding of measuring lengths in centimeters from 2.1 Unit 7 to measure side lengths of different shapes to check for equality.

In Grade 3, students will learn that shapes in different categories may share some attributes (for example, rectangles and rhombuses both have four sides) and that the shared attribute can define a larger category (for example, quadrilaterals) (3.G.A.1). In Grade 4, this work will be extended further to include such properties as the number of right angles and the existence of parallel sides (4.G.A.2). In Grade 5, students will classify two-dimensional shapes based on a hierarchy of properties (5.G.B.4).

In Grade 1, students partitioned circles and rectangles (both familiar shapes from Kindergarten) into two and four equal shares and described the shares using the language of fractions (1.G.A.3). In this unit, students will continue using the language of fractions when they partition circles and rectangles into two, three, or four equal shares. Students will extend this concept when they recognize that equal shares do not have to have the same shape (2.G.A.3). This forms the basis for the study of fractions in Grade 3 (3.G.A.2 and 3.NF.A.1).

In this unit, students will partition a rectangle into rows and columns of same-size squares and will count to find the total number of them in the rectangle (2.G.A.2). This will prepare students for Grade 3 when they will measure areas and relate area measurement to multiplication and to addition (3.MD.C.5).

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP1 to MP7. Here are some examples of how students can show that they have met a standard.

MP2: In G2-10 Extension 5, students reason abstractly and quantitatively when they draw pictures to show that a quarter of one pie can be larger than half of another pie.

MP3: In G2-2 Extension 2, students analyze and critique incorrect reasoning about the number of vertices possible in a closed shape with straight sides. In G2-6 Extension 1, students construct viable arguments when they use mathematical definitions to explain why a square is always a rhombus. Students also analyze and critique the argument of a partner.
MP.5: In G2-5 Extension 3, students strategically choose and use tools such as tens blocks, drawings, and/or number sentences to determine whether there are more sides among three squares and a pentagon or two hexagons, and the difference in the total number of sides.

MP.7: In G2-12 Exercise 5, students look for and make use of structure when they determine which tangram pieces can be used to replicate a given design.
Unit 8  Geometry: Shapes

Introduction

In this unit, students will learn about the difference between defining attributes (e.g., the quadrilateral is closed and has four straight sides) and non-defining attributes (e.g., the quadrilateral is blue and the long side is sitting upright). They will build and draw shapes according to defining attributes. Students will compose shapes using, for example, drawings, pattern blocks, and tangrams to create a composite shape and compose new shapes from a composite shape.

Students will partition shapes into two, three, and four equal parts or shares, and describe the parts using words and phrases like “halves,” “thirds,” “fourths,” “half of,” and “one fourth of.” They will learn that dividing a shape into equal shares in different ways results in shares of the same size.

Recurring games. Variations on I Have ____, Who Has ____? and Memory are used several times in this unit. See 2.1 Unit 4 pp. E-1–2 for a full description of these games.

Materials. Consider laminating or gluing BLM Attribute Shapes (pp. S-58–60) onto cardstock in advance, and then cutting out the shapes.

Yarn circles are convenient for sorting objects. Cut yarn into pieces about 2.5 ft long and tie each piece into a circle. Students can sort shapes by placing the shapes with a certain property inside the circle, and the shapes that do not have that property outside the circle.

You will need cubes in a variety of sizes, one for each student. In advance, you might have students bring in boxes that are cubes such as small tissue boxes, or boxes that have at least one square face, such as empty medication boxes. If a box has one square face, you can cut it to the proper height to make a cube and cover the open face with paper.

In addition to the BLMs provided at the end of this unit, the following Generic BLMs, found in section U, are used in Unit 8:

BLM 1 cm Grid Paper (p. U-1)
BLM Game Cards (pp. U-2–3)
BLM 2 cm Grid Paper (p. U-5)
BLM 2 cm Dot Paper (p. U-6)
Goals

Students will identify straight and curved lines and sides, and open and closed lines.

PRIOR KNOWLEDGE REQUIRED

Can identify triangles, rectangles, and squares

MATERIALS

large paper shapes (square, triangle, rectangle, circle)
yarn circles, two per student
shapes from **BLM Attribute Shapes** (pp. S-58–60), one set per student
**BLM Find Closed Lines** (p. S-61)
scissors and sheets of paper (see Extension 1)

NOTE: In this unit, we use the word “line” in the colloquial, not the mathematical sense. Any curved or straight path is described as a line.

**Introduce straight lines and curved lines.** Draw on the board:

|   |

SAY: A line that is straight with no bends or curves is called a *straight* line. Write “straight lines” on the board. Draw on the board:

\[<\]

SAY: A line that is not straight and has no pointed corners is called a *curved* line. Write “curved lines” on the board. Have volunteers draw two or three more examples of straight and curved lines.

**Sides of a shape.** Show students a large paper square. ASK: What is this shape called? (a square) PROMPT: This shape is a *square*. Run your finger along each side in turn and SAY: These are the sides of the square. Point to the corners and SAY: A *side* is the line that goes from corner to corner. ASK: Are the sides of a square straight or curved? (straight) Repeat with a paper *triangle* and a paper *rectangle*. Show students a large paper circle and SAY: This is a *circle*. ASK: Which type of line makes a circle, a straight line or a curved line? (curved)

On the board, draw some shapes with straight and curved sides and for each one, ask students if it has straight sides only, curved sides only, or both straight and curved sides. Then have volunteers draw shapes for their classmates to describe.
ACTIVITY 1

Give each student two yarn circles and a set of the shapes from BLM Attribute Shapes (1). Have them sort the shapes according to whether they have all straight sides or at least one curved side.

Introduce closed and open lines. Draw on the board:

SAY: These are two paths. Pointing to the closed path, ASK: If Anwar keeps walking along the path, where will he end up? (back where he started) Pointing to the open path, ASK: When Mary walks along this path, will she end up where she started? (no) Why not? (the path doesn’t go back to where it started) SAY: A path that goes back to where it started is called a closed path. Write “closed path” above the first picture on the board. A path that has two ends is called an open path. Write “open path” above the second picture. SAY: Instead of closed and open paths, we can say closed lines and open lines. Draw several more closed and open curved lines. For each one, ASK: Is this line closed or open?

Exercises: Is the path closed or open?

a)  b)  c)  d)

Answers: a) open, b) closed, c) closed, d) open

Shapes are closed lines. Draw three sides of a square on the board.

ASK: Is this an open path or a closed path? (open) Add the fourth side to the square. ASK: What shape is this? (a square) If you walk along the sides of the square, will you end where you started? (yes) Is a square an open or closed line? (closed) Explain that the corners of the square are not ends.

SAY: If you draw a closed line on paper, it makes a shape that you can cut out. If you cut along an open line, it makes a slit in the paper, not a shape. (Some students may benefit from a demonstration of this.)

Draw the shape in the margin on the board. ASK: Is this a square? (no) How is it different from a square? (it has a curved side) Does it make a shape? (yes) How do you know? (sample answers: if you walk along it, you will end where you started; you can cut out a shape)

Draw on the board:

For each one, ASK: Does the line make a shape? (no, yes)
Exercises: Does the line make a shape?

a) [ ]  b) [ ]  c) [ ]  d) [ ]

Answers: a) yes, b) no, c) yes, d) no

Drawing closed and open lines. On one side of the board, draw a variety of closed lines, including squares, rectangles, triangles, circles, and shapes with a mix of straight and curved sides. ASK: Are these open or closed lines? (closed) Write “closed lines” on the board above the shapes. On the other side of the board, draw a few open lines, including a square with a missing side, a triangle with a break in one side, a spiral, and a “W.” Point to each open line and ASK: How is this line different from a closed line? (it has a break in it, the ends don’t join up) Are these open or closed lines? (open) Write “open lines” on the board. Have volunteers draw some lines of both types.

ACTIVITY 2

Tic-tac-toe. Have students complete BLM Find Closed Lines.


Extensions

1. Show students how to make a snowflake using a sheet of paper using the following steps:

   Step 1: Fold a sheet of paper into quarters by folding once in each direction.

   Step 2: With the open edges of the paper facing the top and the right and the vertical side shorter than the top side, bring the top left corner down to meet the bottom edge, making a sharp corner. (see diagram 1)

   Step 3: Along the vertical short side of the triangle, draw an open curved line that goes from top to bottom. Along the horizontal short side of the triangle, draw an open curved line that begins and ends on the same side. Do the same for the corner of the triangle. (see diagram 1)

   Step 4: Along the long side of the triangle, draw an open curved line that begins and ends on the same side. No lines should touch.

   Step 5: Cut along the lines.

   Step 6: Unfold to get a snowflake. (see diagram 2)
Examples:

Diagram 1

Diagram 2

ASK: Why did cutting open lines make closed shapes? (because the paper was folded)

2. Invite students to make a poster showing straight, curved, closed, and open lines. Have students use the lines they drew to explain what straight, curved, closed, and open lines are.

3. Have students draw examples of closed and open lines in their notebooks, using both straight and curved lines.
Goals
Students will identify and count sides and vertices of shapes.
Students will sort shapes by the number of vertices.

PRIOR KNOWLEDGE REQUIRED
Can identify the sides of a shape
Can identify triangles, squares, rectangles, and circles

MATERIALS
shapes from BLM Attribute Shapes (2) (p. S-59), one set per student
large paper shapes (triangle, rectangle, circle)
masking tape
cards numbered 1 through 12
yarn circles, two per student
shapes from BLM Attribute Shapes (1) (p. S-58), one set per student pair
1 cm grid paper or BLM 1 cm Grid Paper (p. U-1)
BLM Sides and Vertices (p. S-62)

Introduce vertex and vertices. Give each student a triangle cut out from BLM Attribute Shapes (2). Hold up a large paper triangle. ASK: What shape is this? (triangle) Run your finger all the way around the edge of the triangle and have students do the same with their triangles. ASK: Are there places on the edge of the triangle that feel sharp or pointy? (yes) SAY: Put your finger on a pointy part or corner. Pointing to a vertex on your paper triangle, SAY: A pointy corner of a shape is called a vertex. Point to the three vertices of the triangle one by one and SAY: When there is more than one vertex, we say vertices. Triangles have three vertices. Trace your triangle on the board, and draw an arrow that points to each vertex. Write “vertex” and “vertices,” as shown below:

```
vertex

3 vertices
```

Have students practice reading “vertex” and “vertices.” SAY: The “ex” at the end of “vertex” becomes “ices” in “vertices.” ASK: What is the line between two vertices on a shape called? (a side)

Repeat with a large paper rectangle. Have a volunteer count the vertices. Then show students a circle. ASK: How many vertices does a circle have? (0) SAY: The side of the circle always bends but it is never pointy. It has no corners. So a circle has no vertices.
**ACTIVITY 1**

**Counting vertices.** Give each student pair a set of shapes from BLM Attribute Shapes (1). Player 1 has her eyes closed. Player 2 places a shape in his partner’s hands. Player 1 counts the number of vertices by touch and opens her eyes to check the count. Players then switch roles. Have students play the game until they are successful. Discuss successful strategies such as the following: do not rotate the shape because you might count some vertices twice; use one hand to hold the shape and the other one to count; keep a finger on one corner at all times so that you know where you started. Explain that the number of vertices of a shape stays the same regardless of the orientation of the shape.

**Counting vertices of polygons.** Use masking tape on the floor to create a polygon (a closed line with straight sides) with seven or eight vertices, and have students guess how many vertices it has. SAY: The sides of my shape are straight, so every bend is a vertex. Then have volunteers stand at each vertex and ask another volunteer to count how many students are standing. ASK: Was your guess correct? Repeat for other shapes with straight sides. Then solve the problem a different way: instead of counting volunteers, label the vertices with numbered cards (1, 2, 3, and so on) and have students verify that the answers are the same. Make sure to include some concave shapes (shapes that bend in on themselves), such as the ones shown below:

![Shapes](image)

(10 vertices, 12 vertices, 4 vertices, 5 vertices)

Draw on the board:

```
1
  O
3
```

ASK: How many vertices does the triangle have? (3) How do you know? (it has 3 corners) Erase the numbers and re-draw them beginning at a different vertex (see example below) and repeat the questions.

```
1
  O
3
```

ASK: Does it matter which vertex you start counting at? (no) Repeat with a square. Then draw a variety of other polygons, including concave polygons, and have volunteers count the vertices by numbering them.
Exercises: Count the vertices.

a)  

b)  

c)  

Answers: a) 5, b) 5, c) 8

Counting vertices of open lines. Draw any type of angle on the board.

ASK: Is this line open or closed? (open) SAY: An open line can have vertices, too, if it has sharp corners. Point to the line you drew and SAY: This line has one vertex. The ends of an open line do not count as vertices. Draw on the board:

For each one, ASK: How many vertices does the open line have? (1, 2, 3, 4) Have volunteers number the vertices for each line.

Exercises: Draw an open line with the number of vertices.

a) 1 vertex  
b) 3 vertices  
c) 5 vertices  
Bonus: 0 vertices

Sample answers

a)  

b)  

c)  

Bonus:

Counting sides. Draw on the board:

ASK: How many vertices does this shape have? (3) Have a volunteer number the vertices. Point to the middle of the curved side and ASK: Is this a vertex? (no) The line bends here, so why is it not a vertex? (not pointy) Remind students that a side is a line between vertices or end points.

ASK: How many sides does this shape have? (3) How many are straight? (2) How many are curved? (1) Number the sides as shown in the margin.

ACTIVITIES 2–3

2. Sorting shapes. Give each student two yarn circles and a set of shapes from BLM Attribute Shapes (2). Students sort the shapes into two sorting circles: four vertices and three vertices. ASK: How many sides do shapes with four vertices have? (4) How many sides do shapes with three vertices have? (3) ASK: Are there any shapes outside the sorting circles? (no)

3. Counting sides and vertices. Have students draw several different shapes on grid paper or BLM 1 cm Grid Paper. They then exchange their drawings with a partner and count the sides and vertices in each other’s shapes.
Have students complete BLM Sides and Vertices. (2. 5 vertices; 3. 4 sides, 4 vertices; 4. 4 sides, 4 vertices; 5. 3 sides, 3 vertices; 6. 5 sides, 5 vertices; 7. 6 sides, 6 vertices; 8. 7 sides, 7 vertices; 9. 4 sides, 4 vertices)

**Extensions**

1. The picture shows a fancy way of writing the numbers 1 to 6.

   \[1 2 3 4 5 6\]

   a) Count the vertices on the numbers 1, 2, 3, and 5. What do you notice?

   b) Draw numbers from 1 to 6 with the same number of sides as the value of each number.

**Answers**

a) Each number has the same number of vertices as its value (1 has 1 vertex, 2 has 2 vertices, 3 has 3 vertices, and 5 has 5 vertices)

b) Answers will vary and do not need to resemble real numbers. Examples:

   \[\begin{array}{l}
   1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \\
   \text{or} \\
   1 \quad \bigtriangleup \quad \bigtriangleup \quad \bigtriangleup \quad \bigtriangleup \quad \bigtriangleup
   \end{array}\]

(PM3) 2. Carl says it is possible to draw a closed shape with straight sides and exactly two vertices, because you can extend the two sides as long as you need to. Do you agree with Carl? Explain why or why not.

**Answer:** I do not agree with Carl. If you have two straight sides that meet at one vertex, the straight sides never curve back to close the shape, even if you extend the straight sides.

3. Is it possible to draw a closed shape with two vertices? If it is, draw an example. If it is not, explain why.

**Answer:** yes, sample shape:
G2-3  Squares and Rectangles
Pages 179–181

STANDARDS
2.G.A.1

VOCABULARY
closed
curved
equal sides
open
longer
rectangle
shape
shorter
side
square
square corner
straight
vertices

Goals
Students will identify squares and rectangles by their attributes.
Students will draw squares and rectangles.

PRIOR KNOWLEDGE REQUIRED
Can identify squares and rectangles visually
Can identify straight and curved lines and open and closed lines
Can identify and count sides and vertices of shapes
Can measure lengths using a centimeter ruler

MATERIALS
large paper shapes (squares, different rectangles, parallelogram,
trapezoid, pentagon, triangle, circle, and two shapes with
curved sides)
tape
pattern block squares or squares from BLM Pattern Blocks (p. S-63),
six per student
BLM Find the Squares (p. S-64)
colored chalk (red and blue)
scissors
BLM Squares and Rectangles (p. S-65), one section per student
blue and red colored pencils
2 cm dot paper or BLM 2 cm Dot Paper (p. U-6)
squares from BLM Attribute Shapes (1) to (2) (pp. S-58–59, see
Extension 1), one per student

Being a square does not depend on size, color, or pattern. Show
students a large paper square and ASK: What shape is this? (square)
Divide the board in two (reserve the second side of the board to show
shapes that are not squares later in the lesson). Trace the paper square
on one side of the board so the bottom side of the square is parallel to the
floor. ASK: Is this a square? (yes) How do you know? (it is the shape of a
square) Draw a smaller square with the same orientation and ask the same
questions. (yes, it is the shape of a square) Draw more squares of varying
sizes and colors, all oriented the same way. Add a pattern, such as dots, to
some of the squares. ASK: Do the dots change the shape? (no) Is it still a
square? (yes) Write “squares” on the board above the shapes. Leave these
on the board for the rest of the lesson.

Being a square does not depend on position. Tape the large paper
square to the board in a slightly rotated position so that the bottom side is
not parallel to the floor. Trace and then remove the paper square. ASK: Is
this shape a square? (yes) How do you know? (it is the shape of a square)
SAY: It is the same square as before, but we turned it a little. Repeat several
times, increasing the angle of rotation until the square stands on a vertex.
SAY: The shape did not change—all I did was turn it.
ACTIVITY 1

Give each student a pattern block square (or squares from BLM Pattern Blocks) and BLM Find the Squares. Students will use their pattern block squares to determine the shapes on the BLM that are squares and cross out those that are not. (1. square, 2. X, 3. square, 4. square, 5. X, 6. X, 7. X, 8. square, 9. X, 10. square, 11. X, 12. square, 13. SQUARE)

Squares have 4 sides and 4 vertices. Have a volunteer number and then count the sides of one of the squares drawn on the board with a bottom side parallel to the floor. ASK: How many sides does the square have? (4) Repeat with a different volunteer for the vertices. (4) Repeat for a square of a different size and then for a square that is rotated. ASK: Do all squares have four sides and four vertices? (yes) Does the number of sides and vertices change when a square is turned? (no)

Squares have straight sides. Draw on the board:

ASK: Is this a square? (no) Why not? (one side is curved) Have a volunteer fix the drawing so that it is a square. ASK: Do squares have all straight sides? (yes)

A square is a closed line. Draw on the board:

ASK: Is this a closed line or an open line? (open) Is this a square? (no) Why not? (one side has a hole in it) Have a volunteer fix the drawing so that it is a square. ASK: Is a square a closed line or an open line? (closed)

Squares have square corners. Draw on the board:

Ask a volunteer to circle the corner that matches the corners on a square. (the middle one) SAY: Squares have a special corner that we call a square corner.

Exercises: Is it a square?

a) b) c) d)

Answers: a) no, b) no, c) yes, d) no

As a class, discuss why each shape from the previous exercises is or is not a square. (a) 5 sides, 5 vertices; b) not closed, 3 vertices; c) 4 sides, 4 vertices, 4 square corners; d) not square corners)
Sorting shapes. Refer back to the half of the board labeled “squares.” Write “not squares” on the other half of the board. One by one, show students several large paper shapes that are squares and others that are not squares: different rectangles, a parallelogram, a trapezoid, a pentagon, a triangle, a circle, and two shapes with curved sides. Decide as a class whether each shape is a square or not (“square” or “not square”) and tape it to the appropriate half of the board. Encourage students to look at and count the sides and vertices of each shape to help them decide. Continue with shapes you draw on the board and include one or two open lines. Draw the first three or four shapes and then invite volunteers to draw others. Prompt students to use different sizes and patterns.

NOTE: The fact that the sides of a square are all of equal length is taught later in the lesson. If a student suggests this idea now, tell the class that you will check this later.

Identifying squares in the environment. Point to objects around the classroom and for each one, ASK: Does this shape look like a square? Students can compare the faces of 3-D objects with the squares on the board. Have volunteers identify other objects that include squares.

Identifying rectangles. Present rectangles as you did squares: show students a large paper rectangle and ASK: What shape is this? (a rectangle) Trace the rectangle on one side of the board, then draw or have volunteers draw more rectangles on the board (different sizes, colors, patterns, and orientations) and label them as “rectangles.” ASK: How many sides does a rectangle have? (4) How many vertices does a rectangle have? (4) What kind of corner does a rectangle have? (square) Emphasize that being a rectangle does not depend on pattern, color, size, or position.

ACTIVITY 2

Modeling rectangles. Have students create rectangles using up to six pattern block squares. Students will trace the rectangles in their notebooks and explain how the rectangles are different. (For example: This rectangle is 3 squares wide and 2 squares tall. The other rectangle is wider; it is 6 squares wide and only 1 square tall.)

NOTE: Grade 2 students consider squares and rectangles different shapes, even though all squares are rectangles. They do not identify a square as a special type of rectangle. However, identifying a square as a rectangle is not a mistake and should not be considered as such.

Distinguishing between squares and rectangles. Draw several rectangles and squares on the board. For each one, ASK: Is this shape a square or a rectangle? Erase the shapes. Draw the shapes in the margin on the board.

ASK: Is the first shape a square? (yes) Is the second shape a square? (no) What do we call the second shape? (rectangle) What is the same about rectangles and squares? (both have 4 sides and 4 vertices, and all 4 corners are square) You may need to prompt students to get a complete
answer. ASK: What is the difference between a square and a rectangle? (the rectangle is longer) Have a volunteer color the longer sides on the rectangle in red and the shorter sides in blue. ASK: Does the square have long or short sides? (short) Color the sides of the square in blue.

**ACTIVITY 3**

Distribute one section of BLM Squares and Rectangles to each student. Have students cut out the shapes and sort them into two groups: squares and rectangles. (squares: A and D; rectangles: B, C, and E)

**Length of sides in squares and rectangles.** Hold up a large paper square. ASK: Is this a square or a rectangle? (square) Run your finger along one side and ASK: Is this side longer, shorter, or the same length as the other sides? (the same) SAY: We need to check that the sides are all the same as this one. Pointing to an adjacent side, ASK: How can we check if this side is the same? (measure the side) SAY: We can also fold the square to check. Demonstrate folding the square in half diagonally at the corner between the two sides and compare the sides. ASK: Are the sides the same? (yes) SAY: We call two sides that are the same length equal sides. Repeat with the other adjacent side then with the side opposite and use the word “equal” each time.

Repeat with the rectangle. Pointing to one of the shorter sides, ASK: How many sides of the rectangle are the same length as this side? (1) Fold the rectangle in half to demonstrate. Repeat with the longer sides.

**ACTIVITY 4**

Have students test the paper squares and rectangles they sorted in Activity 3 by folding to ensure that the squares have all equal sides and rectangles have two longer sides. Then have them retest the squares and rectangles by using indirect measurement. Students can mark the length of one side of a paper square in their notebooks, compare the other sides to the mark, and color all sides of the paper square blue. Have students do the same for a paper rectangle and color the shorter sides blue and the longer sides red.

**Squares and rectangles in the environment.** Point to objects in the classroom, such as doors, windows, and books, and for each one, ASK: Does this shape look like a square or a rectangle? Students can compare the faces of 3-D objects with the squares and rectangles on the board. Then have volunteers identify other objects that include squares and rectangles.

For the following activities, students may wish to use pattern blocks to check square corners.
ACTIVITIES 5–6

5. **Drawing squares.** Have students draw squares of various sizes using 2 cm dot paper or BLM 2 cm Dot Paper. Have students also draw some shapes that have four sides and four vertices but are not squares (e.g., quadrilaterals or shapes with at least one curved side).

6. **Drawing rectangles.** Have students draw rectangles of various sizes using 2 cm dot paper or BLM 2 cm Dot Paper. Have students also draw some shapes that have four sides and four vertices but are not rectangles (e.g., quadrilaterals or shapes with at least one curved side).

**Extensions**

1. Have students trace a square from BLM Attribute Shapes (1) and (2) in their notebooks and create a picture that incorporates the square.

**NOTE:** Students will need 2 cm dot paper or BLM 2 cm Dot Paper for Extensions 2–5. If students answer “yes” to Questions 3–5, have them draw an example.

2. Draw a shape with 4 sides that has opposite sides equal and is not a rectangle.

   **Sample answer**

   ![Sample shape]

3. Is it possible to draw a shape with 4 equal sides, 4 square corners, and no other vertices that is not a square?

   **Answer:** no

4. Is it possible to draw a shape with straight sides, 4 square corners, and no other vertices that is not a rectangle or a square?

   **Answer:** no

5. Is it possible to draw a shape with straight sides and 4 square corners that is not a rectangle or a square?

   **Answer:** yes, sample shape:

   ![Sample shape]

   (MP6)

6. Have students explain in writing, or orally to a partner, what the words square and rectangle mean. Encourage students to use math words like sides, vertices, and closed in their explanations.

   **Sample answer:** A rectangle is a closed shape with 4 vertices, 4 straight sides, and 4 square corners. A square is a closed shape with 4 vertices, 4 straight sides of equal length, and 4 square corners.
Goals

Students will identify polygons and classify polygons by the number of sides, up to six sides.
Students will model polygons on geoboards.
Students will draw polygons by connecting dots.

Prior Knowledge Required

Can identify straight and curved lines and open and closed lines
Can identify and count sides and vertices of shapes
Can identify triangles

Materials

shapes from BLM Attribute Shapes (pp. S-58–60), an assortment for each student
tape
index cards with names of polygons (triangles, quadrilaterals, pentagons, hexagons)
colored pencils
BLM Identifying Polygons (p. S-66)
BLM Game Cards (pp. U-2–3)
geoboards
2 cm dot paper or BLM 2 cm Dot Paper (p. U-6)
BLM Matching Polygons (pp. S-67–68)
rulers
BLM Space Polygons (p. S-69, see Extension 1)

Introduce polygons. Divide the board into two. On one side, draw a variety of polygons, including regular polygons (shapes with equal sides and equal angles) and irregular polygons. Write "polygons" above the shapes. SAY: These shapes are polygons. Write "not polygons" on the other side of the board and draw the following shapes:

not polygons

Pointing to the first shape, ASK: How is this line different from the polygons? (it is not closed) Repeat with the second and third shapes. (it has a curved side, it has an extra line) Pointing to the fourth shape, SAY: The sides of a polygon do not cross each other. This shape has two sides that cross, so it is not a polygon. Pointing to the fifth shape, SAY: In a polygon, exactly two sides meet at a vertex. In this shape, four sides meet at the middle vertex, so this is not a polygon.
Draw a variety of other non-polygons. ASK: What is the same about all the polygons? Are they all closed shapes? (yes) Do they all have straight sides? (yes) How many sides meet at each vertex? (2) Do they all have the same number of vertices? (no) SAY: All shapes that are closed and have straight sides that do not cross are called polygons.

Exercises: Draw two different polygons. Draw two different shapes that are not polygons.

**ACTIVITY 1**

**Sorting shapes.** Give each student an assortment of shapes from BLM Attribute Shapes. Have them sort the shapes into two groups: polygons and not polygons. Ask students to put aside all the shapes that are not polygons and sort the polygons by the number of sides: three sides, four sides, and so on. Have them compare their results with a partner. Then have students count the number of vertices of the shapes in each group. Have volunteers tape their groups of polygons that have the same number of sides to the board. Keep the groups of polygons on the board.

**Names of polygons.** SAY: Mathematicians gave names to polygons depending on the number of sides and vertices they have. You know some of them already. ASK: What is a polygon with three sides and three vertices called? (triangle) Hold up an index card that says “triangles” and have a volunteer tape it to the board above the group of triangles. ASK: What shapes have four sides? (squares and rectangles) Have a volunteer indicate where the shapes with four sides are. ASK: Are they all squares or rectangles? (no) Hold up the card that says “quadrilaterals” and SAY: All polygons with four sides are called quadrilaterals. So squares and rectangles are quadrilaterals. ASK: How many vertices do quadrilaterals have? (4) Have the volunteer tape the card in the appropriate place. Hold up the card that says “pentagons” and SAY: A polygon with five vertices is called a pentagon. ASK: How many sides does a pentagon have? (5) Have a volunteer tape the card in the appropriate place. Hold up the card that says “hexagons” and SAY: A polygon with six sides is called a hexagon. How many vertices does a hexagon have? (6) Have a volunteer tape the card in the appropriate place.

Have students use colored pencils to complete BLM Identifying Polygons.

Draw on the board:

<table>
<thead>
<tr>
<th>Polygon</th>
<th>Number of Sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>triangle</td>
<td>3</td>
</tr>
<tr>
<td>quadrilateral</td>
<td>4</td>
</tr>
<tr>
<td>pentagon</td>
<td>5</td>
</tr>
<tr>
<td>hexagon</td>
<td>6</td>
</tr>
</tbody>
</table>
SAY: The table shows what we know about polygons. A triangle has three sides. ASK: How many vertices does it have? (3) Do we need to write that? (no) Why? (the number of sides and the number of vertices are always the same)

Use any or all of the following activities to reinforce the names of polygons. These games can be repeated for a few days to solidify learning.

**ACTIVITY 2**

Have students play I Have _____, Who Has _____? (see unit introduction) in groups of four. In advance, make cards using BLM Game Cards. Fill in the top of a card with a picture of a polygon. You can use the shapes from BLM Matching Polygons. In the bottom of the card, write the name of a different polygon (e.g., triangle, quadrilateral, pentagon, hexagon).

**Modeling polygons.** Using a geoboard, create each of the polygons introduced in the lesson. Give each student a geoboard and have them name the polygon and then recreate it exactly on their geoboards.

**ACTIVITIES 3–4**

3. Provide students with a geoboard, 2 cm dot paper or BLM 2 cm Dot Paper, and name cards from BLM Matching Polygons (1). Player 1 draws a card at random and (without showing the card to Player 2) creates the polygon on the geoboard or draws it on dot paper. Player 2 identifies the polygon. Players switch roles and play again.

4. Have students play Memory (see unit introduction) using the cards from BLM Matching Polygons to match a polygon with its name.

**Drawing polygons from vertices.** ASK: How many vertices does a triangle have? (3) SAY: On a geoboard, we stretched an elastic around each vertex of the triangle. Draw and number three dots (not in a line) on the board. SAY: On the board, we use a dot for each of the three vertices of a triangle. Have a volunteer connect the dots in order to form a triangle, as shown below:

```
1
2
3
```

SAY: Dot 1 connects to dot 2, dot 2 connects to dot 3, and dot 3 connects back to dot 1. ASK: Why do we have to connect dot 3 to dot 1? (to close the triangle) Repeat for a different set of three dots and let volunteers draw and connect the dots.
Exercise: Draw 3 dots in your notebook. Use a ruler to connect the dots in order. Join the first and last dots to make a triangle.

ASK: How many vertices does a quadrilateral have? (4) How many dots do I need to make a quadrilateral? (4) Draw and label four dots, as shown below:

Have a volunteer connect the dots to make a quadrilateral.

Draw four different dots. Label the dot at the top “1,” as shown below:

Point at the 1 and SAY: I will start to connect the dots here. Which dot should I connect to next to make a quadrilateral? Point to an adjacent dot and ASK: Can I connect here? (yes) Point to the other adjacent dot and ASK: Can I connect here? (yes) Point to the last dot and ASK: Can I connect here? (no) SAY: Let’s see what happens if I connect there. Draw the lines as shown below:

ASK: Is this a polygon? (no) Why not? (the sides cross, 4 lines meet at the middle vertex) Erase the lines and have a volunteer connect the dots to make a quadrilateral. Number the rest of the dots as shown below:

ASK: Why do we connect dot 4 to dot 1? (to close the shape)

Exercise: Draw 4 dots in your notebook. Use a ruler to connect the dots and make a quadrilateral.
Extensions

1. Have students complete BLM Space Polygons.

2. A heptagon has seven sides. Make a heptagon on a geoboard.

3. An octagon has eight sides. Make an octagon on a geoboard.

4. Demonstrate how to draw a pentagon by drawing four dots to make a quadrilateral, then adding one more dot on the outside. Example:

   ![Pentagon Diagram]

   Erase the line connecting the dots inside the pentagon. Have students draw their own pentagons using this method.

5. Demonstrate how to draw a pentagon by drawing four dots to make a quadrilateral, then adding one more dot in the middle. Example:

   ![Pentagon Diagram]

   Start at the middle dot and draw a line to an adjacent dot, then keep going in order. Example:

   ![Pentagon Diagram]

   Have students draw their own pentagons using this method.

   (MP1)

6. Draw five dots as in Extension 5. Ask students to show all the different ways to connect the dots to make a pentagon. Have them explain how they know they found all the ways.

   **Sample explanation:** The vertex in the middle has to connect to exactly two other vertices. Those two vertices have to be from the quadrilateral and have to be beside each other or lines will cross. So I tried connecting the middle vertex to each pair of vertices that are beside each other.

   **Answers**

   ![Pentagon Diagrams]
**Goals**

Students will identify and draw polygons.  
Students will identify circles.

**PRIOR KNOWLEDGE REQUIRED**

- Can identify and count sides and vertices of polygons  
- Can identify polygons by number of sides and number of vertices  
- Can name triangles, quadrilaterals, pentagons, and hexagons

**MATERIALS**

- BLM Naming Polygons (p. S-70, optional)  
- Rulers or BLM Polygons and Geoboards (p. S-71)  
- Geoboards  
- 2 cm dot paper or BLM 2 cm Dot Paper (p. U-6)  
- BLM Geoboards (pp. S-72–74)  
- Large paper circle  
- BLM Shapes in Flags (p. S-75)  
- Clipboards, paper, and pencils  
- A Cloak for The Dreamer by Aileen Friedman, The Wing on a Flea by Ed Emberley, A Star in My Orange by Dana Meachen Rau, or The Shape of Things by Dayle Ann Dodds (see Extension 1)  
- Scissors (see Extension 1)  
- BLM Polygon Word Search (p. S-76, see Extension 5)

**Review names of polygons.** Draw on the board:

<table>
<thead>
<tr>
<th>Polygon</th>
<th>Number of Sides</th>
<th>Number of Vertices</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

ASK: Which polygon has three sides and three vertices? (triangle) Write “triangle” in the empty cell in the first row. Repeat to fill in the rest of the table. (quadrilateral, pentagon, hexagon)

Draw various polygons with three to six sides, including squares and rectangles, and have students name each shape, or have students complete BLM Naming Polygons. (1. 3, 3, triangle; 2. 6, 6, hexagon; 3. 6, 6, hexagon; 4. 4, 4, quadrilateral; 5. 4, 4, quadrilateral; 6. 6, 6, hexagon; 7. 5, 5, pentagon; 8. 5, 5, pentagon) Remind students that in geometry, shapes often have more than one name. For example, all squares and rectangles have four sides, so all squares and rectangles are quadrilaterals.
Drawing polygons. Give students rulers and have them draw an example of each type of polygon. You might use the drawings to create a class display. Alternatively, have students complete BLM Polygons and Geoboards.

**ACTIVITY 1**

Have students create polygons on a geoboard and then copy the polygons onto dot paper or BLM 2 cm Dot Paper. Students who struggle with copying shapes can practice copying dots and lines on BLM Geoboards (1) to (2). Use the blank geoboards on BLM Geoboards (3) to create additional exercises. After students are comfortable with the exercises on the BLM, have them copy polygons from geoboard to geoboard, first using a geoboard of the same size and then using geoboards of different sizes (i.e., geoboards with different distances between pegs).

Completing polygons. Draw on the board:

```
   __________
```

ASK: Are these polygons? (no) Why not? (they are not closed) SAY: The first one should be a triangle. ASK: How many sides does it have? (2) How many sides does a triangle have? (3) How many sides are missing? (1) Have a volunteer complete the triangle. ASK: Is this a triangle now? (yes) SAY: Let's count the vertices to check. ASK: How many vertices does a triangle have? (3) Count the vertices.

Repeat for the second shape to make a quadrilateral. (2 sides are missing, 4 vertices) Repeat for a pentagon and a hexagon after drawing the following shapes on the board:

```
   __________
```

(2 sides are missing, 5 vertices; 3 sides are missing, 6 vertices)

**ACTIVITY 2**

Have students draw and label a triangle, quadrilateral, pentagon, or hexagon with sides missing. They then trade drawings with a partner and complete each other's shape, and then check each other's work by counting vertices.

Polygons in the environment. Point to the faces of various 3-D objects around the room and for each one ASK: Which type of polygon is similar to the flat shape that we see when we look at the shape from here? Some objects may be examined from different sides; for example, a paper towel roll looks like a rectangle from the side and a circle from the top. Invite students
to identify distinct polygonal shapes in objects. For example, ASK: What polygons can you find on a soccer ball? (pentagons and hexagons)

**Identifying circles.** Hold up a large paper circle and identify it by name. Trace the circle on one side of the board and draw more circles of different sizes, colors, and patterns. Write "circles" on the board above the pictures. ASK: Are circles open or closed? (closed) Do they have any vertices? (no) SAY: When you run your finger around a circle it is always bending but is never pointy. ASK: If it has zero vertices, how many sides does it have? (1) Emphasize that being a circle does not depend on pattern, color, or size. Write "not circles" on the other side of the board. Draw a large variety of polygons and closed shapes with at least one curved side (but no ovals). ASK: How do you know that these shapes are not circles? (they have straight sides, they have vertices)

**ACTIVITIES 3–4**

3. Have students complete BLM **Shapes in Flags**. (1. triangle, quadrilateral, pentagon; 2. triangle, quadrilateral; 3. circle, triangle, quadrilateral, hexagon)

4. Take students on a walk through the neighborhood and have them point out various objects and describe their shapes as polygons. For example, a stop sign is an octagon, a city bus from the side looks like a rectangle, and a school bus from the side is similar to a hexagon. Students can use a clipboard, paper, and a pencil to sketch the polygonal objects they see during the walk. Alternatively, they can draw pictures after the walk. Have students name each polygon in their pictures.

**Extensions**

1. Read or have students read any of the following stories:
   - *A Cloak for The Dreamer* by Aileen Friedman. A tailor’s son uses circles to make a cloak that does not protect him from the weather. The family changes the circles to hexagons and comes to the realization that the son should not be a tailor and should pursue his own dreams.
   - *The Wing on a Flea* by Ed Emberley. Real-life objects are used to introduce shapes and sizes.
   - *A Star in My Orange* by Dana Meachen Rau. Objects in nature are used to introduce shapes and patterns.
   - *The Shape of Things* by Dayle Ann Dodds. Circles, squares, and triangles are shown as part of real-life objects.

Have students draw or cut out shapes, based on what they listened to or read, to create their own picture of a real-life object made up of different shapes.
NOTE: For Extensions 2–4, encourage students to use any tools they think will help to model and solve the problems, such as tens blocks, toothpicks, straws, or pencil and paper. Have students explain their solutions in writing and orally to a partner.

(MP2, MP4, MP5) 2. Kate uses straws to make 3 triangles and 2 pentagons. She uses 1 straw for each side. How many straws did she use?

Sample answers

• I used tens blocks to show straws. I made 3 triangles and 2 pentagons using 1 tens block for each side. I used 19 blocks, so Kate used 19 straws.

• I used pencil and paper to write addition sentences. Triangles have 3 sides each. $3 + 3 + 3 = 9$, so Kate used 9 straws for the 3 triangles. Pentagons have 5 sides each and Kate makes 2 pentagons. $5 + 5 = 10$, so Kate used 10 straws for the 2 pentagons. $10 + 9 = 19$, so Kate used 19 straws.

(MP2, MP4, MP5) 3. Kate uses straws to make 3 squares and 1 pentagon. Amit uses straws to make 2 hexagons. They each use 1 straw for each side. Who used more straws? How many more straws?

Sample answer: I used addition and subtraction sentences. Squares have 4 sides and a pentagon has 5 sides, so Kate uses $4 + 4 + 4 + 5 = 17$ straws. Hexagons have 6 sides, so Amit uses $6 + 6 = 12$ straws. Kate uses more straws. $17 − 12 = 5$, so Kate uses 5 more straws than Amit.

(MP2, MP4, MP5) 4. Amit has 10 straws. He uses 1 straw for each side of a polygon.

a) How many triangles can he make?

b) How many squares can he make?

c) How many pentagons can he make?

Sample answers

• I drew pictures and counted the sides.
  a) I counted 9 sides for 3 triangles, so Amit can make 3 triangles with 1 straw left over.
  b) I counted 8 sides for 2 squares, so Amit can make 2 squares with 2 straws left over.
  c) I counted 10 sides for 2 pentagons, so Amit can make 2 pentagons.

• I used addition sentences.
  a) I added three 3s to make 9, so Amit can make 3 triangles with 1 straw left over.
  b) I added $4 + 4 = 8$, so Amit can make 2 squares with 2 straws left over.
  c) I added $5 + 5 = 10$, so Amit can make 2 pentagons.
5. Complete BLM Polygon Word Search.

Answers

1. i p a h m d t c n h e o r n e e n e r c e e n t x h e i t c p t w a o r a a t t a d g s e n g a a g p o l y g o n g o a n r c l i n g o n h p u z e z l e s s q u a r e

2. I am done the word search puzzle.
Goals

Students will identify sides of the same length in polygons visually. They will test their assumptions using indirect comparison and measurement.

Students will identify rhombuses visually and by measuring.

Prior Knowledge Required

Can identify the sides of polygons
Can compare lengths indirectly
Can measure lengths to the closest centimeter
Can identify polygons by the number of sides
Can identify rectangles and squares
Knows that opposite sides are the same length in a rectangle
Knows that all sides are the same length in a square
Knows that a square and a rectangle have 4 square corners

Materials

BLM Polygon Cards (pp. S-77–78)
blue and red chalk
overhead projector (optional)
transparency of BLM Polygon Cards (1) (p. S-77, optional)
erasable marker (optional)
sheet of paper
blue and red colored pencils
centimeter rulers
BLM Find the Rhombuses (p. S-79)
2 cm dot paper or BLM 2 cm Dot Paper (p. U-6, see Extensions 3 and 4)

Identifying equal sides using indirect comparison. Distribute BLM Polygon Cards (1). SAY: Look at Question 1. ASK: What is the shape? (rectangle) How do you know? (it has 4 sides, the opposite sides are the same length, it has 4 square corners) PROMPT: How many sides does a rectangle have? (4) What kind of corners does it have? (square) What do you know about the lengths of the sides? (it has 2 long sides and 2 short sides) Are the long sides the same length? (yes) Are the short sides the same length? (yes) Is this a square? (no) Why not? (the sides are not all the same length) Are you sure? (yes) Are you sure that the opposite sides are equal? (not sure, but it is likely)

SAY: Let’s check if the opposite sides are equal. Draw a rectangle on the board or project a transparency of BLM Polygon Cards (1). Use blue to color one short side. Explain what you are doing as you do the following: Hold one edge of a blank sheet of paper to the colored side of the rectangle. On the paper, mark off the length of the side. Pointing to the line

STANDARDS

2.G.A.1

VOCABULARY

centimeter
equal
equal sides
polygon
rectangle
rhombus
shape
side
square
square corner
drawn on the paper, SAY: This line shows how long the blue side is. I can use it like a ruler to compare this side to the other short side. Hold the piece of paper against the other short side to show that they are the same length. Color the other short side blue. Have students color the short sides of their rectangles blue. Use red to color one long side and have students use a sheet of paper to mark off the length of a long side and use it to compare to the opposite side. (both are the same length) Have students use red to color the long sides of their rectangles.

**ACTIVITY 1**

Have students work in pairs to predict which sides of the shapes on BLM Polygon Cards (1) are equal; then they can use the technique described above to verify. They should use the same color for equal sides. (1. opposite sides are equal, 2. all sides are different, 3. all sides are equal, 4. all but the bottom side are equal, 5. all sides are equal, 6. all sides are equal)

ASK: How else can we check that sides are equal? (by folding, by measuring)

**Review measurement in centimeters.** Draw on the board:

![Ruler](image)

ASK: What do we need to remember when we measure length in centimeters? (line up the 0 cm mark at the start of what you are measuring)

How long is this side? (2 cm) SAY: The number at the end of what you are measuring tells how long it is.

**Identifying equal sides using measurement.** In the following activity, students compare side lengths using a ruler.

**ACTIVITY 2**

Give students BLM Polygon Cards (2) and have them repeat Activity 1 but this time measuring the sides in centimeters. (7. long sides are equal, 4 short sides are equal; 8. long sides are equal, 2 short slanted sides are equal; 9. opposite long sides are equal, 2 slanted sides are equal; 10. all sides are equal; 11. all sides are equal; 12. long opposite sides are equal, short opposite sides are equal)

**NOTE:** A square is a special case of a rhombus.

**Identifying rhombuses.** SAY: Shapes with all equal sides are special. Some have special names. ASK: What is the name of one shape with all sides equal? (square) Draw a rhombus on the board or project a
transparency of BLM Polygon Cards (1) on the board. SAY: Look at Question 3. ASK: Does this shape have all equal sides? (yes) SAY: It is a quadrilateral because it has four sides. ASK: Is it a square? (no) Why not? (it does not have square corners) SAY: It has a special name. A quadrilateral with four equal sides is called a **rhombus**. Write “rhombus” below the picture.

Draw on the board:

a)  

b)  

c)  

**NOTE:** Shape a) is a rhombus, shape c) is obviously not a rhombus, and shape b) is not a rhombus but looks like one. Rotating shape b) so that the sides are neither vertical nor horizontal will help to disguise it.

ASK: Which of these shapes are rhombuses? (students may say shapes a) and b)) Which one is not a rhombus? (shape c)) Cross it out. SAY: The other two quadrilaterals look like rhombuses but they may not be. Use a sheet of paper to mark the side length for shape a) and have volunteers measure the other sides. (rhombus) Repeat for shape b). (not a rhombus)

Have students complete **BLM Find the Rhombuses**. (not rhombuses: 2, 3, 4, 8; rhombuses: 1, 5, 6, 7)

**Extensions**

(MP3, MP6)  

1. a) Is a square always a rhombus? Explain.
   
   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.
   
   **Selected sample answer:** a) yes, because it has 4 sides and all sides are the same length, and any quadrilateral with four equal sides is a rhombus

   (MP3, MP6)  

2. a) Is a rhombus always a square? Explain.
   
   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.
   
   **Selected sample answer:** a) a rhombus can be a square if it has square corners, but a rhombus does not need to have square corners, so a rhombus is not always a square

**NOTE:** For Extensions 1 and 2, encourage partners to ask questions to understand and challenge each other’s thinking (MP3) and use of math words (MP6)—see p. A-43 for sample sentence and question stems to guide students.
NOTE: Students will need 2 cm dot paper or BLM 2 cm Dot Paper for Extensions 3 and 4.

3. A rhombus has all equal sides. A rectangle has all square corners. Draw a polygon that is both a rhombus and a rectangle. What is the shape called?

   Answer: a square

4. Each side of the pentagon is 1 cm long.

   Sketch a different pentagon that has sides 1 cm long.

   Sample answers:
Goals
Students will identify and create polygons with given properties.

PRIOR KNOWLEDGE REQUIRED
Can identify and count sides and vertices
Can identify triangles, rectangles, squares, quadrilaterals, and rhombuses by name
Is familiar with pentagons and hexagons
Can perform direct comparisons of length
Can measure lengths to the nearest centimeter
Can identify shapes with sides the same length
Can identify square corners
Knows that a rhombus is a quadrilateral with all sides equal
Knows that a square has 4 equal sides and 4 square corners
Can copy shapes on dot or grid paper

MATERIALS
large paper triangles of varying shapes (optional)
tape (optional)
sheet of paper
BLM Triangle Paper (p. S-80)
overhead projector
transparency of BLM Triangle Paper (p. S-80)
erasable marker
BLM Geoboards (pp. S-72–74, optional)
large paper square
pattern blocks or blocks from BLM Pattern Blocks (p. S-63, see Extensions 1 and 2)
divider, such as a binder (see Extension 2)
1 cm grid paper or BLM 1 cm Grid Paper (p. U-1, see Extension 4)
ruler (see Extension 4)

NOTE: In this lesson, since students need to identify polygons with equal sides and square corners, it is important that the polygons be accurate. In order to ensure this, it is recommended that you produce them in advance, whenever possible.

Identifying polygons with equal sides. SAY: We know two kinds of polygons that always have equal sides. ASK: What are their names? (square and rhombus) Can triangles have equal sides too? (yes) Tape paper triangles to the board or draw on the board:

a)  b)  c)  d)
Pointing to the triangles one at a time, have students signal thumbs up or down if the triangle has all sides the same length. (a) no, (b) no, (c) no, (d) yes) If students disagree, have a volunteer compare the sides by using a sheet of paper to mark off a side length.

**Drawing polygons with equal sides.** Distribute BLM Triangle Paper. SAY: This is a special kind of grid paper made up of triangles with equal sides. We can use it to draw polygons with equal sides. Let’s start by drawing triangles. Project BLM Triangle Paper on the board:

SAY: All the sides of the little triangles are equal. Each side is 1 cm long. Shade a 1 cm triangle. SAY: This triangle has sides 1 cm long. Let’s make one side longer. Extend one side of the triangle to 2 cm, as shown below:

Pointing to the horizontal side, SAY: We can make this side 2 cm long too. Extend the side, as shown below:

ASK: Where do I draw to close the triangle? (along the line connecting the sides) Will that side be 2 cm too? (yes) How do you know? (because it is 2 sides of the little triangles long) Have a volunteer draw the remaining side, as shown in the margin.

**Exercises:** Draw a triangle with all sides the same length.

a) 4 cm 

b) 6 cm

**Bonus:** Draw a triangle with all sides 3 cm long. It should point down.

**Answers:** a) 

b)

**Bonus:**
NOTE: Students who struggle with these exercises can practice their skills by doing exercises you provide on **BLM Geoboards**.

**SAY:** We can use triangle paper to draw a rhombus too. On your grid, draw two adjacent sides of a rhombus with side length 3 cm. Have students do the same on their triangle paper. **ASK:** How many sides do we need to add? **(2)** **SAY:** Try to add two sides each 3 cm long to make the rhombus. Give students an opportunity to do so on their grid paper. Have a volunteer present the answer on the board. The picture should look like this:

![Rhombus](image)

For the Bonus in the following exercises, let students know that rhombuses can slant to the left or the right.

**Exercises:** Draw a rhombus with the given side length.

a) 4 cm  

b) 7 cm  

**Bonus:** Draw a rhombus. The side length is 4 cm. It should lean the other way from the other ones you drew.

**Answers**

a)  

b)  

**Bonus:**  

**Identifying square corners.** Hold up a large paper square or draw one on the board. **ASK:** Is this a rhombus? **(yes)** **SAY:** All four sides are equal so it is a rhombus. **ASK:** What do we usually call this? **(a square)** **WHAT makes it a square?** (the square corners) **PROMPT:** What is the difference between this rhombus and the ones you drew before? **SAY:** Squares and rectangles always have square corners. Hold up a sheet of paper. **ASK:** What shape is this? **(a rectangle)** **DOES it have square corners?** **(yes)** **Draw on the board:**

![Square](image)
ASK: Do you think that any of these shapes have square corners? (yes, the first two) SAY: It is usually easy to see square corners on a quadrilateral and a triangle, but it can be hard to tell with other shapes. Hold up the piece of paper and ASK: How could I use this rectangle to check if any of the polygons on the board have square corners? (compare them to the square corner on the piece of paper) Hold the corner of the paper to the square corner in the triangle and SAY: You see that it fits exactly, so this is a square corner. Make a check mark in the corner. ASK: Do you think the other two corners are square? (no) Hold the corner of the paper to each corner in turn and SAY: This corner is too pointy. Make an X in each corner.

Repeat for the remaining two shapes with the help of volunteers. (each one has 2 square corners) Describe angles greater than a square corner as too wide.

ASK: Which kind of grid paper, square or triangle, has square corners? (square) Which kind of grid paper would be easier for drawing squares and rectangles? (square)

Extensions

1. Making shapes with pattern blocks. Distribute pattern blocks or blocks from BLM Pattern Blocks. Put two different pattern blocks side by side on the overhead projector, but don’t let students see the shapes. Ask students to choose two pattern blocks and place them so that the figure they create has the same shape as the shadow of your blocks. Repeat with two different blocks. When students are comfortable working with two blocks, make shapes with three blocks and then four blocks, but do not tell students how many blocks you used. Each time, ask students to recreate the shape and identify the resulting polygon. Some examples are shown below:

Encourage multiple solutions whenever possible. Have students with different pattern block combinations check if their shapes match by superimposing their arrangements on yours.

2. a) Describing designs made from pattern blocks. Show students a hexagonal shape made from pattern blocks. (see the first shape below) Ask them to describe the shape. (hexagon) PROMPTS: What blocks did I use? (triangles, square) How many blocks of each kind did I use? (2, 1) Which shape is at the top? (triangle) Which shape is on the bottom? (triangle) Have students use “above,” “below,” and “between” if they are familiar with these terms. Repeat with a different simple design, such as the flower (1 hexagon and 6 squares) and the house (2 squares, 1 trapezoid, and 1 triangle) shown on the following page.
b) Set a divider, such as an upright open binder, between two students. Player 1 creates a design using pattern blocks and describes the design to Player 2, who tries to recreate the design from the description. Then players compare their designs.

3. Use BLM Triangle Paper to draw a hexagon with equal sides.

Sample answer

4. Show students how to use 1 cm grid paper or BLM 1 cm Grid Paper to draw a kite (a shape with two short sides together and two longer sides together). Draw a square with sides 2 cm long. Use a ruler to draw a diagonal of the square. Extend the diagonal past the edges of the square, as shown below:

To make the kite, choose any point along the line and draw a line from the point to each of the other corners of the square (that the first line has not passed through). Make the edges of the kite thicker, as shown below:

a) Draw a kite. Check that the long sides are equal.

Use the method you used to draw a kite, but choose a point inside the square instead of the corners.

b) Are the sides of the square longer or shorter than the two new sides?

c) Are the two new sides equal? How do you know?
Sample answers

a)

b) longer, c) yes, I can measure
G2-8 Cubes

STANDARDS
2.G.A.1

VOCABULARY
- circle
- cube
- equal sides
- face
- pentagon
- polygon
- rectangle
- shape
- side
- square
- three-dimensional (3-D)
- triangle

Goals
Students will identify and define cubes.

PRIOR KNOWLEDGE REQUIRED
- Recognizes and can name squares and rectangles
- Can measure lengths to the nearest centimeter

MATERIALS
- large cardboard rectangle and square
- centimeter rulers
- large cube
- cubes of different sizes, one per student
- objects shaped like cubes (e.g., dice, connecting cubes)
- stickers, 12 per student
- scissors
- BLM Cube (p. S-81)
- glue
- sample rectangular prisms, pyramids, cylinders, and cones
  (see Extensions)
- colored pencils (see Extension 1)
- BLM 3-D Shapes (pp. S-82–84, see Extension 1)
- BLM Prisms (p. S-85, see Extension 2)
- BLM Pyramids (p. S-86, see Extension 2)
- paper and several quarters (see Extension 3)
- BLM Cylinders (p. S-87, see Extension 3)
- sheet of paper and tape (per student, see Extension 4)
- BLM Cones (pp. S-88–89, see Extension 4)

Introduce cubes. Hold up a large cardboard rectangle and square.
ASK: What are these shapes called? (rectangle, square) How are these shapes different? (a rectangle has 2 longer sides and 2 shorter sides, a square has 4 equal sides) SAY: Let’s check. Have a volunteer use a centimeter ruler to measure the sides of both shapes to confirm that they are indeed a rectangle and a square. Show students a large cube and
ASK: What is this called? (a cube) SAY: Squares, rectangles, circles, and triangles are flat. A cube is not flat so we call it three-dimensional or 3-D (like some movies).
ACTIVITY 1

Give each student a cube (different sizes, if possible) and a centimeter ruler. After you demonstrate on your large cube, have students measure the cubes from side to side, front to back, and top to bottom. Record the results of the measurements of several cubes on the board.

ASK: What do you notice? (the measurements of each cube are all the same) Is a cube more like a square or a rectangle? (a square) How is a cube different from a square? (a square is flat)

Cubes in the environment. ASK: What cubes or 3-D shapes that are almost cubes can you think of? (examples: dice, blocks, tissue boxes) You might point out some objects that are cubes in the classroom. ASK: How is an “almost cube” different from a cube? (examples: some dice have rounded vertices, connecting cubes have little holes in their sides and the linking part sticks out, some beads are cubes with a hole in the center, ones blocks are nearly cubes—they have one side missing and a linking part sticking out on the opposite side)

Introduce faces. SAY: Each flat part of a 3-D shape like a cube is called a face. Point to the faces on your large cube and ask students to count the faces on their own cube. Suggest that students put a sticker on each face, then remove the stickers and count them. Discuss other ways to keep track of the number of faces. If students do not suggest the following way, show it to them. SAY: Count the top and the bottom first, then look at the shape from the top. From the top, the cube looks like a square. But each side of that square is a hidden face. A square has four sides, so there are four “hidden” faces. Four faces plus two faces (top and bottom) are six faces altogether.

Tracing flat faces. Invite a volunteer to trace a face of a cube on the board and have the rest of the students trace a face of their cube in their notebook. ASK: What shape did you trace? (square) Do you think all of the faces of the cube are the same? (yes) Have students check by placing each face of their cube in turn on the tracing. Remind them to keep track of the faces they have checked (e.g., by using stickers). Have students cut out the tracing of the face to use later.

ACTIVITY 2

Distribute BLM Cube. Tell students that they will cut out the shape along the dashed lines and fold along the solid lines to make a cube.

ASK: What shape is each face of the cube? (square) Have students count the square faces on the shape. (6) Then have students cut out and build the cube by folding along the solid lines and using the tabs to glue it in place.

Identifying faces in pictures. Draw a picture of a cube on the board. Ask students to identify the shape of its faces. Shade the front face. ASK: Is this a square? (yes) Shade the top face. Ask students to find this face on their
cubes. ASK: What is the shape of the top face on your cube? (square) Does it look like a square in the picture? (no) SAY: It has four sides but it does not look like a square. Cover the rest of the picture to emphasize the point. Ask students to hold the square face that they cut out earlier in front of them, so that it looks like a square. Then ask them to tilt the square so that it lies horizontally at eye level. You may need to demonstrate this. ASK: Do some sides look shorter from this view? (yes)

Draw on the board:

For each shape, point to the shaded face and ASK: Is this face a square? (yes, no, no, no, yes, no) NOTE: Students do not need to identify the shape of each shaded face at this point. For each shape, ASK: Is this a cube? (yes, no, no, no, yes, no) For the shapes that are not cubes, ASK: Why is this not a cube? (not all faces are squares)

**Extensions**

NOTE: If possible, use real prisms, pyramids, cylinders, and cones for discussion purposes in these extensions.

1. a) Distribute BLM 3-D Shapes (1). Have students identify the shape of each face. They can color each shape a different color (e.g., squares in blue, rectangles in red, triangles in yellow). Ask them to think about what each shape will be after they build it. Then have them cut out and build the shapes.

b) Distribute BLM 3-D Shapes (2). Have students identify the shape of each face. They can color each shape a different color (e.g., squares in blue, triangles in yellow). Ask them to think about what each shape will be after they build it. Then have them cut out and build the shapes.

c) Distribute BLM 3-D Shapes (3). Have students identify the shape of each face. They can color each shape a different color (e.g., squares in blue, triangles in yellow, pentagons in green). Ask them to think about what each shape will be after they build it. Then have them cut out and build the shapes.

d) Have students divide all of the shapes from BLM 3-D Shapes into two groups: ones with “prism” in the name and ones with “pyramid” in the name. Then have them turn the shapes over so the name sides are facing down. ASK: What is the difference between a prism and a pyramid? (pyramid has a point on top) What shapes are the sides of the prisms? (rectangles, squares) What shapes are the sides of the pyramids? (triangles) SAY: Prisms and pyramids can
start with any kind of polygon on the bottom. The sides of prisms are rectangles or squares and the top of the prism is the same shape as the bottom. The sides of pyramids are triangles and the tops are points.

2. a) Have students complete BLM Prisms.

b) Have students complete BLM Pyramids.

Answers
a) 1. circle first, third, and fourth shapes; 2. circle first and second shapes; 3. circle first, second, fourth, and fifth shapes
b) 1. circle second and fifth shapes; 2. circle second shape; 3. circle second, third, and fourth shapes

3. Introduce cylinders. In advance, place a piece of paper over a quarter, rub the paper with a pencil, cut out the shaded circle, then turn both the paper and the coin and repeat to make a two-sided paper coin. Show students the paper coin. Ask students to identify the shape. (circle) Then show them a real quarter and ask them to identify the shape again. (a circle) Have students look at both coins from the side and ASK: How are they different? (the real coin is thicker) SAY: The real coin has thickness. It is a 3-D shape. To make thickness more visible, place several quarters in a stack. SAY: This shape is called a cylinder. Write “cylinder” on the board. SAY: A cylinder has a circle on the top and bottom, but a cylinder is not flat like a circle.

Have students complete BLM Cylinders.

Answers: 1. circle second and fifth shapes; 2. circle second and fourth shapes; 3. circle third, fifth, and sixth shapes

4. Introduce cones. Give each student the shapes cut out from BLM Cones (1). Show them how to roll each shape into a cone. Students place their cones on a sheet of paper with the open part facing down, and trace the bases. They then cut out the circles and tape them to the bottom of the cones. SAY: The shape you made is called a cone. Write “cone” on the board. SAY: A cone has a flat face in the shape of a circle. It comes up to a point from the circle.

Have students complete BLM Cones (2).

Answers: 1. circle first and fifth shapes, 2. circle third and sixth shapes, 3. circle first and sixth shapes
Goals
Students will recognize equal parts of a whole as a fraction.
Students will name fractions using words.

PRIOR KNOWLEDGE REQUIRED
Can identify triangles, rectangles, and squares

MATERIALS
large paper rectangle with one side colored red
dpaper squares, two per student
scissors
BLM Game Cards (pp. U-2–3)
BLM Naming Fractions (pp. S-90–91)
BLM Coloring Fractions (p. S-92)
colored pencils
BLM Matching Fractions (pp. S-93–95, see Extension)

Introduce halves. Draw on the board:

SAY: The line cuts the rectangle into two parts. ASK: What shape are the parts? (rectangles) Are the two rectangles the same size? (no) Erase the line and draw a vertical line closer to the right side of the rectangle. ASK: Are the two rectangles the same size now? (no) Have a volunteer draw a line to divide the rectangle into two parts of the same size. ASK: What do we call each part when they are both the same size? (half) PROMPT: When you share a sandwich with a friend, you cut it in half. SAY: We cut the rectangle in two parts of the same size with a line. Each part is called a half. The two parts are called halves.

Folding shapes in half. Hold up a large paper rectangle that is white on one side and red on the other side. SAY: I want to fold the rectangle in half. Fold the rectangle into two rectangles with the white side on the outside so that it is obviously not divided in half. Show students the folded rectangle with the smaller piece facing forward so that they see a white flap over a red rectangle. ASK: Is the rectangle folded in half? (no) Is this front part bigger or smaller than half? (smaller) How can you tell? (the red part sticks out) Turn the folded rectangle around so that the white side faces out. ASK: Is it folded in half now? (no) Why not—is the red part sticking out? (the red part sticks out at the back). SAY: I will fold it again in two pieces that match exactly so that nothing sticks out, front or back. Demonstrate matching
up sides of the rectangle so that it is folded in half with the white side still facing out. Unfold the rectangle. ASK: What shape is each folded half? (rectangle) Are the two new rectangles the same size? (yes) How do you know? (because when we fold, they match exactly) SAY: When we fold a rectangle into shapes that match exactly, with nothing sticking out, we have folded it in half.

**ACTIVITY 1**

Give each student a paper square. Have students fold the square in half as many ways as they can. (2 rectangles or 2 triangles, if the square is folded diagonally)

**Exercises**

1. Is the shaded part more than half a square?
   
   a)  
   b)  
   c)  
   d)  
   e)  
   f)  

   **Answers:** a) yes, b) no, c) no, d) no, e) yes, f) yes

2. Is the shaded part half a circle?
   
   a)  
   b)  
   c)  
   d)  

   **Answers:** a) yes, b) no, c) no, d) yes

**Other ways to make half.** Fold your rectangle in half along a diagonal, then unfold it. ASK: Are the parts the same shape? (yes) Which shape? (triangle) Do you think they are the same size? (yes) Refold the rectangle the same way. ASK: Do the parts match exactly? (no) SAY: Even though the parts do not match exactly when I fold them, the parts are still the same size and the rectangle is still cut in half. Demonstrate cutting the rectangle along the fold and then overlaying the parts so that they match exactly. SAY: Now we know three ways to cut a rectangle in half. Draw on the board:

![rectangle folded in half]

SAY: Each rectangle has two parts that are the same shape and size.

**Exercises:** Is the shaded part more or less than half?

a)  
   b)  
   c)  
   d)  

Teacher Resource for Grade 2
**Bonus**

e) ![Shaded Triangle](image)

**Answers:** a) less, b) more, c) more, d) less, Bonus: e) more, f) less

Have volunteers draw a new line to divide each shape in the exercises above in half.

**Equal parts.** Give each student a new paper square and ask them to fold it in half any way they want. Next, have them fold the square in half again without unfolding it first. Then have them unfold their square. **ASK:** How many parts are there now? (4) Are the parts the same size and shape? (yes) Do they match exactly? (yes) Are they equal? (yes) Are they in half? (no) Why not? (there are 4 parts) **SAY:** Equal parts are not always halves.

For the following exercises, draw the pictures one at a time, and ask students to signal how many equal parts are in each picture.

**Exercises:** How many equal parts are there?

- ![Four Lines](image)
- ![Circle](image)
- ![Triangle](image)

**Answers:** a) 3, b) 4, c) 2, d) 4, Bonus: 6

**Introduce fourths.** **SAY:** When a shape like a square has four equal parts, each part is called one **fourth.** Sometimes, we say one **quarter** instead of one fourth. For example, we say “a quarter” when we talk about money. Write “one half” and “one fourth” on the board and have students practice saying them aloud. Draw on the board:

![One Half](image) ![One Fourth](image)

Point to each shape and **ASK:** What part is shaded? Give all students the opportunity to become comfortable with identifying and saying “halves” and “fourths.”

**Does the square have one fourth shaded?** Draw and write on the board:

![Shaded Squares](image)

Are there 4 parts?
Are all parts equal?
Is 1 part shaded?
Is one fourth shaded?
Point to the first square and ASK: Are there four parts in total? (yes) Are all parts equal? (yes) Is one part shaded? (yes) So, is one fourth shaded? (yes) SAY: If we answer “no” to any of the questions on the board, the answer to “Is one fourth shaded?” would be no. Repeat with the second and third squares. Have students signal the answers. (yes, no, yes, no; no, yes, yes, no) Pointing to the third square, ASK: What do we call the shaded part for this square? (a half) Point to the fourth square and ASK: Is one fourth shaded? (yes) How do you know? (there are 4 parts, all parts are equal, 1 part is shaded) Point to the last square and ASK: Is one fourth shaded? (no) Why not? (2 parts are shaded)

**Exercises:** Is one fourth shaded? How do you know?

a)  b)  c)  d) 

**Answers:** a) no, not divided into 4 parts; b) no, 3 parts shaded; c) yes, 4 parts, all parts equal, 1 part shaded; d) no, parts not equal

**How many fourths?** Draw the pictures shown below without the words. ASK: Do all of the pictures have four equal parts? (yes) Do all of them show one fourth? (no) SAY: Each of the four equal parts is one fourth. To say how much of each circle is shaded, we can count the fourths. Point to each circle one at a time and ASK: How many fourths are shaded? As students answer, write the words below each picture. The final pictures should look like this:

- one fourth
- three fourths
- two fourths
- two fourths

Draw on the board:

a)  b)  c)  d) 

Pointing to each circle in turn, ASK: Are three fourths shaded? How do you know? (a) no, only 2 parts are shaded; b) yes, there are 4 equal parts, 3 parts are shaded; c) no, not divided into 4 parts; d) no, parts are not equal)

**Introduce thirds.** Draw on the board:

ASK: Are the parts of the rectangle halves? (no) Fourths? (no) How many parts are there? (3) Are they equal parts? (yes) SAY: When a shape has three equal parts, each part is called one *third*. Write “thirds” below the rectangle.
SAY: We can show thirds in other shapes too. Draw on the board:

Shade one third of any picture and ASK: Is one third shaded? (yes) How do you know? (there are 3 equal parts, 1 part is shaded) PROMPT: How many parts should there be? (3) Does the shape have three parts? (yes) What is important about the parts? (they should be equal parts) Are they equal parts? (yes) How many should be shaded? (1) Is one part shaded? (yes)

**Exercises:** Is one third shaded? How do you know?

- a) ![Image 1](image1.png)
- b) ![Image 2](image2.png)
- c) ![Image 3](image3.png)
- d) ![Image 4](image4.png)

**Answers:**

- a) no, 2 parts shaded; b) no, not divided into 3 parts; c) no, parts not equal; d) yes, 3 parts, all parts equal, 1 part shaded

Point to part a) above and SAY: This shape has three equal parts but two of them are shaded. ASK: What do we call the shaded part of the rectangle? (two thirds)

**Exercises:** Are two thirds shaded? How do you know?

- a) ![Image 5](image5.png)
- b) ![Image 6](image6.png)
- c) ![Image 7](image7.png)
- d) ![Image 8](image8.png)

**Answers:**

- a) no, not equal parts; b) yes, 3 equal parts, 2 shaded; c) no, 3 parts shaded; d) no, not divided into 3 parts

**ACTIVITY 2**

Have students play **I Have _____, Who Has _____?** (see unit introduction). In advance, make cards using **BLM Game Cards.** In the top part of a card, write a fraction. Fill in the bottom of the card with a picture of a different fraction. (See example in margin.) Use only fractions covered in the lesson (one or two halves; one, two, or three thirds; one, two, three, or four fourths). Vary the positions of the shaded parts.

**Introduce fractions.** SAY: One half, two thirds, and three fourths are called fractions. A fraction tells how much of a whole shape is shaded.
Exercises: What is the shaded fraction?

a) ![Fraction](image1)

b) ![Fraction](image2)

c) ![Fraction](image3)

d) ![Fraction](image4)

Bonus: ![Fraction](image5)

Answers: a) two thirds, b) three fourths, c) one third, d) two fourths, Bonus: two halves

For extra practice, have students complete BLM Naming Fractions. (see answers below)

1. X, X; 2. √, X, √, X; 3. X, √, √, X; 4. X, √, √, X; 5. X, √, X, X

Coloring fractions. Draw a square divided into fourths on the board and ask a volunteer to color one fourth. Draw a new square and ask a volunteer to color three fourths. Then draw a shape divided in thirds and have a volunteer color one third. SAY: Let’s make this a little harder. Draw three squares—one divided in half, one in thirds, and one in fourths. Ask a volunteer to color one third. ASK: How did you decide which square to color? (the square that has 3 parts) Do one or two more similar examples on the board.

Have students complete BLM Coloring Fractions. (see answers below)

1. ![Fraction](image6)

2. ![Fraction](image7)

3. ![Fraction](image8)

4. ![Fraction](image9)

Making a whole. Draw on the board:

Pointing to the first circle, ASK: How much of the circle is shaded? (the whole circle) How many parts are there? (2) What is each part called? (a half) How many halves are shaded? (2) How many halves make a whole? (2). Repeat for the next two pictures to establish that three thirds make a whole and four fourths make a whole.

Extensions

1. Teach students the following sequence: half, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth. Have them play Memory (see unit introduction) using cards from BLM Matching Fractions.

(MP6) 2. Explain to a partner what “one third” means, what “one fourth” means, and how they are different. Draw pictures to help explain.
**Goals**

Students will partition rectangles into equal parts, and they will recognize that equal shares of identical wholes need not have the same shape.

**PRIOR KNOWLEDGE REQUIRED**

- Can name fractions using words
- Knows fractions as equal parts of a whole
- Can identify triangles, rectangles, and squares

**MATERIALS**

- 4 large paper squares
- BLM Comparing Halves (p. S-96), one section for each pair of students
- Scissors
- Eating Fractions by Bruce McMillan or Two Greedy Bears by Mirra Ginsburg (see Extension 1)
- Pattern blocks or blocks from BLM Pattern Blocks (p. S-63, see Extensions 3 and 4)

### Dividing shapes.

Draw on the board:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>

Have a volunteer join the dots. **ASK:** How many lines did you draw? (1) How many parts are there? (2) What fraction is each part? (a half) Repeat with the following shapes:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

(2 lines cut the shape into 3 equal parts, 3 lines cut the shape into 4 equal parts) **Ask** students if they see a pattern. **SAY:** Drawing one line cut the rectangle into 2 parts. If the lines do not cross, two lines cut the rectangle into three parts, three lines cut it into four parts, and so on. **ASK:** How many parts do you think there would be if I drew six lines? (7). **Draw** a rectangle divided by six lines on the board to check students’ predictions.

**SAY:** Cutting a rectangle into smaller parts is called *dividing* the rectangle.

### Dividing shapes in different ways.

Fold three paper squares as shown below:

- a)  
- b)  
- c)  

---

**STANDARDS**

2.G.A.2, 2.G.A.3

**VOCABULARY**

divide  
equal  
fraction  
half  
halves  
part  
rectangle  
shape  
square  
triangle
Hold up square a) and SAY: This square was divided into two rectangles that are taller than they are wide. Hold up square b) and SAY: This square was divided into rectangles that are wider than they are tall. Do you think the tall rectangles are the same size as the wide rectangles? (yes) Cut square b) along the dividing line and put the rectangles on top of square a) to show the parts are all the same size. SAY: Even though we cut the two squares into halves in different ways, the halves are the same size.

Shade half of square a) and square c) and hold them up. SAY: In square a), the shaded part is a rectangle. In square c), the shaded part is a triangle. Point to square a) and SAY: This shaded rectangle is half of this square. Point to square c) and SAY: This shaded triangle is half of this square. ASK: Do you think the shaded halves are the same size? After students have discussed the question, SAY: Let’s show that they are the same.

**ACTIVITY**

Give each pair of students a section of BLM Comparing Halves. Each student cuts out one square and then cuts it in half along the dividing line. Then have students trade halves with their partners so that each student has a rectangle and a triangle. Affix your triangle to the board with the right angle on the bottom left. Have students place their triangle in front of them in the same orientation. Demonstrate how to put the rectangle on top of the triangle so that the bottom sides line up, as shown below:

Draw a line to mark off the extra part of the triangle that sticks out above the rectangle and cut off the extra part. Have students do the same. Then have students rearrange the small piece of the triangle to make the rectangle. Have a volunteer demonstrate the solution on the board, as shown below:

ASK: Which one is bigger, the triangle or the rectangle? (they are the same size)
Extensions

1. Read one of the following books to the class:
   - *Eating Fractions* by Bruce McMillan. Different foods are divided into halves, thirds, and fourths.
   - *Two Greedy Bears* by Mirra Ginsburg. The bears do not know how to divide a round slab of cheese into two equal parts. A fox finds a solution to his advantage, but not to the bears’ advantage. ASK: How would you divide the cheese? How would you divide a square slab? A triangular slab?

2. **Why is 25¢ called a quarter?** ASK: How many quarters are in one dollar? (4) What fraction of a dollar is 25¢? (one fourth) What is another name for that fraction? (a quarter) SAY: The 25-cent coin is called a quarter because 25¢ is a quarter of a dollar.
   a) How many cents are in half a dollar?
   b) How many cents are in three fourths of a dollar?

   **Answers:** a) 50, b) 75

3. Distribute one square and two triangles from BLM Pattern Blocks.
   ASK: Which is bigger, one square or two triangles? Cut one triangle in half and place all three triangle pieces on the square, as shown below:

   ![Diagram](image)

   The triangles do not quite cover the square, so the square is bigger.

4. Give students pattern blocks or BLM Pattern Blocks. Have a volunteer identify a hexagon and then ask students to hold up their own hexagons. Show students a triangle and ASK: How many triangles are needed to cover a hexagon? Have students use their triangles to cover the hexagon. (6) SAY: This means that the triangle is one sixth of the hexagon. Have students find a block that covers half the hexagon so that only two of those blocks are needed to cover the hexagon. (a trapezoid) Repeat for one third of the hexagon. (a rhombus) You might also ask students to find half of the rhombus (a triangle) and one third of the red trapezoid. (a triangle)

   **(MP2)**

5. Is it possible for one quarter of a pie to be bigger than one half of another pie? Show your thinking with a picture.

   **Answer:** Yes, if one pie is a lot bigger than the other:

   ![Pie Diagram](image)

   Look for students to create a suitable model for one quarter of a pie and one half of another pie and to recognize what has to be true in their models for the real-world situation to hold (MP2): one pie has to be quite a bit bigger than the other (see example in margin).
Goals

Students will divide rectangles into same-size squares and use addition and skip counting to find the total number of squares; they will write addition sentences for the number of squares.

PRIOR KNOWLEDGE REQUIRED

Can write repeated additions from visual representations
Can add 3 or more one-digit numbers
Can skip count by 2s, 3s, and 5s

MATERIALS

BLM Triangle Patterns (p. S-97), one section per student
scissors
tape
1 cm grid paper or BLM 1 cm Grid Paper (p. U-1)
20 pattern block squares, or 20 squares from BLM Pattern Blocks (p. S-63), or 20 one-centimeter connecting cubes per student (see Extensions 1 and 2)
BLM Patterns (p. S-98, see Extension 3)

Finding the number of squares in a rectangle. On the board, draw a grid with 3 rows and 5 columns. Draw a dot in each square. Pointing at the top row, ASK: What do we call a line of dots that goes across like this? (a row) What do we call a line of dots that goes up and down? (a column) How many circles are in each row? (5) Write “5” beside the first row. ASK: How many rows are there? (3) Have a volunteer write an addition sentence for the number of dots. The final picture should look like this:

\[
\begin{array}{ccccc}
\cdot & \cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot & \cdot \\
\end{array}
\]

\[5 + 5 + 5 = 15\]

Draw the same grid as before without the dots. SAY: I want to know how many little squares are in the rectangle. ASK: Can I count the squares the same way we counted the dots? (yes) Shade the top row of squares, as shown below:

\[
\begin{array}{ccc}
\square & \square & \square \\
\square & \square & \square \\
\square & \square & \square \\
\end{array}
\]

ASK: Is the shaded part of the rectangle a row or a column? (row) How many rows are there in this rectangle? (3) Count the rows to verify.
this on the board. Draw several more rectangles made of squares with different numbers of rows and ask students to tell you the number of rows in each rectangle.

Pointing to the first rectangle, ASK: How many squares are in the first row? (5) Count the squares to verify. Write “5” beside the first row. ASK: How many squares are in the second row? (5) Have a volunteer count the squares in the second row. Write “5” beside the second row. ASK: How many squares are in the third row? (5) Do we need to count again to be sure? (no) Why not? (the same number of squares are in each row) Write “5” beside the third row. ASK: Can we use these numbers to write an addition for the number of squares in the rectangle? (yes) What will we add? (5s) How many 5s will we add? (3) SAY: We will add 5 three times because there are 3 rows. Have a volunteer write the repeated addition on the board:

\[ 5 + 5 + 5 \]

Repeat with the following rectangle:

\[
\begin{array}{cccc}
6 & & & \\
6 & & & \\
6 & & & \\
6 & & & \\
\end{array}
\]

(6 + 6 + 6 + 6)

**Exercises:** Write an addition for the total number of squares.

a)    b)

\[ 3 + 3 + 3 + 3, \quad 5 + 5, \quad 7 + 7 + 7 \]

**Answers:** a) 3 + 3 + 3 + 3, b) 5 + 5, c) 7 + 7 + 7

**Skip counting by rows.** Draw a rectangle with 2 rows and 5 columns. SAY: It is too much work to count every square. We know all the rows have the same number of squares. ASK: How many squares are in each row? (5) Write “5” beside the first row. Point to the second row and SAY: There are 5 squares in the first row and 5 squares in this row. ASK: How many squares are there in total? (10) Write “10” beside the second row. ASK: What addition sentence can we write? (5 + 5 = 10) Write the addition sentence beside the second row.
Add another row of squares. **ASK:** How many squares did I add? (5) How many squares are there now? (15) How do you know? (10 + 5 = 15) Write “15” and “5 + 5 + 5 = 15” beside the third row. Repeat with another row. The final picture should look like this:

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SAY:** We add 5 each time. This means we can skip count to find the total number of squares in the rectangle.

Draw a rectangle with 4 rows and 2 columns. **ASK:** How many squares are in each row? (2) What can we skip count by to count the squares? (2s) Have students skip count by 2s as a class, and write the number of squares beside each counted row. (2, 4, 6, 8)

**Exercises:** Count the squares in the top row. Skip count to find the total number of squares.

a) ![Image](image1)

b) ![Image](image2)

**Bonus:** ![Image](image3)

**Answers:** a) 5, 30; b) 2, 14; Bonus: 3, 18

**Making rectangles out of squares.** Draw a square on the board. **SAY:** We know some ways to divide a square into quarters. Have volunteers draw a few different ways. **ASK:** Are any squares divided into smaller squares? (yes) Which one? (see answer in margin)
ASK: How many rows are there? (2) Write “2 rows” on the board. 
SAY: Remember, columns go up and down. How many columns are there? 
(2) Write “2 columns.” How many small squares are there? (4) Write 
“4 squares,” as shown below:

2 rows  
2 columns  
4 squares

SAY: We can divide rectangles into squares too. Draw on the board:

SAY: If we connect the dots, we will divide the rectangle into squares. 
ASK: Which way do we draw lines to divide into rows, up and down or 
across? (across) Have a volunteer join the dots to divide the rectangle 
horizontally. ASK: How many rows are there? (2) Write “2 rows” on the 
board, as shown below:

2 rows

Have another volunteer join the dots to divide the rectangle into columns. 
ASK: How many columns did we make? (3) Write “3 columns.” ASK: How 
many small squares are there? (6) Write “6 squares.” The final picture 
should look like this:

2 rows  
3 columns  
6 squares

Have students complete Questions 14–18 on AP Book 2.2 p. 199.

**ACTIVITY**

Give each student one section of BLM Triangle Patterns and have 
them cut out all of the triangles.

Have students tape a gray triangle and a white triangle together to 
make a larger triangle. ASK: Does the triangle you made have a 
square corner? (no) Ask them to make 12 such triangles, then tape 
two of the triangles of the larger size together to make a rhombus. 
Have a volunteer tape their rhombus to the board. Then have students 
make six rhombuses, and make a pattern of their choice using the 
rhombuses. The pattern should have the rhombuses meet so that they 
always share a side, as shown in the margin.
Extensions

Distribute 20 pattern block squares or squares from BLM Pattern Blocks or 1 cm connecting cubes, and 1 cm grid paper or BLM 1 cm Grid Paper.

(MP1) 1. a) Use 12 squares to make as many different rectangles as you can. Then copy them onto grid paper. Count the rows and columns.

b) Explain how you know you found all the possible rectangles.

Sample answer: b) I tried all the numbers from 1 to 12 as the number of rows. I made one column at a time with that number of rows until I used 12 squares. If the shape was a rectangle, I copied it on grid paper. 5, 7, 9, 10, and 11 rows did not make a rectangle.

Answers

a) 1 row, 12 columns

2 rows, 6 columns

3 rows, 4 columns

4 rows, 3 columns

6 rows, 2 columns

12 rows, 1 column

2. Use 20 squares to make as many different rectangles as you can. Then copy them onto grid paper. Count the rows and columns.

Answers: 1 row, 20 columns; 2 rows, 10 columns; 4 rows, 5 columns; 5 rows, 4 columns; 10 rows, 2 columns; 20 rows, 1 column

3. Give students BLM Patterns and have them copy the small pattern of their choice onto grid paper. Tell them to start by outlining a grid of the appropriate size. Then have them proceed row by row or section by section to reproduce the pattern. After they are done, challenge students to try one of the larger patterns.
4. Amy makes a rectangle with 5 squares in each row and 3 rows. How many squares does she use altogether?

   **Answer:** 15

5. Josh makes a rectangle with 4 squares in each row and 6 rows. How many squares does he use altogether?

   **Answer:** 24
Goals
Students will solve problems and puzzles involving polygons and fractions.

PRIOR KNOWLEDGE REQUIRED
Can identify polygons
Can write repeated additions from visual representations
Can add 3 or more one-digit numbers
Can draw polygons using dot paper
Can draw fractions as equal parts of a whole

MATERIALS
BLM Tangram (p. S-99), one section per student
scissors
BLM Tangram Puzzles (pp. S-100–103)
1 cm grid paper or BLM 1 cm Grid Paper (p. U-1)
colored pencils
access to an online tangram applet for each student (optional)
Grandfather Tang’s Story by Ann Tompert
BLM Always, Sometimes, Never (pp. S-104–105, see Extension)
BLM Attribute Shapes (pp. S-58–60, see Extension)

NOTE: This lesson in the AP Book reviews what has been done in the unit to this point. Students can complete the questions either before or after the lesson. In this lesson, students compose shapes and create tessellations (repeated tilings).

Tangrams. Give each student one section of BLM Tangram. Have students cut out the shapes and solve the following sequence of puzzles.

Exercises
1. a) Create a square using only 1 shape.
   b) Create a square using only 2 shapes.
   Bonus: Create a square using 3 shapes: 2 small triangles and 1 medium triangle.

Answers
a) b) c)
2. Create a square using 4 triangles. Hint: Only use one large triangle.

Answer

3. a) Create a triangle using 4 triangles.

b) Counting the outside triangle, how many triangles are in the shape you made? Hint: Can you take away a triangle and still have a triangle left?

Answers
a)

b) 7, the outside triangle, each of the 4 pieces is a triangle,

plus and

4. Find two ways to create this shape using only 2 shapes.

Sample answers

5. a) Give students BLM Tangram Puzzles. The pictures on the BLM are made up of tangram shapes. Have students match their tangram shapes to the outlines on the BLM to create the pictures.

Answers

b) To make the task a little more challenging, give students smaller versions of the pictures and have them create the shapes using the pictures as reference (instead of matching shapes to the outlines on the BLM).
Individual or small-group follow-up: Tell students to start by identifying the largest triangle in each picture and place the largest triangle from their set of tangrams in that position. Have them add the other shapes one by one by identifying the position of each new shape in relation to the shapes already in place.

6. Have students create squares using from one to five tangram shapes. ASK: How many different squares can you create? Repeat with rectangles, quadrilaterals, pentagons, and hexagons.

Sample answers

7. a) Create a square using tangram pieces. The more pieces you use, the harder it will be. Shade each piece a different color. Copy your square onto grid paper or BLM 1 cm Grid Paper. Turn the square a quarter turn or a half turn, and copy it again beside the first square. Repeat several times to make a quilt.

Sample answer

b) Have students find larger shapes within their quilt that also repeat.

**ACTIVITIES 1–2**

1. Students can use online tangram applets to create and solve puzzles. Search using the terms "tangram applet" and "tangram puzzle."

2. Read Grandfather Tang's Story by Ann Tompert to the class. Grandfather tells a story of a shape-shifting fox. Students can use tangram pieces to recreate the animals illustrated in the story.
Extensions

NOTE: The cards on the first page of BLM Always, Sometimes, Never describe easier properties of polygons than those on the second page of the BLM.

1. **Always, Sometimes, Never.** Use the cards from BLM Always, Sometimes, Never and shapes from BLM Attribute Shapes (1) to (2). Each player picks a card and decides whether the statement is always true, sometimes true, or never true. If the answer is always or never true, the player sorts the shapes to illustrate the answer. If the answer is sometimes true, the player has to find two shapes that illustrate that the statement is true for one and not true for the other. Students can check each other’s answers.

Examples:

- Triangles are striped. **Sometimes true.** Alexa finds 2 triangles, one striped and one not striped.
- Triangles have 3 sides. **Always true**
  To show that all triangles have 3 sides, Jon sorts the shapes into two groups: triangles and not triangles.

(MP3, MP6) 🐘 2. In pairs, have students take turns choosing a statement from Extension 1 where they selected “always true” or “never true,” and explaining why the statement is always true or never true. Do partners agree with each other? Have them discuss why or why not.

**NOTE:** Encourage partners to ask questions to understand and challenge each other’s thinking (MP3) and use of math words (MP6)—see p. A-43 for sample sentence and question stems to guide students.
Attribute Shapes (I)
Attribute Shapes (2)
Attribute Shapes (3)
Find Closed Lines

☐ Draw X on the lines that are **not** closed.

☐ Circle the closed lines.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 

Who wins: X, O, or nobody? ____________________________
Sides and Vertices

☐ Count the sides.
☐ Count the vertices.

1.

2.

3.

4.

5.

6.

7.

8.

9.

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices

____ sides
____ vertices
Pattern Blocks
Find the Squares

☐ Use a pattern block square to see if it matches the shape.
☐ Cross out the shapes that are **not** squares.

1. 🟢
2. 🟢
3. 🟢
4. 🟢
5. 🟢
6. 🟢
7. 🟢
8. 🟢
9. 🟢
10. 🟢
11. 🟢
12. 🟢
13. 🟢

Write the letters that are left. _____ _____ _____ _____ _____
Squares and Rectangles
Identifying Polygons

- Color the triangles blue.
- Color the quadrilaterals orange.
- Color the pentagons green.
- Color the hexagons yellow.
Matching Polygons (I)

triangle

triangle

quadrilateral

quadrilateral

pentagon

pentagon

hexagon

hexagon
Matching Polygons (2)

triangle

triangle

quadrilateral

quadrilateral

pentagon

pentagon

hexagon

hexagon
Space Polygons

☐ Color the quadrilaterals black.
☐ Color the pentagons red.
☐ Color the hexagons blue.
☐ Color the shapes with 7 sides green.
☐ Color the shapes with 8 sides yellow.
Naming Polygons

triangle
pentagon

quadrilateral
hexagon

☐ How many sides? How many vertices?
☐ Name the shape.

1. _____ sides
   _____ vertices

2. _____ sides
   _____ vertices

3. _____ sides
   _____ vertices

4. _____ sides
   _____ vertices

5. _____ sides
   _____ vertices

6. _____ sides
   _____ vertices

7. _____ sides
   _____ vertices

8. _____ sides
   _____ vertices
Polygons and Geoboards

☐ Draw the shape.

1. triangle

2. quadrilateral

3. pentagon

4. hexagon

5. rectangle

6. square
Copy the circled dots.
Geoboards (2)

☐ Copy.
Geoboards (3)

☐ Copy.
Shapes in Flags

☐ What shapes do you see in the flags? Write X or ✓.

1. The Bahamas

☐ circle
☐ triangle
☐ quadrilateral
☐ pentagon
☐ hexagon

2. United Kingdom

☐ circle
☐ triangle
☐ quadrilateral
☐ pentagon
☐ hexagon

3. Namibia

☐ circle
☐ triangle
☐ quadrilateral
☐ pentagon
☐ hexagon

4. BONUS

Choose one flag. Color one of each shape you found.
Polygon Word Search

☐ Find the words in the puzzle.

1. heptagon  hexagon  octagon  pentagon
   polygon  rectangle  square  triangle

   i   p   a   h   m   d   t   o   r
   h   e   o   e   n   e   r   c   e
   e   n   t   x   h   e   i   t   c
   p   t   w   a   o   r   a   a   t
   t   a   d   g   s   e   n   g   a
   a   g   p   o   l   y   g   o   n
   g   o   a   n   r   c   l   n   g
   o   n   h   p   u   z   e   z   l
   n   l   e   s   q   u   a   r   e

☐ Write the leftover letters using the reading pattern.

2. _____  _____  _____  _____  _____  _____  _____  _____
   _____  _____  _____  _____  _____  _____  _____  _____
   _____  _____  _____  _____  _____  _____  _____  _____
   _____  _____  _____  _____  _____  _____  _____  _____
Polygon Cards (I)

☐ Compare the length of the sides.
☐ Color the sides. Use the same color for equal sides.

1.

2.

3.

4.

5.

6.
Polygon Cards (2)

☐ Use a centimeter ruler to measure the sides.
☐ Color the sides. Use the same color for equal sides.

7. 

8. 

9. 

10. 

11. 

12. 

Find the Rhombuses

☐ Cross out the shapes that are not rhombuses.
☐ Measure the sides of shapes that might be rhombuses.
☐ Color the rhombuses.

1. ______ cm ______ cm
   ______ cm

2. ______ cm ______ cm
   ______ cm

3. ______ cm ______ cm
   ______ cm

4. ______ cm ______ cm
   ______ cm ______ cm

5. ______ cm ______ cm
   ______ cm ______ cm

6. ______ cm ______ cm
   ______ cm ______ cm

7. ______ cm ______ cm
   ______ cm

8. ______ cm ______ cm
   ______ cm

Copyright © 2014–2019 JUMP Math: To be Copied. US Edition
Triangle Paper
Cube

☐ Cut out the shape.
☐ Fold along the solid lines.
☐ Use the tabs to glue the cube together.
3-D Shapes (I)

- Triangular Prism
- Rectangular Prism
3-D Shapes (2)

Square Pyramid

Triangular Pyramid
3-D Shapes (3)

Pentagonal Pyramid

Pentagonal Prism
Circle the prisms.

1. [Images of various 3D shapes, some labeled as prisms and some as not prisms]

2. [Images of various 3D shapes, some labeled as prisms and some as not prisms]

3. [Images of various 3D shapes, some labeled as prisms and some as not prisms]
Pyramids

Circle the pyramids.

1.

2.

3.
Cylinders

☐ Circle the cylinders.

1.

2.

3.
Cones (I)
Cones (2)

☐ Circle the cones.

1.

2.

3.
Naming Fractions (I)

In a fraction, all the parts are the same size.

- ✔️ the pictures that show the shaded fraction.
- ✗ the pictures that do not show the shaded fraction.

1. one fourth

2. one half

3. one half

4. one fourth

5. one third
Naming Fractions (2)

☐ Match the shaded circle with the fraction.

6. 
- one half
- one fourth
- one third

7. 
- three fourths
- two fourths
- three thirds

8. 
- two thirds
- four fourths
- two halves
- two fourths
Coloring Fractions

☐ Color the correct fraction.

1. two thirds

2. one half

3. one quarter

4. two quarters
Matching Fractions (I)

- One half
- One third
- One fourth
- One fifth
- One sixth
- One seventh
Matching Fractions (2)

- one eighth
- one ninth
- one tenth
- two thirds
- three fourths
- two fifths
Matching Fractions (3)

- five fifths
- four sixths
- three sevenths
- three eighths
- two ninths
- nine tenths
Comparing Halves

Diagram of comparing halves.
Triangle Patterns
Tangram
Tangram Puzzles (I)

A bunny
Tangram Puzzles (2)

A person
Tangram Puzzles (3)

A boat
Tangram Puzzles (4)

A windmill
Always, Sometimes, Never (I)

- Triangles are striped.  
- Triangles have 3 sides.

- Triangles have 4 vertices.  
- Squares are dotted.

- Squares have 4 vertices.  
- Squares have 2 vertices.

- Circles have a vertex.  
- Rectangles have 4 sides.
Always, Sometimes, Never (2)

Hexagons have 4 vertices.  
Quadrilaterals have 4 sides.

Triangles have no curved sides.  
Hexagons have 6 vertices.

Pentagons can have curved sides.  
Pentagons have equal sides.

Squares are quadrilaterals.  
Hexagons have 7 sides.
This Unit in Context

In Kindergarten, students classified objects into given categories, counted the numbers of objects in each category, and sorted the categories by count (K.MD.B.3). Their work in Kindergarten and Grade 1 on counting and comparing numbers allowed students to answer questions about the total number of data points, how many are in each category, and how many more or less are in one category than in another (1.MD.C.4). They used that knowledge to obtain the answers to those questions from a chart or picture graph.

In this unit, students will use picture graphs, tally charts, and bar graphs to display and interpret information (2.MD.D.10). Students will read, interpret, and draw picture graphs, tally charts, and bar graphs. They will use the knowledge, learned in 2.2 Unit 3, of counting by 5s starting at zero when they draw and interpret tally charts (2.MD.D.10). Students will use their knowledge of line plots from 2.2 Unit 5 to compare picture graphs, bar graphs, and line plots.

In this unit, the concept of scale on a bar graph or picture graph is restricted to a single-unit scale. In Grade 3, this will extend to scales where each square in a bar graph or picture in a picture graph could represent more than one object (3.MD.B.3).

Students will also use their knowledge of addition, subtraction, number comparison, and one-step word problems from earlier in the year to answer “put together,” “take apart,” and compare problems that are posed through graphical information (2.MD.D.10). In Grade 3, students will solve two-step comparison problems using information presented in scaled bar graphs (3.MD.B.3).

Work on data management from Kindergarten through Grade 5 prepares students for the study of statistics, which begins in Grade 6 and continues through high school.

Sorting data into categories will also be important in Geometry when students start forming categories of shapes in Grade 3 (3.G.A.1) and continue refining and generalizing these categories in Grades 4 and 5 (4.G.A.2 and 5.G.B.3, 4).

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP1 and MP3 to MP8. Here are some examples of how students can show that they have met a standard.

**MP1:** In MD2-44 Extension 2, students look for all the amounts of money that can be made using exactly two coins. Students make sense of the problem when they read the question carefully and realize that the question is asking for a list of possible amounts of money. Students persevere in solving the problem when they use an organized approach to find all the possible amounts.
MP4: In MD2-45 Extension 1, students model mathematically when they use addition and subtraction sentences and a table to represent and solve a multi-step, real-world problem involving a class survey.

MP8: In MD2-47 Extension 3, students look for and express regularity in repeated reasoning when they start at 2 and count by 5s in order to find a pattern in the resulting numbers, and then use that pattern to find four-digit numbers that can be found by starting at 2 and adding 5s.
Unit 9 Measurement and Data: Graphs

Introduction

In this unit, students will use picture graphs, tally charts, and bar graphs to display and interpret information. Students will begin by reading and interpreting tally charts and graphs. Then they will draw tally charts, picture graphs, and bar graphs, and answer three types of questions about the graphs: compare, put together, and take apart. In the final lesson, students will compare picture graphs, bar graphs, and line plots. They will be introduced to the concept of outliers in line plots.

Weather calendar. At the start of this unit, post a calendar (or BLM Weather Calendar, p. T-26) in the classroom, and draw a simple picture each day to record the weather. Use the symbols given on the BLM for rainy, sunny, cloudy, and snowy. Record the weather every day, even if there is no math class. Students will use the calendar at the end of the unit to make graphs of the data.

In addition to the BLMs provided at the end of this unit, the following Generic BLMs, found in section U, are used in Unit 9:

- BLM 1 cm Grid Paper (p. U-1)
- BLM 2 cm Grid Paper (p. U-5)
MD2-44  Picture Graphs

Pages 201–204

STANDARDS
2.MD.D.10

VOCABULARY
data
picture graph
symbol

Goals
Students will read and interpret picture graphs and answer questions about the data presented in picture graphs.
Students will complete picture graphs when given quantities for each category.

PRIOR KNOWLEDGE REQUIRED
Can answer compare, put together, and take apart word problems
Can solve simple two-step word problems

MATERIALS
BLM Pet Cards (p. T-27), one of each kind of animal per student tape

How picture graphs are useful. Have students do the following activity to help understand why it is useful to organize information. The data set created will be used in the instructional part of the lesson.

ACTIVITY
In advance, make copies of BLM Pet Cards and cut out the cards. The cards show cats, dogs, fish, and unicorns. Pass out the cards and have each student take the card(s) that represent any pets they own. Students who have pets other than cats, dogs, or fish can choose a unicorn card, and students who have no pets can choose their favorite of the animals pictured. Students should take only one card for each kind of pet. For example, a student with one goldfish and another student with several fish in an aquarium will each take one fish card. The aim of the activity is for everyone to participate in creating a varied collection of cards; accuracy is not important. Have students tape their cards randomly on the board.

Discuss the display of cards as a class. For example, ASK: Are there more cats or fish? How many cats are there? How many dogs? How many fish? Try to ask questions that students will have difficulty answering with certainty because the cards are not organized.

SAY: It’s hard to answer some of these questions because the pictures are all over the place. ASK: What could we do to make it easier? (group the cards by animal) SAY: We will make a picture graph with these cards. Draw a table (with each row a little taller than the cards) on the board, as shown on the next page.
SAY: In a *picture graph*, we put pictures of things in rows or columns so that they are easy to count and compare. The top row in this picture graph is for cats. Move all the cat cards on the board into the top row. ASK: What goes in the second row? (dogs) Have volunteers move the dog cards into the second row. Make sure that students use consistent spacing between cards. Repeat for the remaining two rows.

**Answering questions by using data in a picture graph.** SAY: Let’s think about some of my earlier questions. ASK: Which pet has the most cards? Which has more cards: cats or dogs? Can we tell how many more? (yes) How? (by counting and subtracting or by counting the extras) SAY: Let’s count to see how many pets are cats. Count the cat cards and write the total beside the row. Prompt for the rest of the totals in the table. SAY: The numbers that we use to make the picture graph are called data. SAY: Our data tell us that [number] pets are dogs. ASK: What does our data tell us about how many pets are cats? (answer will vary) Ask some “how many more” or “how many fewer” questions. After each question, write the subtraction and the answer on the board. Ask some “put together” questions, such as “How many students chose fish or unicorns?” After each question, write the addition and final answer on the board. Ask some “take apart” questions, such as “How many pets are not fish?” Guide students to do the question in two ways: add all pets and then subtract fish; add cats, dogs, and unicorns.

Draw on the board:

<table>
<thead>
<tr>
<th>Favorite Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>Red</td>
</tr>
<tr>
<td>Yellow</td>
</tr>
</tbody>
</table>

SAY: A Grade 2 class voted for their favorite color. The choices were blue, green, red, and yellow. The picture graph shows how many students voted for each color. Each happy face symbol stands for 1 vote. ASK: How many people voted for blue? (6) SAY: There are 6 happy face symbols in the column for Blue, so 6 people voted for blue. Write “6” below Blue (for future reference). Do the same with each of the other colors.
Exercises: Use the “Favorite Color” picture graph to answer the question.

a) How many students voted altogether?

b) Which colors got the same number of votes?

c) Which color got the most votes?

d) How many students did not vote for yellow?

Bonus: How many more students voted for blue or green than for red?

Answers: a) $6 + 2 + 4 + 4 = 16$, b) red and yellow, c) blue, d) $16 - 4 = 12$ or $6 + 2 + 4 = 12$, Bonus: $6 + 2 = 8$, $8 - 4 = 4$

Extensions

1. a) The students in Mr. Miri’s class made a picture graph of their favorite vegetables.

<table>
<thead>
<tr>
<th>Favorite Vegetables of Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broccoli</td>
</tr>
<tr>
<td>Carrots</td>
</tr>
<tr>
<td>Corn</td>
</tr>
<tr>
<td>Peas</td>
</tr>
</tbody>
</table>

Use the graph to answer the questions.

i) How many students like each vegetable best?

Answers: broccoli: 3, carrots: 6, corn: 10, peas: 8

ii) How many more students like corn or peas than broccoli or carrots?

Answer: $10 + 8 = 18$, $3 + 6 = 9$, $18 - 9 = 9$

iii) How many fewer students chose a green vegetable than an orange or a yellow vegetable?

Answer: $3 + 8 = 11$, $6 + 10 = 16$, $16 - 11 = 5$

b) Mr. Miri’s class decided to ask all the students in the school about their favorite vegetable. The picture graph was too big to draw. So his students made a different picture graph where each happy face stands for 10 students.

<table>
<thead>
<tr>
<th>Favorite Vegetables of School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broccoli</td>
</tr>
<tr>
<td>Carrots</td>
</tr>
<tr>
<td>Corn</td>
</tr>
<tr>
<td>Peas</td>
</tr>
</tbody>
</table>

Each 🎉 stands for 10 students
Use the graph to answer the questions.

i) How many students in the school like each vegetable best?

**Answers:** broccoli: 20, carrots: 50, corn: 90, peas: 90

ii) How many fewer students like broccoli or carrots than corn?

**Answer:** $20 + 50 = 70$, $90 - 70 = 20$

iii) How many students voted?

**Answer:** $20 + 50 + 90 + 90 = 250$

c) Use both graphs to answer the question. How many more students voted in the school than in the class?

**Answer:** $250 - 27 = 223$

2. a) Find all of the amounts that you can make using two coins. Use any tools you think will help.

b) Explain how you know you found all the possible amounts.

**Sample answers:** a) I used play coins and pencil and paper and found 2¢, 6¢, 10¢, 11¢, 15¢, 20¢, 26¢, 30¢, 35¢, 50¢; b) I know I found all the possible amounts because I went in order from smallest coins to largest coins

**NOTE:** The answer to part a) does not include 50-cent coins. If 50-cent coins are included, the following amounts are also possible: 51¢, 55¢, 60¢, 75¢, 100¢.
Goals
Students will draw and interpret tally charts.
Students will make picture graphs using data given in tally charts.
Students will answer compare, put together, and take apart questions using the data presented in the graphs.

PRIOR KNOWLEDGE REQUIRED
Can read and complete templates for picture graphs
Can answer compare, put together, and take apart word problems
Can solve simple two-step word problems

MATERIALS
30 pipe cleaners
coin
BLM Making a Tally Chart (p. T-28)
red, blue, yellow, and green chalk or erasable markers (optional)
BLM Making a Picture Graph (p. T-29)
transparency of BLM Making a Picture Graph (p. T-29, optional)
overhead projector (optional)

Review skip counting by 5s. As a class, skip count by 5s to 50.

Understanding the need to keep track when counting. Show students a pile of about 30 pipe cleaners and explain that you want to count them. As a class, discuss strategies to keep track of the count (e.g., create small groups, link pipe cleaners). On a desk, put 12 pipe cleaners side by side. SAY: People often keep track of a count by drawing a short line or mark for each thing they count. This way of keeping track of a total is called a tally, and the lines we draw are called tally marks. Draw 12 tally marks (short vertical lines, no grouping) on the board. ASK: Is it easier to count the pipe cleaners or the marks on the board? (it’s the same) Circle two consecutive groups of 5 tally marks on the board and ASK: Is it easier to count the tallies now? (yes) Have a volunteer put the pipe cleaners in groups of 5. Show students that they can bind the groups together using one of the 5 pipe cleaners. Demonstrate counting 5 pipe cleaners, binding the pile, then continuing on with the remaining pipe cleaners.

SAY: We can keep track of our tally on the board in the same way, by grouping the marks in 5s. Below the 12 tally marks, draw 4 new tally marks, counting as you go. SAY: When we get to 5, we draw a line across the group. Draw on the board:

```
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
```

SAY: We keep counting and grouping as we go. Count up to 12 as you draw the tally marks, as shown in the margin.
SAY: It doesn’t matter how we draw the line across the group. Some people draw it in the other direction. Have volunteers show how to make 7 and 14 with tallies. ASK: What do numbers less than 5 look like? (just tally marks, no grouping)

**Exercises:** Draw a tally to show the number.

a) 3  
b) 9  
c) 16

**Answers:** a) |||  b) ||||  c) |||| |||| |

**Converting a tally to a number.** Draw on the board:

```
  |||| ||||
```

ASK: How do we find what number the tally shows? (count by 5s) What number does it show? (25)

**Exercises:** What number does the tally show?

a)  
b)  
c)  

**Answers:** a) 10, b) 15, c) 35

Draw on the board

```
    |||| ||||
```

SAY: This tally has some groups of 5 and some extras. ASK: How do we find the number this tally shows? (count by 5s, then by 1s) What number does this tally show? (13) Count aloud for the class while pointing at the tally marks: 5, 10, 11, 12, 13.

**Exercises:** What number does the tally show?

a)  
b)  
c)  

**Answers:** a) 8, b) 11, c) 21

**Drawing a tally chart.** SAY: We use tallies to keep track of something we are counting as we go. Then we count them later. Let’s do an example. Draw on the board:

<table>
<thead>
<tr>
<th>Coin Toss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heads</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
SAY: This is a tally chart. The title says “Coin Toss.” It tells you what we are counting. There are 2 columns: heads or tails. Each of you will toss a coin, and we will keep a tally of which side lands up. At the end, we will count to see how many heads and how many tails we got. Show students a coin, and point out which side of the coin is “heads” and which one is “tails.” Have each student toss the coin. Mark each toss in the tally chart. At some point, you may want to have volunteers make the tally marks for you. Remind them to bundle 5s. When you are done, ASK: How many heads did we get? How many tails did we get? Write the answers in the bottom row.

Answering questions using a tally chart. Review the results of your tally chart. ASK: Which was the most common side? (answer will vary) Write the question “Which was the most common side?” and the answer on the board.

Exercises: Use the “Coin Toss” tally chart to answer the questions.

a) Which was the least common side?

b) Did tails come up more or fewer times?

c) How many more or fewer times did tails come up?

d) How many times did we toss the coin altogether?

ACTIVITY

Divide students into groups of approximately 10. Give each student a tally chart from BLM Making a Tally Chart. Students fill in the chart with two activities of their choice. Tell students to choose two activities they think that other students will like. Example: Would you rather make a snowman or swim in a pool? Then have students survey the other members of their group and make a tally of the results. When everyone is done, discuss the results as a class. For example, ASK: Did the answers surprise you? Did other students like what you liked?

Making a picture graph from a tally chart. SAY: Tally charts work well for showing the results when asking questions, but sometimes it is better to use a picture graph, especially when we want to show our findings to other people. Let’s do an example. Rob’s class wants to choose colors for a new school T-shirt. The students voted for the color they like best. Rob drew a tally chart of the results. Draw on the board:

<table>
<thead>
<tr>
<th>School T-shirt Colors</th>
<th>Color</th>
<th>Number of Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td></td>
</tr>
</tbody>
</table>
SAY: We can make a picture graph from our results. We need the same number of rows and columns in the picture graph and we will use the same titles as in the tally chart. ASK: Which color got the most votes? (blue) How many students voted for blue? (10) SAY: We need to make our picture graph big enough for 10 people to vote for blue. Draw the picture graph beside the tally chart. The picture graph should look like this:

**School T-shirt Colors**

<table>
<thead>
<tr>
<th>Color</th>
<th>Number of Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td></td>
</tr>
</tbody>
</table>

SAY: Let’s draw one happy face for each vote. If you have colored chalk or erasable markers, draw the faces in the appropriate colors. Fill in the blue row. Have volunteers fill in the rest of the picture graph using the data in the tally chart. The final picture graph should look like this:

**School T-shirt Colors**

<table>
<thead>
<tr>
<th>Color</th>
<th>Number of Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>✳️✳️✳️✳️✳️✳️✳️✳️✳️✳️</td>
</tr>
<tr>
<td>Green</td>
<td>✳️✳️✳️✳️✳️✳️✳️✳️✳️✳️</td>
</tr>
<tr>
<td>Red</td>
<td>✳️✳️✳️✳️✳️✳️✳️✳️✳️✳️</td>
</tr>
<tr>
<td>Yellow</td>
<td>✳️✳️✳️✳️✳️✳️✳️✳️✳️✳️</td>
</tr>
</tbody>
</table>

SAY: Each happy face stands for one student. Write below the picture graph: “Each ✳️ stands for one student.”

SAY: *Popular* means liked by many people. ASK: Which color is the most popular? (blue) In this case, we say “popular” and not “common” because our graph shows what students liked. We did not count real things.

**Exercises:** Use the “School T-shirt Colors” tally chart or the “School T-shirt Colors” picture graph to answer the question.

a) Which color is the least popular?

b) How many more people chose blue than green?

**Bonus:** How many more people chose blue or green than red or yellow?

**Answers:** a) yellow; b) 4; Bonus: $10 + 6 = 16$, $8 + 4 = 12$, $16 - 12 = 4$

ASK: Do the answers to the exercises change if you use the picture graph or the tally chart? (no, both graphs have the same information)
Making a picture graph from data. SAY: Now you will make your own picture graph. Tessa is packing for a trip. These are the clothes she is taking. Write on the board:

- 2 pairs of pants
- 1 pair of shorts
- 2 sweaters
- 4 T-shirts

Distribute BLM Making a Picture Graph, and draw or project a copy on the board. SAY: We will make a picture graph for Tessa’s clothes. ASK: What title should we use? (e.g., Tessa’s Clothes) Write the title on the board, and tell students to write it in the space provided above their graphs.

SAY: The top row of the chart is for titles. ASK: What did Tessa count? (clothes) SAY: Clothes can be the title of our first column. Write “Clothes” in the first cell. SAY: The second part of the picture graph is always how many we counted, or the number. Let’s make the title of that part “Number.” The picture graph should look like this:

<table>
<thead>
<tr>
<th>Clothes</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pants</td>
<td></td>
</tr>
<tr>
<td>Shorts</td>
<td></td>
</tr>
<tr>
<td>Sweaters</td>
<td></td>
</tr>
<tr>
<td>T-shirts</td>
<td></td>
</tr>
</tbody>
</table>

SAY: We write each kind of clothing on a separate line below “Clothes.” Model this on the board and have students copy in their graphs. The picture graph should look like this:

<table>
<thead>
<tr>
<th>Clothes</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pants</td>
<td></td>
</tr>
<tr>
<td>Shorts</td>
<td></td>
</tr>
<tr>
<td>Sweaters</td>
<td></td>
</tr>
<tr>
<td>T-shirts</td>
<td></td>
</tr>
</tbody>
</table>

SAY: Now choose any symbol you like and fill in the picture graph. I will use triangles. Tessa is taking 2 pairs of pants on her trip. So I will draw 2 triangles in the row for pants. The picture graph should look like this:

<table>
<thead>
<tr>
<th>Clothes</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pants</td>
<td>△ △</td>
</tr>
<tr>
<td>Shorts</td>
<td></td>
</tr>
<tr>
<td>Sweaters</td>
<td></td>
</tr>
<tr>
<td>T-shirts</td>
<td></td>
</tr>
</tbody>
</table>
Ask students what shapes they will use in their picture graph. Have them complete the picture graph. Complete your own picture graph as shown below:

**Tessa’s Clothes**

<table>
<thead>
<tr>
<th>Clothes</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pants</td>
<td>△△</td>
</tr>
<tr>
<td>Shorts</td>
<td>△</td>
</tr>
<tr>
<td>Sweaters</td>
<td>△△</td>
</tr>
<tr>
<td>T-shirts</td>
<td>△△△△</td>
</tr>
</tbody>
</table>

SAY: In my picture graph, each triangle stands for one piece of clothing. Write below the graph:

Each △ stands for one piece of clothing.

Have students fill in the blanks at the bottom of their graphs.

**Extensions**

(MP1, MP.4)  

1. Ms. Smith’s class chose their favorite drinks. There are 25 students in the class. Use the information to fill in the table.

<table>
<thead>
<tr>
<th>Favorite Drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

• Apple juice was the most popular drink. 12 students chose it.
• 7 fewer students chose milk than apple juice.
• 2 more students chose orange juice than water.

**Sample solution:** 12 – 7 = 5, so 5 students chose milk. There are 25 students in the class, and 12 + 5 = 17 students chose apple juice or milk, so 25 – 17 = 8 students chose orange juice or water. There are 2 more students who chose orange juice than water, so I tried different pairs of numbers that add to 8 until I found 5 + 3 = 8; 5 – 3 = 2, so 5 students chose orange juice and 3 students chose water.

**Answer**

<table>
<thead>
<tr>
<th>Favorite Drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

Individual or small-group follow-up: If students struggle to find how many students chose orange juice and water, ASK: How can you find out how many students chose orange juice or water together? (subtract the number that chose milk or apple juice from the total) How can we find how many students chose each one? (find a pair of numbers that adds to 8 in which the larger number is 2 more than the smaller number)
2. Is it easier to see the number of things in a tally chart or in a picture graph? What if the numbers are big?

**Sample answer:** Generally, it is easier to see exact numbers in a tally chart, especially if the numbers are big.

3. Make a picture graph for the letters in “Mississippi.” Use each letter as its own symbol in the graph.

**Answer**

<table>
<thead>
<tr>
<th>Mississippi</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>P</td>
</tr>
</tbody>
</table>
Goals
Students will read and interpret bar graphs and answer questions using the data presented in the graphs.

PRIOR KNOWLEDGE REQUIRED
Can read, interpret, and make picture graphs
Can answer compare and put together problems
Can solve simple two-step word problems

MATERIALS
10 to 15 connecting cubes in various colors for every 2 or 3 students
overhead projector
transparency of BLM Bar Graphs (pp. T-30–31)
BLM Bar Graphs (pp. T-30–31)

Review picture graphs. Have student work in groups of two or three and give 10 to 15 connecting cubes in various colors to each group. Have each group sort the cubes by color and connect blocks of the same color together. ASK: What symbol will you use for your blocks in a picture graph? (e.g., squares) Draw a sample picture graph on the board (see the graph below at left).

SAY: Today we will make a bar graph. A bar graph is like a picture graph, but it is drawn using squares or boxes. Using the same data, draw the bar graph beside the picture graph on the board, as shown below:

Comparing bar graphs and picture graphs. SAY: Like tally charts and picture graphs, a bar graph has a title at the top. The words at the bottom are labels. In these two graphs, the labels are the names of the colors. ASK: What differences do you see between the picture graph and the bar graph? (the boxes touch in the bar graph; there are numbers on the side of the bar graph; the words are written sideways) SAY: A bar graph has a number line on the side to help count the boxes. The bars in the graph are
completely shaded. We always use boxes in a bar graph—we never use other shapes like we do for picture graphs.

ASK: In the picture graph, how do we find out how many blue cubes we counted? (count the boxes) How would we find that answer in the bar graph? (the same way) SAY: In a bar graph, we can count the boxes or we can use the numbers on the side. Point at the top of the blue bar and SAY: In our example, the top of the bar for blue cubes reaches this line. It says 3. So we can see that there are 3 blue cubes without counting. Ask more similar questions about the bar graph, and explain how to find the answers by looking across to the number line.

**Answering questions using data in a bar graph.** SAY: Let’s look at another example. Project the “Pets We Have” graph from BLM Bar Graphs (1) on the board and distribute a copy of the BLM to students. ASK: What was counted in this graph? (pets) What are the kinds of pets? (cats, dogs, and hamsters) Show where this information is located on the bottom of the graph. ASK: How many cats were counted? (3) Count the boxes out loud. Write “3 cats” beside the graph.

Repeat with dogs and hamsters. Have students count on their copies of the graph. (5 dogs, 2 hamsters)

For the following exercises, project the “Hand We Use to Write” graph from BLM Bar Graphs (1), and tell students to refer to their own copy.

**Exercises:** Use the bar graph to answer the question.

a) How many people write with their right hand?

b) How many people write with their left hand?

c) How many fewer people write with their left hand?

**Answers:** a) 9, b) 2, c) 7

Distribute BLM Bar Graphs (2) and project the “Our Favorite Snack” graph on the board. ASK: What was counted in this graph? (favorite snacks) What are the choices? (bagels, cheese, fruit, muffins) Which snack is the most popular? (muffins) SAY: The muffin bar is the longest so it is the most popular. ASK: Which snack is the least popular? (fruit) (If students say cheese, SAY: I can see why you might say cheese, but there’s an even shorter bar.) How many people chose fruit as their favorite snack? (0) SAY: 3 people chose cheese, but even fewer people, 0 people, chose fruit.

For the following exercises, project the “Coins in Jane’s Pocket” graph from BLM Bar Graphs (2) and have students refer to their own copies. SAY: This graph shows the number of coins in Jane’s pocket.

**Exercises:** Use the bar graph to answer the question.

a) Which bar is the longest? What does that tell you?

b) How many coins does Jane have in her pocket?

c) Which is more common: dimes or nickels?
**Bonus:** Does Jane have more money in quarters or in all of the other coins combined?

**Answers:** a) pennies, pennies are the most common coin; b) 22; c) dimes; Bonus: the quarters add to 75¢, the other coins combined add to 89¢

**Extensions**

1. Tell students that each bar graph below shows a word used in math. At the bottom of the bar there is a letter. The height of the bar tells you how many times to use that letter. Write each letter the number of times shown. Use all the letters to make a word.

   **Example:**

   ![Bar graph example](image)

   Letters: e e e l v n
   Word: eleven

   **Hint:** parts a), b), and d) are numbers.

   **a)**

   ![Bar graph a](image)

   **b)**

   ![Bar graph b](image)

   **c)**

   ![Bar graph c](image)

   **d)**

   ![Bar graph d](image)

   **Answers:** a) nine, b) thirteen, c) addend, d) seventeen

2. Use the “Our Favorite Snack” bar graph from BLM Bar Graphs (2) to answer the question.

   a) What is the biggest difference in how popular two snacks are?

   b) Find two snacks that are as popular together as another snack by itself.

   **Bonus:** If every snack was as popular as muffins, how many people would be in the class?

   **Answers:** a) 10, between fruit and muffins; b) bagels and cheese are as popular as muffins, 7 + 3 = 10; Bonus: 40, 4 choices with 10 votes each
3. The “Hand We Use to Write” bar graph from BLM Bar Graphs (1) shows that of 11 people, 2 write with their left hand and 9 write with their right hand. If you asked 21 people, how many do you think will write with each hand? Explain.

**Answer:** This question is intended to make students think about many possible answers. For example, they might answer 10 and 11 (make it half and half because there are 2 choices), or 7 and 14 (keep the difference of 7 the same), or 3 and 18 or 4 and 17 (use a big number and a small number).

(MP3, MP7) 4. a) Find a fast way to add 80 + 70. Use addition facts that you already know.

b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

**Answers**
a) 150

b) sample explanations:
- I used 7 + 7 is 14. 8 + 7 is one more than 14, so 8 + 7 is 15. I added a 0, so 80 + 70 = 150.
- I took 20 from the 70 and gave it to the 80 so the addition became 100 + 50, which is 150.
- I used 8 + 8 = 16 and took one away to get 15, because 8 + 7 is one less than 8 + 8. I added a 0, so 80 + 70 = 150.
MD2-47 Making Bar Graphs
Pages 210–212

Goals
Students will create bar graphs to represent data provided in various formats.
Students will answer compare, put together, and take apart questions about the data presented in the graphs.

PRIOR KNOWLEDGE REQUIRED
Can read and interpret picture graphs, tally charts, and bar graphs
Can answer compare, put together, and take apart word problems
Can solve simple two-step word problems

MATERIALS
BLM Making a Bar Graph (p. T-32)
overhead projector (optional)
transparency of BLM Making a Bar Graph (p. T-32, optional)
erasable marker (optional)
classroom weather calendar
BLM Insects (p. T-33, see Extension 1)
scissors and glue (see Extension 1)
2 cm grid paper or BLM 2 cm Grid Paper (p. U-5, see Extension 1)
1 cm grid paper or BLM 1 cm Grid Paper (p. U-1, see Extension 2)

Filling in a bar graph by counting boxes. SAY: Today we will make bar graphs. Draw on the board:

<table>
<thead>
<tr>
<th>Eye Color</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>2</td>
</tr>
<tr>
<td>Brown</td>
<td>9</td>
</tr>
<tr>
<td>Green</td>
<td>2</td>
</tr>
<tr>
<td>Hazel</td>
<td>5</td>
</tr>
</tbody>
</table>

Eye Color | Number of People |
-----------|------------------|
Blue       | 2                |
Brown      | 9                |
Green      | 2                |
Hazel      | 5                |

BLM Insects (p. T-33, see Extension 1)
scissors and glue (see Extension 1)
2 cm grid paper or BLM 2 cm Grid Paper (p. U-5, see Extension 1)
1 cm grid paper or BLM 1 cm Grid Paper (p. U-1, see Extension 2)
ASK: What are we counting? (how many people have each eye color) What would be a good title for the graph? (Eye Colors) Write “Eye Colors” above the graph. ASK: What are the different choices for eye color? (blue, brown, green, hazel) SAY: We will make the graph with the bars going from side to side. So we will write the choices on the left. Write the colors down the left side, and label them “Colors.” SAY: The label “Colors” tells what blue, brown, green, and hazel are. Point at the bottom of the graph and ASK: What do we put along the bottom? (the numbers) Write the numbers. SAY: We have to write what we are counting too. For this graph, we are counting the number of people who have each eye color. Write “Number of People” under the numbers.

SAY: Now let’s fill in the graph. Pointing to the table, ASK: How many people have blue eyes? (2) How many boxes do we need to color? (2) Where do they go? (where it says blue) Have a volunteer shade 2 boxes. Count as they color. Repeat for the remaining colors. The graph should look like this:

![Eye Colors Graph]

SAY: The table tells how common each eye color is. ASK: Which eye color is the most common? (brown) Which two colors are the least common? (blue and green)

Have students complete Questions 1 and 2 on AP Book 2.2 p. 210. Tell them to complete the bar graphs by using the data to color the lightly shaded bars.

**Filling in a bar graph using bar height or length.** SAY: On a class trip, Amit and Lily collected leaves to make a collage. Write on the board:

Amit and Lily collected 8 elm leaves. They collected 4 more maple leaves than elm leaves and 1 fewer oak leaf than elm leaves.

SAY: Let’s make a bar graph of the leaves they collected. This time, the bars will go up. Draw the graph on the next page on the board.
ASK: What would be a good title for the graph? (e.g., Leaves, Collected Leaves, Amit and Lily’s Leaves) Write the title above the graph. ASK: How many elm leaves did they collect? (8) How many boxes do we need to color? (8) SAY: We could count and color 8 boxes, but how else can we do this without counting where we will stop coloring? (use the numbers on the side and stop at the 8) SAY: The numbers on the side show how many boxes there are without counting. Draw a thick line 8 boxes up in the elm column. Then have a volunteer color the column to the line.

SAY: They collected 4 more maple leaves than elm leaves. ASK: How much taller will the maple bar be? (4 boxes) Count 4 boxes up from 8 in the next column and draw a thick line at 12. Have a volunteer color the bar. ASK: How else can we find the height of the bar? (add 8 + 4 to get 12) Repeat for the oak bar. (7)

SAY: We can use the number line at the side to help us answer questions too. ASK: How many more maple leaves than oak leaves did they collect? (5) How did you get the answer? Try to elicit a few different answers.

Have students complete Questions 3 and 4 on AP Book 2.2 p. 211.

**Making a bar graph.** Lead students through drawing a bar graph. Model each step before asking students to copy it. SAY: Now we will make our own bar graph. Let’s do an example with money. Vicky counted the coins in her piggy bank. This is what she found. Write on the board:

Vicky has 5 quarters, 11 dimes, 8 nickels, and 12 pennies.

Distribute **BLM Making a Bar Graph** and draw or project a copy on the board. Have students place the BLM so that the long edge is horizontal. Because there are no words on the page, students will need direction to
correctly orient the page as they fill in the blanks. ASK: What would be a good title for our graph? (answers will vary) SAY: We will use “Vicky’s Piggy Bank.” Write the title above the graph in the space provided. Then have students copy the title on their graphs.

ASK: What did Vicky count? (coins) Write “Coins” on the label for the vertical line. Students can turn the page to write this, but they must turn it back after.

Next have students write the names of the coins in the spaces provided. Finally, guide students to add the number line across the bottom. Write “Number of Coins” below the number line. Starting with the pennies, have volunteers color the bars of the graph. The final graph should look like this.

**Vicky’s Piggy Bank**

| Coins     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Pennies   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Nickels   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Dimes     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Quarters  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**ACTIVITY**

Use the data you collected on the classroom weather calendar (see unit introduction) to make bar or picture graphs. This can be done as a whole class or in small groups of students.
Extensions

1. Students work in groups of two or three. Give each group a section from **BLM Insects**. Have students work together to cut out pictures from the BLM and make a picture graph by gluing the pictures to 2 cm grid paper or **BLM 2 cm Grid Paper**. Then have them make a bar graph of the same data.

2. Have students make their own bar graph from scratch on 1 cm grid paper or **BLM 1 cm Grid Paper**. Working in pairs, have students collect data in up to four categories and create a graph. Students may use topics from any of the graphs used in class (e.g., left- and right-handedness, favorite snacks, pets) or use a data set of their choice.

3. Look for a pattern in the numbers you make by starting at 2 and adding 5s. Use the pattern to write five 4-digit numbers that you get when you start at 2 and add 5s.

   **Sample solution:** I started at 2 and wrote 1- and 2-digit numbers by adding 5s. I noticed that all the numbers that have ones digit 2 or 7 are numbers I can make by adding 5s when I start at 2. So I can use any 4-digit numbers that have ones digit 2 or 7. For example, 2002, 2007, 2012, 2017, 2022.
Goals

Students will compare the three types of graphs they learned in Grade 2: picture graphs, bar graphs, and line plots.

Students will discuss how the graphs are similar and how they differ (including in their uses).

Students will be introduced to the concept of outliers in a line plot.

PRIOR KNOWLEDGE REQUIRED

Can read and interpret picture graphs, bar graphs, and line plots

Understands that the axis on a line plot is part of a number line

MATERIALS

Harry Potter and the Sorcerer’s Stone by J.K. Rowling

Review three types of graphs. Draw on the board:

Pointing to each graph in turn, ASK: What kind of graph is this? (picture graph, bar graph, line plot) Write the name of each graph above the picture as students name them.

Comparing bar graphs to picture graphs. Draw students’ attention to the first graph and ASK: How can you tell this is a picture graph? (it has little pictures) Point to the bar graph and ASK: How do you know this is not a picture graph? (it has shaded bars, it has no little pictures, it has a number line) Could the bar graph be a picture graph with squares? (no, the pictures in a picture graph don’t touch) SAY: In a picture graph, you can always see separate shapes. A bar graph is always filled in. ASK: Do you have to use the same shape in a picture graph? (no) SAY: You don’t have to use the same shape, but it can make it easier to compare. SAY: Bar graphs and picture graphs show the same things in different ways. For both of these graphs, we group things. There is one bar for each group on a bar graph.
**Exercises:** Use the “Trees” picture graph or bar graph to answer the question.

a) How many elm trees were counted? How many oak? How many pine?

b) How many trees were counted altogether?

**Answers:** a) 3 elm, 2 oak, 4 pine; b) 9 trees

**Comparing bar graphs to line plots.** SAY: Let’s look at the line plot now. ASK: What did we graph on this line plot? (heights of trees) In the picture graph, what do 4 triangles in the Pine column mean? (we counted 4 pine trees) In the bar graph, what does the bar for 4 in the Pine column mean? (we counted 4 pine trees) In the line plot, what do 4 Xs in the column for 3 meters mean? (we measured 4 trees that are 3 m tall) SAY: So how tall a column is means the same in all of the graphs—it shows how many we counted.

SAY: The bar graph shows three types of trees: oak, elm, and pine. ASK: Do we have different types of trees on the line plot? (we do not know, we cannot tell from the graph) SAY: In bar graphs, we show the different groups along the bottom. We graph things that we have sorted and counted. In line plots, we have part of a number line along the bottom. We use a line plot to show things that we have measured in some way.

**Exercises:** Use the “Tree Heights” line plot to answer the question.

a) How many trees are 2 m tall? How many are 3 m tall? How many are 4 m tall? How many are 5 m tall? How many are 6 m tall?

b) How many trees were measured altogether?

**Answers:** a) three are 2 m, four are 3 m, one is 4 m, zero are 5 m, one is 6 m; b) 9 trees were measured

SAY: The bar graph and the picture graph show the trees in different orders. ASK: Did I make a mistake? (no, you can put the trees in any order) SAY: The picture graph shows the trees in alphabetical order. The bar graph shows them from least common to most common. We can put them in any order we like. ASK: What order did we use in the line plot? (from shortest to tallest) ASK: Can I change the order in a line plot? (no, the line plot uses part of a number line that is always in the same order)

ASK: Are there any types of trees not in the bar graph? (yes, lots) Have students name a few other types of trees if they can. ASK: Why aren’t they in the graph? (because none were counted) SAY: We did not count any trees that are 5 m tall either. ASK: Why is it on the line plot? (because 5 is part of the number line)

**Discussing outliers in line plots.** Have students do the following activity to lead to a discussion about outliers.
ACTIVITY

On the board, make a horizontal bar graph and line plot showing the number of pockets each student has on their own clothing. In the bar graph, leave room for adding categories and extending the length of the number line. Start each graph with the assumption that students will have 0 to 4 pockets. One at a time, have students come to the board and add their number of pockets to the graphs, extending as necessary. When students are done, read the first page of Chapter 5 from *Harry Potter and the Sorcerer’s Stone* until you have read the sentence that begins “Hagrid’s coat seemed to be made of nothing *but* pockets ….” As a class, decide how many pockets there are in Hagrid’s coat. Encourage students to pick a large number. Add the pockets in Hagrid’s coat to the bar graph and the line plot.

SAY: Hagrid’s coat is special. He has so many more pockets than everyone else. ASK: Which graph, the bar graph or the line plot, shows how special Hagrid’s coat is? (the line plot, because the X for Hagrid’s is so far away from all of the other Xs on the plot)

Extensions

1. Would you use a bar graph or a line plot to show the data?
   a) the heights of students in the class
   b) the number of boys and girls in the class

   **Answers:** a) line plot, b) bar graph

2. Would you use a bar graph or a line plot to show the data? Why?
   a) how each student gets to school
   b) how far each student lives from school

   **Answers:** a) bar graph, because we are choosing things like walking, taking the bus, biking, and getting a ride; b) line plot, because we are measuring distances

3. The table shows the heights of all the boys and girls on the basketball team.

   **Heights of Players (cm)**

<table>
<thead>
<tr>
<th>Boys</th>
<th>122, 121, 124, 124, 129, 125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>124, 121, 131, 123, 124, 125, 123</td>
</tr>
</tbody>
</table>

   a) Make a bar graph to show how many girls and boys are on the team.

   b) Make a line plot to show how tall the players are.
4. Explain to a partner the differences between line plots and bar graphs.

**Sample answer:** In a bar graph, you can compare different groups and you show the number for each group with a bar. In line plots, you cannot compare different groups and you show the amount of things above a number line with X’s.
# Weather Calendar

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>29</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **rainy**
- **sunny**
- **cloudy** (no rain)
- **snowy**
Pet Cards

Cat
Dog
Unicorn
Fish
Cat
Dog
Unicorn
Fish
Cat
Dog
Unicorn
Fish
Cat
Dog
Unicorn
Fish
Making a Tally Chart

☐ Which activity do you like more?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

☐ Which activity do you like more?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

☐ Which activity do you like more?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Making a Picture Graph

Each ____ stands for ____
Bar Graphs (I)

**Pets We Have**

- **Number of Pets**
  - Dogs: 2
  - Cats: 5
  - Hamsters: 2

**Type of Pet**

**Hand We Use to Write**

- **Number of People**
  - Left: 2
  - Right: 7
Bar Graphs (2)

Our Favorite Snack

<table>
<thead>
<tr>
<th>Snack</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagels</td>
<td>7</td>
</tr>
<tr>
<td>Cheese</td>
<td>2</td>
</tr>
<tr>
<td>Fruit</td>
<td>9</td>
</tr>
<tr>
<td>Muffins</td>
<td>8</td>
</tr>
</tbody>
</table>

Coins in Jane’s Pocket

<table>
<thead>
<tr>
<th>Type of Coin</th>
<th>Number of Coins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennies</td>
<td>9</td>
</tr>
<tr>
<td>Nickels</td>
<td>3</td>
</tr>
<tr>
<td>Dimes</td>
<td>6</td>
</tr>
<tr>
<td>Quarters</td>
<td>2</td>
</tr>
</tbody>
</table>
Making a Bar Graph
Insects
1 cm Grid Paper
## Game Cards (I)

<table>
<thead>
<tr>
<th>I have</th>
<th>I have</th>
<th>I have</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who has</td>
<td>Who has</td>
<td>Who has</td>
</tr>
<tr>
<td>I have</td>
<td>I have</td>
<td>I have</td>
</tr>
<tr>
<td>Who has</td>
<td>Who has</td>
<td>Who has</td>
</tr>
<tr>
<td>I have</td>
<td>I have</td>
<td>I have</td>
</tr>
<tr>
<td>Who has</td>
<td>Who has</td>
<td>Who has</td>
</tr>
<tr>
<td>I have</td>
<td>I have</td>
<td>I have</td>
</tr>
<tr>
<td>Who has</td>
<td>Who has</td>
<td>Who has</td>
</tr>
</tbody>
</table>

U-2

Blackline Master — Generic — Teacher Resource for Grade 2
Game Cards (2)

0  1  2  3
4  5  6  7
8  9  zero  one
two  three  four  five
six  seven  eight  nine
### Hundreds Charts

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
<td>46</td>
<td>47</td>
<td>48</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>51</td>
<td>52</td>
<td>53</td>
<td>54</td>
<td>55</td>
<td>56</td>
<td>57</td>
<td>58</td>
<td>59</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>61</td>
<td>62</td>
<td>63</td>
<td>64</td>
<td>65</td>
<td>66</td>
<td>67</td>
<td>68</td>
<td>69</td>
<td>70</td>
</tr>
<tr>
<td>7</td>
<td>71</td>
<td>72</td>
<td>73</td>
<td>74</td>
<td>75</td>
<td>76</td>
<td>77</td>
<td>78</td>
<td>79</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>81</td>
<td>82</td>
<td>83</td>
<td>84</td>
<td>85</td>
<td>86</td>
<td>87</td>
<td>88</td>
<td>89</td>
<td>90</td>
</tr>
<tr>
<td>9</td>
<td>91</td>
<td>92</td>
<td>93</td>
<td>94</td>
<td>95</td>
<td>96</td>
<td>97</td>
<td>98</td>
<td>99</td>
<td>100</td>
</tr>
</tbody>
</table>
2 cm Grid Paper
2 cm Dot Paper

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.

.
Unit 4: Number and Operations in Base Ten  Name: ______________________
Quiz (Lessons 41 to 45)  Date: ________________

1. Add.
   a)  
      133 + 10 = _____

   b)  
      187 + 10 = _____

2. Count by tens.
   a) 40, 50, 60, _____, _____, _____
   b) 810, 820, 830, _____, _____, _____

3. Add 10 each time.
   a) 49, 59, 69, _____, _____, _____
   b) 216, 226, 236, _____, _____, _____

4. Count by hundreds to find the missing numbers.
   200, 300, _____, 500, _____, _____, 800, _____

5. Add 100 each time.
   150, 250, 350, _____, _____, _____, _____, _____
Unit 4: Number and Operations in Base Ten

Quiz (Lessons 41 to 45)

6. Add 5 each time.
   a) 715, 720, 725, _____, _____, _____, _____, _____, _____
   b) 18, 23, 28, _____, _____, _____, _____, _____, _____

   BONUS:
   437, 442, 447, _____, _____, _____, _____, _____, _____

7. Add.
   a) 361 + 1 = _____  361 + 10 = _____  361 + 100 = _____

   BONUS:
   823 + 10 = _____  823 + 100 = _____  823 + 1 = _____

8. Subtract 10 each time.
   a) 90, 80, 70, _____, _____, _____
   b) 470, 460, 450, _____, _____, _____

9. Subtract 100 each time.
   a) 600, 500, 400, _____, _____, _____
   b) 658, 558, 458, _____, _____, _____

10. Subtract.
    a) 290 – 10 = _____  290 – 100 = _____
    b) 718 – 10 = _____  718 – 100 = _____
Unit 4: Number and Operations in Base Ten

**Quiz (Lessons 41 to 45)**

1. a) 143  
   b) 197  

2. a) 70, 80, 90  
   b) 840, 850, 860  

3. a) 79, 89, 99  
   b) 246, 256, 266  

4. 400, 600, 700, 900  

5. 450, 550, 650, 750, 850, 950  

6. a) 730, 735, 740, 745, 750, 755  
   b) 33, 38, 43, 48, 53, 58  

**BONUS**  
452, 457, 462, 467, 472  

7. a) 362  
   371  
   461  

**BONUS**  
833  
923  
824  

8. a) 60, 50, 40  
   b) 440, 430, 420  

9. a) 300, 200, 100  
   b) 358, 258, 158  

10. a) 280  
    190  
   b) 708  
    618
1. What number do the tens blocks show?
   a) 
   b) 

   _____        _____

2. Add.
   a) 
   b) 

   140 + 10 = _____
   180 + 10 = _____

3. Add.
   a) 
   b) 

   114 + 10 = _____
   159 + 10 = _____

4. Add.
   a) 278 + 10 = _____
   b) 931 + 10 = _____
   c) 682 + 10 = _____

5. Add 10 each time.
   a) 24, 34, 44, _____, _____, _____
   b) 638, 648, 658, _____, _____, _____

   BONUS:
   1812, 1822, 1832, _____, _____, _____
Unit 4: Number and Operations in Base Ten

Test (Lessons 41 to 45)

6. Count by hundreds to find the missing numbers.
   a) 100, 200, _____, 400, _____, _____, 700, _____, _____
   **BONUS:**
   5200, 5300, _____, 5500, _____, _____, 5800

7. Add 100 each time.
   a) 330, 430, _____, _____, _____
   b) 409, 509, _____, _____, _____
   **BONUS:**
   7112, 7212, _____, _____, _____, _____, _____

8. Add 5 each time.
   a) 15, 20, _____, _____, _____, _____, _____, _____, _____, _____
   b) 825, 830, _____, _____, _____, _____, _____, _____, _____, _____
   c) 1, 6, 11, _____, _____, _____, _____, _____, _____, _____, _____
   **BONUS:**
   618, 623, 628, _____, _____, _____, _____, _____, _____

   a) 247 + 1 = _____   247 + 10 = _____   247 + 100 = _____
   **BONUS:**
   394 + 10 = _____ 394 + 100 = _____   394 + 1 = _____
10. Randy says $210 + 10 = 310$. Explain his mistake. 

_____________________________________________________________________


11. Subtract 10 each time.
   a) 70, 60, _____, _____, _____
   b) 290, 280, _____, _____, _____
   c) 81, 71, _____, _____, _____
   d) 546, 536, _____, _____, _____

12. Subtract 100 each time.
   a) 800, 700, _____, _____, _____
   b) 891, 791, _____, _____, _____

13. Subtract.
   a) $580 - 10 = _____$  $580 - 100 = _____$
   b) $329 - 10 = _____$  $329 - 100 = _____$
1. a) 120  
   b) 170  
2. a) 150  
   b) 190  
3. a) 124  
   b) 169  
4. a) 288  
   b) 941  
   c) 692  
5. a) 54, 64, 74  
   b) 668, 678, 688  
BONUS  
1842, 1852, 1862, 1872  
6. a) 300, 500, 600, 800,  
900  
BONUS  
5400, 5600, 5700  
7. a) 530, 630, 730  
   b) 609, 709, 809  
BONUS  
7312, 7412, 7512, 7612,  
7712  
8. a) 25, 30, 35, 40, 45,  
50, 55, 60, 65  
   b) 835, 840, 845, 850,  
855, 860, 865  
   c) 16, 21, 26, 31, 36,  
41, 46, 51, 56  
BONUS  
633, 638, 643, 648, 653  
9. a) 248  
   257  
   347  
BONUS  
404  
   494  
   395  
10. Answers may vary.  
Sample answer:  
Randy added 100 instead of adding ten.  
11. a) 50, 40, 30  
   b) 270, 260, 250  
   c) 61, 51, 41  
   d) 526, 516, 506  
12. a) 600, 500, 400  
   b) 691, 591, 491  
13. a) 570  
   480  
   b) 319  
   229
Unit 5: Measurement and Data

1. How long is the pen?

   ![Pen Measurement Diagram]

   ____ inches

2. About how long is the spring?

   ![Spring Measurement Diagram]

   about ____ inches

3. What is the best estimate for the bottom object? Write a ✓.

   ![Objects Measurement Diagram]

   - 2 inches
   - 5 inches
   - 8 inches

4. How long is the line?

   ![Line Measurement Diagram]

   a) about ____ inches
      ____ cm

   b) about ____ inches
      ____ cm

5. Write longer or shorter to make the sentence correct.

   a) 1 inch is ____________ than 1 cm.

   b) 1 cm is ____________ than 1 inch.
Unit 5: Measurement and Data
Quiz (Lessons 17 to 20)

1. 6
2. 3
3. 2 inches
4. a) 3, 8
   b) 3, 7
5. a) longer
   b) shorter
Unit 5: Measurement and Data
Quiz (Lessons 21 to 24)

1. Circle the objects that are more than 1 foot long.

   ![car](image1) ![tiger](image2) ![ant](image3) ![leaf](image4)

2. Frances measured some lengths. She forgot to write the units. Write inches or feet.
   a) bathtub 6 __________
   b) doorknob 3 __________

3. Draw a picture. Write the equation. Write the answer.
   a) A cucumber is 10 inches long. It grows 4 inches.
      How long is the cucumber now?

      ![cucumber](image5)
      ___________________  The cucumber is _____ inches long.

   b) Carol draws a line 15 inches long. She erases 6 inches.
      How long is the line now?

      ![line](image6)
      ___________________  The line is _____ inches long.
Unit 5: Measurement and Data
Quiz (Lessons 21 to 24)

1. circle: car, tiger

2. a) feet
   b) inches

3. a) Teacher to check drawing.
   \[ 10 + 4 = 14, 14 \]
   b) Teacher to check drawing.
   \[ 15 - 6 = 9, 9 \]
Unit 5: Measurement and Data

Quiz (Lessons 25 to 28)

1. Write the numbers you know in the blanks. Draw a □ for the number you do not know. Use the part-whole picture to find the number you do not know.

   A hockey stick was 58 inches long.
   Charlotte cut off 6 inches.
   How many inches are left?

   _____ – _____ = _____
   total inches    inches cut off    inches left

2. Write the numbers in the blanks. Write + or − in the circles. Find the answer.

   Andrea is building a fence. She built 7 feet on Monday, 3 feet on Tuesday, and 9 feet on Wednesday.
   How many feet of fence did Andrea build altogether?

   _____ □ _____ □ _____ = _____

3. Draw a line to show where the first step ends. Use the comparing picture to find the smaller number. Use the part-whole picture to find the total.

   Henry built a tower that is 27 inches tall. Ingrid built a tower that is 6 inches shorter than Henry’s.
   How many inches tall were their towers altogether?

   _____ □ _____    □____
   _____
   _____ + _____ = _____
4. Draw $\times$s to show the data in the line plot. Answer the questions.

<table>
<thead>
<tr>
<th>Boat</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>15 feet</td>
</tr>
<tr>
<td>B</td>
<td>17 feet</td>
</tr>
<tr>
<td>C</td>
<td>16 feet</td>
</tr>
<tr>
<td>D</td>
<td>15 feet</td>
</tr>
</tbody>
</table>

Lengths of Boats

a) How many boats are 15 feet long? _____
b) What is the length of the longest boat? _____ feet
c) What length is the most common? _____ feet
d) How many boats are there altogether? _____
Unit 5: Measurement and Data

Quiz (Lessons 25 to 28)

1. \(58 - 6 = 52\)

2. \(7 + 3 + 9 = 19\)

3. \(27 + 21 = 48\)

4. Teacher to check line plot.
   a) 2
   b) 17
   c) 15
   d) 4
Unit 5: Measurement and Data
Test (Lessons 17 to 28)

1. Measure the distance between the arrows by counting jumps.

   \[ \begin{array}{cccccccccc}
   0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
   \text{inches} \\
   \end{array} \]

   ____ inches

2. What is the length in inches?
   a) 
   \[ \begin{array}{cccccccccc}
   0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
   \text{inches} \\
   \end{array} \]

   ____ inches

   b) 
   \[ \begin{array}{cccccccc}
   0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
   \text{inches} \\
   \end{array} \]

   ____ inches

3. About how long is the fish?

   \[ \begin{array}{cccccccccc}
   0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 \\
   \text{inches} \\
   \end{array} \]

   about ____ inches

4. How long is the line?

   \[ \begin{array}{cccccccccccc}
   0 & \text{inches} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 \\
   0 & \text{cm} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 \\
   \end{array} \]

   ____ inches  about ____ cm
5. What is the best estimate for the bottom object? Write a ✓.

6. Match the problem with one of the pictures.

a) _____ Virginia draws a line 54 cm long. Then she erases 1 cm.

b) _____ Markus draws a line 54 cm long. He makes it 3 cm longer.

c) _____ Li’s ribbon is 54 cm long. She cuts off 3 cm.

d) _____ Brian makes a paper chain 54 cm long. He makes it 1 cm longer.
7. Sammy measured some lengths. He forgot to write the units. Write **inches** or **feet**.
   a) pencil 7 _________
   b) bookshelf 4 _________

8. Answer the questions about the line plot.

   ![Line plot of bird beaks lengths](image)

   a) How many birds have beaks that are 2 cm long? _____
   b) How many birds have beaks that are 3 cm long? _____
   c) How many birds have beaks that are 4 cm long? _____
   **BONUS** How many birds have the longest beaks? _____

9. Terry says that a string that is 4 feet long is the same length as a string that is 4 inches long. Explain Terry’s mistake.

   __________________________________________________________
   __________________________________________________________
Unit 5: Measurement and Data
Test (Lessons 17 to 28)

1. 9
2. a) 6
   b) 8
3. 9
4. 7, 18
5. 34 inches
6. a) C
   b) A
   c) B
   d) D
7. a) inches
   b) feet
8. a) 2
   b) 4
   c) 3

BONUS
   1

9. Sample answer:
   Feet are longer than inches
Unit 6: Measurement and Data
Quiz (Lessons 29 to 31)

1. Fill in the missing numbers.
   a) 
   b) 

2. Where is the hour hand pointing?
   a) 
   b) 
   at the _____

3. Write the time two ways.
   a) 
   b) 
   _____ o’clock
   _____ o’clock
   _____ : 00
   _____ : _____
Unit 6: Measurement and Data

Quiz (Lessons 29 to 31)

4. Draw the hour hand.
   a) ![Clock 1:00]
   b) ![Clock 4 o'clock]

5. Write how many minutes after the hour.
   a) ![Clock 3 minutes past 5]
   b) ![Clock 2 minutes past 12]

   ____ minutes after 5:00
   ____ minutes after 12:00

6. Where is the hour hand pointing?
   a) ![Clock between 9 and 10]
   b) ![Clock between 11 and 12]

   between _____ and _____
   between _____ and _____
7. Write the time. Include the hour and the minutes.
   a) 
   b) 

8. Write the time.
   a) 
   b) 

_____ minutes after _____

_____ minutes after _____
Unit 6: Measurement and Data

Quiz (Lessons 29 to 31)

1. a) 1, 2, 3, 5, 6, 8, 9, 10, 11
   b) 12, 2, 3, 4, 6, 7, 8, 9, 11

2. a) 6
   b) 8

3. a) 9
   b) 10

4. Teacher to check.

5. a) 10
   b) 50

6. a) 6, 7
   b) 12, 1

7. a) 10:45
   b) 8:20

   or
   08:20

8. a) 50, 5
   b) 15, 1
Unit 6: Measurement and Data

Quiz (Lessons 32 to 34)

Name: ______________________
Date: ________________

1. Write the time in numbers and in words.
   a) [Image of a digital clock showing 3:25]
   b) [Image of a digital clock showing 12:05]

   _____ : _____
   ______________________
   ______________________

2. Write the time the digital clock shows. Then draw the time on the analog clock.
   a) [Image of a digital clock showing 5:40]
   b) [Image of a digital clock showing 1:25]
   c) [Image of a digital clock showing 9:35]

   _____ : _____
   _____ : _____
   _____ : _____

3. Write the time in two ways.
   a) [Image of an analog clock showing half past 4]
   b) [Image of an analog clock showing half past 9]
   c) [Image of an analog clock showing half past 11]

   half past _____
   _____ : _____
   half past _____
   _____ : _____
   half past _____
   _____ : _____
Unit 6: Measurement and Data

Quiz (Lessons 32 to 34)

4. Look at where the hour hand is. Draw the minute hand at 12 or 6. Write the time.

   a)               b)               c)               

   _______________  _______________  _______________

5. Is it a.m. or p.m.?
   a) 6 o’clock in the evening  ________
   b) 2 o’clock in the afternoon  ________
   c) 10 o’clock in the morning  ________

6. Count by the hour.

<table>
<thead>
<tr>
<th>Time Now</th>
<th>An Hour Later</th>
<th>An Hour Later</th>
<th>An Hour Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 p.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:00 a.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Unit 6: Measurement and Data

Quiz (Lessons 32 to 34)

1. a) 3:25
   25 minutes after 3

   b) 12:05
   5 minutes after 12

2. a) 5:40
   minute hand points to 8

   b) 1:25
   minute hand points to 5

   c) 9:35
   minute hand points to 7

3. a) 3
   3:30

   b) 7
   7:30

   c) 11
   11:30

4. a) minute hand points to 6, 8:30

   b) minute hand points to 6, 10:30

   c) minute hand points to 12, 5:00

5. a) p.m.

   b) p.m.

   c) a.m.

6. |     |     |     |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td>9:30</td>
<td>10:30</td>
</tr>
<tr>
<td>p.m.</td>
<td>p.m.</td>
<td>p.m.</td>
</tr>
<tr>
<td>2:00</td>
<td>3:00</td>
<td>4:00</td>
</tr>
<tr>
<td>a.m.</td>
<td>a.m.</td>
<td>a.m.</td>
</tr>
</tbody>
</table>
Unit 6: Measurement and Data
Test (Lessons 29 to 34)

Name: ______________________

Date: ________________

1. Fill in the missing numbers.
   a)   b)   
   [Clock with numbers 9, 2, 4]
   [Blank clock]

2. Where is the hour hand pointing?
   a)   b)   c)   
   [Clocks with times 10:11, 11:12, 12:11]
   at the _____  at the _____  at the _____

3. Write the time two ways.
   a)   b)   c)   
   [Clocks with times 9:10, 10:12, 11:9]
   half past _____  half past _____  _____ o’clock
   _____ : _____  _____ : _____  _____ : _____
4. Draw the hour hand.

a) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

2 o’clock

b) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

6:00

c) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

11 o’clock

5. Write how many minutes after the hour.

a) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

___ minutes

after 3:00

b) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

___ minutes

after 12:00

c) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

___ minutes

after 10:00

6. Where is the hour hand pointing?

a) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

between ___

and ___

b) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

between ___

and ___

c) 

\[ \begin{array}{c}
10 \\
9 \\
8 \\
7 \\
6 \\
5 \\
4 \\
3 \\
2 \\
1 \\
12
\end{array} \]

between ___

and ___
7. Write the time in two ways. Include the hour and the minutes.

a) 

b) 

c) 

d) 

8. Is it a.m. or p.m.?

a) 5 o’clock in the morning _____

b) 9 o’clock in the evening _____

c) 5 o’clock in the afternoon _____

9. Count by the half hour.

<table>
<thead>
<tr>
<th>Time Now</th>
<th>A Half Hour Later</th>
<th>A Half Hour Later</th>
<th>A Half Hour Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:30 a.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 p.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:30 a.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Unit 6: Measurement and Data

Test (Lessons 29 to 34)

1. a) 12, 1, 3, 5, 6, 7, 8, 10, 11
   b) 1, 2, 3, 4, 5, 7, 8, 9, 10, 11

2. a) 2
   b) 12
   c) 7

3. a) 10
   b) 2
   c) 6

4. Teacher to check.

5. a) 20
   b) 35
   c) 50

6. a) 2, 3
   b) 5, 6
   c) 11, 12

7. a) 10:10
   b) 7:25 or 07:25
   c) 11:45
   d) 5:05 or 05:05

8. a) a.m.
   b) p.m.
   c) p.m.

9. | Time   |
   | a.m.   |
   | 2:00   |
   | 2:30   |
   | 3:00   |
   | 9:30   |
   | 10:00  |
   | 10:30  |
   | 6:00   |
   | 6:30   |
   | 7:00   |
   | 7:00   |
Unit 7: Measurement and Data

Quiz (Lessons 35 to 38)

1. Write the value and name of each coin.
   a) 
   Value _____
   Name _________________
   b) 
   Value _____
   Name _________________

   c) 
   Value _____
   Name _________________
   d) 
   Value _____
   Name _________________

2. Count the money by coin value.
   
   _____
   _____
   _____
   _____
   _____
   _____
   _____

   
   _____
   _____
   _____
   _____
   _____

10¢  5¢  5¢  10¢  5¢  25¢  10¢  5¢  5¢  10¢  5¢

BONUS: Liz wants to buy a banana that costs 59¢. She has the coins shown below.

25¢  10¢  5¢  1¢  1¢  10¢  5¢

Does Liz have enough money to buy the banana? ________
Unit 7: Measurement and Data

Quiz (Lessons 35 to 38)

1. a) 10¢
   dime

   b) 1¢
   penny

   c) 25¢
   quarter

   d) 5¢
   nickel

2. 25, 50, 60, 70, 80, 85, 86¢

3. Teacher to check circling.
   10, 20, 30, 35, 36¢

4. Teacher to check circling.
   25, 50, 75, 80¢

BONUS

no
Unit 7: Measurement and Data

Quiz (Lessons 39 to 43)

1. Shade coins to make a dollar.
   
   ![Coin Illustration]

2. Complete the table.

<table>
<thead>
<tr>
<th>Cent Notation</th>
<th>Dollars</th>
<th>Dimes</th>
<th>Pennies</th>
<th>Dollar Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>256¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>803¢</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Write the dollar amount. Write the cent amount. Write the total in dollar notation.

   $1
   $1

   ![Coin Illustration]

   Total ________

4. Andy adds coins to his bag. How much money does he have now?

   ![Coin Illustration]

   35¢ + "___" = "___"

   ![Coin Illustration]
5. Marta pays for a toy. How much money will she get back?

BONUS: Mary has one dollar for a snack. The snack costs 59¢. How much money will she get back?
Unit 7: Measurement and Data

Quiz (Lessons 39 to 43)

1. Shade 3 quarters, 2 dimes, and 1 nickel

2. 

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
<td>6</td>
<td>$2.56</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>3</td>
<td>$8.03</td>
</tr>
</tbody>
</table>

3. 2 dollars, 31¢, $2.31

4. 

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>+ 37</td>
<td>72¢</td>
</tr>
</tbody>
</table>

5. 

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>− 54</td>
</tr>
</tbody>
</table>

BONUS

100 − 59 = 41¢
Unit 7: Measurement and Data

Test (Lessons 35 to 43)

1. a) How many pennies make a nickel? ____________________
   b) How many nickels make a dime? ____________________
   c) How many nickels make a quarter? ____________________

2. Count the money by coin value.
   a) 10¢ 10¢ 10¢ 5¢ 5¢ 5¢ 5¢ 1¢ _____ _____ _____ _____ _____ _____ _____
   b) 25¢ 25¢ 25¢ 10¢ 5¢ 1¢ _____ _____ _____ _____ _____ _____

3. Write the coin values from largest to smallest. Count the money.
   1¢ 25¢ 10¢ _____ _____

   25¢ 10¢ 5¢ 5¢ 5¢ 5¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢
5. Shade enough coins in the bottom row to make a dollar.
   a) 
   b) 

6. Write the dollar amount. Write the cent amount. Write the total in dollar notation.

   

   Total __________

7. Write the amount in dollar notation.

   __________

8. Andy adds coins to his bag. How much money does he have now?

   __________

   $1 + 52¢
9. Marta pays for a toy. How much money will she get back?

[Diagram of a toy with a price tag showing 49¢ and circles representing coins: 25¢, 10¢, 10¢, 10¢.]

10. Alex has 2 quarters, 4 dimes and 3 nickels.
   a) Draw Alex’s coins.

   [Diagram of coins: 2 quarters, 4 dimes, 3 nickels.]

   b) Does Alex have more than a dollar? _________

   **BONUS:** How much more or less than a dollar does Alex have? _______________
Unit 7: Measurement and Data

Test (Lessons 35 to 43)

1. a) 5  
b) 2  
c) 5  
2. a) 10, 20, 30, 35, 40, 45, 50, 51  
b) 25, 50, 75, 85, 90, 91  
3. 25, 10, 1  
   25, 35, 36  
4. Teacher to check circling.  
   25, 50, 75, 85, 86  
5. a) shade 2 dimes and 1 nickel  
b) shade 3 dimes and 1 nickel  
6. 3 dollars, 45¢, $3.45  
7. $1.25  
8. 52  
    + 46  
    98¢  
9. 4  
    25¢  
    − 49  
    6¢  
10. a)  
    b) yes  
BONUS  
    5¢ more
1. Draw $\times$ on the shapes that have a **curved** side. 
   Draw $\bigcirc$ on the shapes that have a **straight** side.

   ![Shapes](Image)

2. Draw the line.
   a) an open line
   b) a closed line

3. Write the number of sides and vertices.
   a) 
      - ____ sides
      - ____ vertices
   b) 
      - ____ sides
      - ____ vertices

4. Circle the rectangles. Draw $\times$ on the squares.

   ![Shapes](Image)

5. Draw $\checkmark$ in the square corners.
   a) 
   b) 
   c) 

Sample Unit Quizzes and Tests for AP Book 2.2 V-73
Unit 8: Geometry
Quiz (Lessons 1 to 4)

6. Circle the polygons.

BONUS: Finish the sentence. Use two of the words below.

open  closed  straight  curved

Polygons are ____________ lines and have ____________ sides.
Unit 8: Geometry

Quiz (Lessons 1 to 4)

1. △ □ ☒ ☐

2. Teacher to check.

3. a) 4
   b) 4
   3

4. (The square may also be circled.)

5. a)

   b)
   ☒ ☒
   ☒ ☒

   c)
   ☒ ☒

6. circle the hexagon and trapezoid

BONUS

closed, straight
1. Draw a line from the shape to its name. Circle the quadrilaterals.

- triangle
- rectangle
- square
- pentagon
- hexagon

2. Circle the rhombus.
Unit 8: Geometry
Quiz (Lessons 5 to 8)

3. Measure the sides. Name the shape.
   a) ___________________                      ___________________
      __________ cm       __________ cm
      __________ cm       __________ cm

   b) __________ cm       __________ cm
      __________ cm

   ___________________       ___________________

4. Circle the cubes.
1. triangle  
rectangle  
square  
pentagon  
hexagon  

2. circle the third shape  

3. a) clockwise from top:  
   4, 3, 4, 3  
   rectangle  

   b) 2, 2, 2, 2  
   rhombus  

4. circle the second and fifth shapes
1. Write half, third, or fourth.
   
   a) \[
   \[
   \text{Each part is a } \underline{\text{third}}. 
   \]
   
   b) \[
   \[
   \text{Each part is a } \underline{\text{half}}. 
   \]
   
   c) \[
   \[
   \text{Each part is a } \underline{\text{fourth}}. 
   \]
   
2. Write √ if true. Write × if not true.
   
   a) \[
   \[
   \begin{array}{l}
   \Box \text{ There are 3 parts.} \\
   \Box \text{ All parts are equal.} \\
   \Box \text{ 2 parts are shaded.} \\
   \Box \text{ 2 thirds are shaded.}
   \end{array}
   \]
   
   b) \[
   \[
   \begin{array}{l}
   \Box \text{ There are 3 parts.} \\
   \Box \text{ All parts are equal.} \\
   \Box \text{ 2 parts are shaded.} \\
   \Box \text{ 2 thirds are shaded.}
   \end{array}
   \]
   
   c) \[
   \[
   \begin{array}{l}
   \Box \text{ There are 3 parts.} \\
   \Box \text{ All parts are equal.} \\
   \Box \text{ 2 parts are shaded.} \\
   \Box \text{ 2 thirds are shaded.}
   \end{array}
   \]
Unit 8: Geometry

Quiz (Lessons 9 to 12)

3. Connect the dots to divide the shape in equal parts.
   Count the equal parts.
   a) 
   b) 
   ____ equal parts.  ____ equal parts.

4. Count the squares in the top row.
   Skip count to find how many squares in total.
   ____  ____  ____  ____
   ____ squares in total

BONUS: Draw a shape with 3 sides and one square corner.
Unit 8: Geometry

Quiz (Lessons 9 to 12)

1. a) third
   b) half
   c) fourth

2. a) ✓ ✓ ✓ ✓ ✓
   b) ✓ ✓ ✓ ✓ ✓
   c) ✓ ✓ ✓ ✓ ✓

3. a) 

   2

   b) 

   3

4. 5, 10, 15, 20
   20

BONUS

Answers will vary.
Teacher to check.
Sample answers:

Diagram of two triangles.
Unit 8: Geometry

Test (Lessons 1 to 12)

Name: ______________________
Date: ________________

1. Count the sides and vertices.
   a) _____ sides           b) _____ sides
       _____ vertices                                 _____ vertices

2. Fill in the polygon chart. Use the words below.

   triangle      quadrilateral      pentagon    hexagon

<table>
<thead>
<tr>
<th>Shape</th>
<th>Name</th>
<th>Number of Sides</th>
<th>Number of Vertices</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>△</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>quadrilateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>□</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Write ✓ if always true.

   a) rectangles
      □ Have 4 sides.
      □ All sides are equal.
      □ Have 4 square corners.

   b) squares
      □ Have 4 sides.
      □ All sides are equal.
      □ Have 4 square corners.
Unit 8: Geometry
Test (Lessons 1 to 12)

4. Write ✓ if always true.
   a) rhombuses              b) quadrilaterals
   □ Have 4 sides.                  □ Have 4 sides.
   □ All sides are equal.         □ All sides are equal.
   □ Have 4 square corners.       □ Have 4 square corners.

5. Color the fraction.
   a) one half
   b) three fourths
   c) two thirds

6. Count the squares in the top row.
   Skip count to find how many squares in total.
   ______
   ______
   ______
   ______ squares in total

BONUS: How many hexagons? Hint: What shape is shaded?
   ______ hexagons
1. a) 3
   b) 4
2. a) △ triangle, 3, 3
   b) □ quadrilateral, 4, 4
   c) ○ pentagon, 5, 5
   d) ◆ hexagon, 6, 6
3. a) ✔
   b) ✔
4. a) ✔
   b) ✔
5. Teacher to check.
6. 5, 10, 15
   15
BONUS
8
1. Use the picture graph to fill in the blanks.

<table>
<thead>
<tr>
<th>T-Shirts</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shorts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) There are ____ T-shirts.

b) There are ____ shorts.

c) There are 6 more ________ than ________.

2. Write the number or draw the tally.

a) 

b) 4

3. Use the bar graph to answer the question.

Flowers in the Garden

<table>
<thead>
<tr>
<th>Number of Flowers</th>
<th>Purple</th>
<th>Red</th>
<th>Pink</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

a) How many fewer red flowers are there than white flowers? _____

b) How many more purple flowers are there than pink flowers? _____
4. Use the data to complete the bar graph. Answer the question.

a) How many oak and birch trees are there? ______

b) What is the most common type of tree? ______

c) How many trees are there altogether? ______
1. a) 10  
b) 4  
c) T-shirts, shorts
2. a) 9  
b) \[\boxed{\text{\ldots}}\]  
3. a) 2  
b) 1  
4. Teacher to check bar graph.  
a) 6  
b) pine  
c) 17
1. Use the picture graph to fill in the blank.

   a) There is ____ pear.
   b) There are ____ apples.
   c) There are ____ oranges.
   d) There are ____ bananas.
   e) _______________ are the most common fruit.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>a</td>
<td>o</td>
<td>p</td>
<td>r</td>
</tr>
</tbody>
</table>

2. Use the picture graph to answer the question.

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>r</td>
<td>t</td>
<td>d</td>
<td>r</td>
<td>t</td>
<td>d</td>
<td>r</td>
</tr>
</tbody>
</table>

   a) How many more tulips are there than roses? ________
   b) How many fewer roses are there than daisies? ________
   c) How many flowers are not daisies? ________
3. Draw circles in the picture graph to show the data in the tally chart.

<table>
<thead>
<tr>
<th>Phases of the Moon</th>
<th>Phases of the Moon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Moon</td>
<td></td>
</tr>
<tr>
<td>Half Moon</td>
<td></td>
</tr>
<tr>
<td>Crescent Moon</td>
<td></td>
</tr>
</tbody>
</table>

4. Draw a tally for the number.

a) 12

b) 19

BONUS:

22
5. Use the bar graph to answer the question.

![Student Birthdays Bar Graph]

a) How many fewer birthdays are in the winter than in the fall? ____

b) How many more birthdays are in the summer than in the spring? ____

6. Complete the bar graph.

![Students' Shoes Bar Graph]

<table>
<thead>
<tr>
<th>Color of Shoes</th>
<th>Number of Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>🧦</td>
<td>🧦</td>
</tr>
<tr>
<td>🎉</td>
<td>❌</td>
</tr>
<tr>
<td>🎆</td>
<td>🎆</td>
</tr>
</tbody>
</table>
ADVANCED

7. a) Use the data to create a line plot.

Heights of Penguins

<table>
<thead>
<tr>
<th>Type of Penguin</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humboldt</td>
<td>2 ft</td>
</tr>
<tr>
<td>Adélie</td>
<td>2 ft</td>
</tr>
<tr>
<td>Emperor</td>
<td>3 ft</td>
</tr>
<tr>
<td>Little Blue</td>
<td>1 ft</td>
</tr>
</tbody>
</table>

b) Use the data to create a bar graph.

Heights of Penguins

<table>
<thead>
<tr>
<th>Height in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>0   1   2   3</td>
</tr>
</tbody>
</table>

Type of Penguin

Humboldt
Adélie
Emperor
Little Blue

Heights (feet)

b) Use the data to create a bar graph.

c) Can you see the type of penguins in the line plot? _______

d) In which graph is it easier to see how many penguins are 2 feet tall? _____________________________
Unit 9: Measurement and Data

Test (Lessons 44 to 48)

1. a) 1  
b) 5  
c) 3  
d) 2  
e) Apples

2. a) 3  
b) 6  
c) 13

3. Teacher to check.

4. a) |||| |||  
b) |||| |||| ||||  
BONUS  
   |||| |||| ||||

5. a) 3  
b) 7

6. Teacher to check.

ADVANCED

7. a) Teacher to check.  
b) Teacher to check.  
c) no  
d) line plot
### Scoring Guides for Sample Unit Quizzes and Tests

**Unit 4: Number and Operations in Base Ten**

**Quiz (Lessons 41 to 45), p. V-34**

**Common Core State Standards Emphasized:** 2.NBT.A.2, 2.NBT.B.7, 2.NBT.B.8, 2.OA.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer</td>
<td>143</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>197</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>70, 80, 90</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>840, 850, 860</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>79, 89, 99</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>246, 256, 266</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>Gives correct answer</td>
<td>400, 600, 700, 900</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>5</td>
<td>Gives correct answer</td>
<td>450, 550, 650, 750, 850, 950</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>6</td>
<td>a) Gives correct answer</td>
<td>730, 735, 740, 745, 750, 755</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>33, 38, 43, 48, 53, 58</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>452, 457, 462, 467, 472</td>
<td>yes / no</td>
<td>/2</td>
</tr>
<tr>
<td>7</td>
<td>a) Gives correct answer for all 3 additions</td>
<td>362, 371, 461</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for 1 or 2 additions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer for all 3 additions</td>
<td>833, 923, 824</td>
<td>yes / no</td>
<td>/1</td>
</tr>
<tr>
<td>8</td>
<td>a) Gives correct answer</td>
<td>60, 50, 40</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>440, 430, 420</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>9</td>
<td>a) Gives correct answer</td>
<td>300, 200, 100</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>358, 258, 158</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>10</td>
<td>a) Gives correct answer for both subtractions</td>
<td>280, 190</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for 1 subtraction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer for both subtractions</td>
<td>708, 618</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for 1 subtraction</td>
<td></td>
<td></td>
<td>/2</td>
</tr>
</tbody>
</table>

**Total Points** /17
### Test (Lessons 41 to 45), p. V-37

**Common Core State Standards Emphasized:** 2.NBT.A.2, 2.NBT.B.7, 2.NBT.B.8, 2.OA.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer</td>
<td>120</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>170</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>150</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>190</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>124</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>169</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer</td>
<td>288</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>941</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>692</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>a) Gives correct answer</td>
<td>54, 64, 74</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>668, 678, 688</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>1842, 1852, 1862, 1872</td>
<td>yes / no</td>
<td>/2</td>
</tr>
<tr>
<td>6</td>
<td>a) Gives correct answer</td>
<td>300, 500, 600, 800, 900</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>5400, 5600, 5700</td>
<td>yes / no</td>
<td>/1</td>
</tr>
<tr>
<td>7</td>
<td>a) Gives correct answer</td>
<td>530, 630, 730</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>609, 709, 809</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>7312, 7412, 7512, 7612, 7712</td>
<td>yes / no</td>
<td>/2</td>
</tr>
<tr>
<td>8</td>
<td>a) Gives correct answer</td>
<td>25, 30, 35, 40, 45, 50, 55, 60, 65</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>835, 840, 845, 850, 855, 860, 865</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>16, 21, 26, 31, 36, 41, 46, 51, 56</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>633, 638, 643, 648, 653</td>
<td>yes / no</td>
<td>/3</td>
</tr>
<tr>
<td>9</td>
<td>a) Gives correct answer for all 3 additions</td>
<td>248, 257, 347</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for 1 or 2 additions</td>
<td>(0.5)</td>
<td>/1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer for all 3 additions</td>
<td>404, 494, 395</td>
<td>yes / no</td>
<td>/1</td>
</tr>
<tr>
<td>10</td>
<td>Gives correct answer</td>
<td>He added 100 instead of adding 10.</td>
<td>1</td>
<td>/1</td>
</tr>
</tbody>
</table>
### Question How to Score

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>a) Gives correct answer</td>
<td>50, 40, 30</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>270, 260, 250</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>61, 51, 41</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>526, 516, 506</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>a) Gives correct answer</td>
<td>600, 500, 400</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>691, 591, 491</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>a) Gives correct answer for both subtractions</td>
<td>570, 480</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for 1 subtraction</td>
<td>(0.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer for both subtractions</td>
<td>319, 229</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for 1 subtraction</td>
<td>(0.5)</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points**  
/27
### Rubric for Unit 4: Number and Operations in Base Ten

#### Test (Lessons 41 to 45), p. V-37

<table>
<thead>
<tr>
<th>Common Core State Standard</th>
<th>Assessed by Question(s) …</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.NBT.A.2</td>
<td>Count within 1,000; skip-count by 5s, 10s, and 100s.</td>
<td>1, 5 + Bonus, 6 + Bonus, 7 + Bonus, 8 + Bonus, 11, 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.NBT.B.8</td>
<td>Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.</td>
<td>2, 3, 4, 9 + Bonus, 10, 13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

---

Name: ____________________
## Scoring Guides for Sample Unit Quizzes and Tests

### Unit 5: Measurement and Data

#### Quiz (Lessons 17 to 20), p. V-41

**Common Core State Standards Emphasized:** 2.MD.A.1, 2.MD.A.2, 2.MD.A.3

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gives correct answer</td>
<td>6</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>2</td>
<td>Gives correct answer</td>
<td>3</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>3</td>
<td>Chooses correct answer</td>
<td>2 inches</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer for inches</td>
<td>3</td>
<td>0.5</td>
<td>/1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for centimeters</td>
<td>8</td>
<td>0.5</td>
<td>/1</td>
</tr>
<tr>
<td>b) Gives correct answer for inches</td>
<td>3</td>
<td>0.5</td>
<td>/2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for centimeters</td>
<td>7</td>
<td>0.5</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>a) Gives correct answer</td>
<td>longer</td>
<td>0.5</td>
<td>/1</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>shorter</td>
<td>0.5</td>
<td>/1</td>
</tr>
</tbody>
</table>

#### Quiz (Lessons 21 to 24), p. V-43

**Common Core State Standards Emphasized:** 2.MD.A.1, 2.MD.A.3, 2.MD.B.5, 2.MD.B.6

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gives correct answer</td>
<td>circles car, tiger</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>feet</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>inches</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Draws correct picture</td>
<td>10 + 4</td>
<td>0.5</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>Gives correct equation</td>
<td>14</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Draws correct picture</td>
<td>15 − 6</td>
<td>0.5</td>
<td>/4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct equation</td>
<td>9</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Points** /7
### Scoring Guides for Sample Unit Quizzes and Tests
#### Unit 5: Measurement and Data

**Quiz (Lessons 25 to 28), p. V-45**

**Common Core State Standards Emphasized:** 2.MD.A.1, 2.MD.A.3, 2.MD.B.5, 2.MD.B.6, 2.MD.D.9, 2.OA.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correctly fills in part-whole picture</td>
<td>58, 6, □</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct subtraction sentence</td>
<td>58 − 6 = □</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>52</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>Gives correct number sentence</td>
<td>7 + 3 + 9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>19</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>Correctly draws a line where first step ends before “How”</td>
<td>27, 21, 6</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly fills in comparing picture</td>
<td>27, 21</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly fills in part-whole picture</td>
<td>48, 27, 21</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>48</td>
<td>0.5</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>Correctly draws line plot for all 4 boats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws line plot for 1, 2, or 3 boats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Gives correct answer</td>
<td>17</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Gives correct answer</td>
<td>15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>Gives correct answer</td>
<td>4</td>
<td>1</td>
<td>/5</td>
</tr>
</tbody>
</table>

**Total Points** /11
### Scoring Guides for Sample Unit Quizzes and Tests

#### Unit 5: Measurement and Data

(continued)

<table>
<thead>
<tr>
<th>Test (Lessons 17 to 28), p. V-48</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Core State Standards Emphasized:</strong> 2.MD.A.1, 2.MD.A.2, 2.MD.A.3, 2.MD.B.5, 2.MD.B.6, 2.MD.D.9, 2.OA.A.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gives correct answer</td>
<td>9</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>8</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>Gives correct answer</td>
<td>9</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>4</td>
<td>Gives correct answer for inches</td>
<td>7</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for centimeters</td>
<td>18</td>
<td>0.5</td>
<td>/1</td>
</tr>
<tr>
<td>5</td>
<td>Chooses correct answer</td>
<td>34 inches</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>6</td>
<td>Gives 4 correct answers</td>
<td>a) C</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives 1 or 2 correct answers</td>
<td>b) A</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>a) Gives correct answer</td>
<td>inches</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>feet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>a) Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>1</td>
<td>yes / no</td>
<td>/3</td>
</tr>
<tr>
<td>9</td>
<td>Gives correct answer</td>
<td>Feet are longer than inches, so 4 feet is longer than 4 inches.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points** /14
## Rubric for Unit 5: Measurement and Data

Test (Lessons 17 to 27), p. V-48

<table>
<thead>
<tr>
<th>Common Core State Standard</th>
<th>Assessed by Question(s)</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.A.1 Measure the length of an object by selecting and using appropriate tools, such as rulers, yardsticks, meter sticks, and measuring tapes.</td>
<td>1, 2, 3, 7</td>
<td>Can answer few, if any, questions accurately and independently.</td>
<td>Can answer some questions accurately and independently.</td>
<td>Can answer most questions accurately and independently.</td>
<td>Can answer all or almost all questions, including bonuses, accurately and independently.</td>
</tr>
<tr>
<td>2.MD.A.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.</td>
<td>4, 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.MD.A.3 Estimate lengths using units of inches, feet, centimeters, and meters.</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.MD.D.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.</td>
<td>8, Bonus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments**
### Scoring Guides for Sample Unit Quizzes and Tests

**Unit 6: Measurement and Data**

#### Quiz (Lessons 29 to 31), p. V-52

**Common Core State Standards Emphasized:** 2.MD.C.7, 2.NBT.A.2

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives 7 to 9 correct answers</td>
<td>1, 2, 3, 5, 6, 8, 9, 10, 11</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>b) Gives 7 to 9 correct answers</td>
<td>12, 2, 3, 4, 6, 7, 8, 9, 11</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>6</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>8</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>9, 9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>10, 10:00</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>a) Correctly draws the hour hand</td>
<td>pointing at 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Correctly draws the hour hand</td>
<td>pointing at 4</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>a) Gives correct answer</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>50</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>6</td>
<td>a) Gives correct answer</td>
<td>6, 7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>12, 1</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>7</td>
<td>a) Gives correct answer</td>
<td>10:45</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>8:20 or 08:20</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>8</td>
<td>a) Gives correct answer</td>
<td>50, 5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>15, 1</td>
<td>1</td>
<td>/2</td>
</tr>
</tbody>
</table>

**Total Points /16**
## Scoring Guides for Sample Unit Quizzes and Tests
### Unit 6: Measurement and Data

(continued)

Quiz (Lessons 32 to 34), p. V-56

<table>
<thead>
<tr>
<th>Common Core State Standards Emphasized:</th>
<th>2.MD.C.7, 2.G.A.3</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer in numbers</td>
<td>3:25</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer in words</td>
<td>25 minutes after 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Gives correct answer in numbers</td>
<td>12:05</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer in words</td>
<td>5 minutes after 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer in numbers</td>
<td>5:40</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Correctly draws the minute hand</td>
<td>pointing at 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Gives correct answer in numbers</td>
<td>1:25</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws the minute hand</td>
<td>pointing at 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Gives correct answer in numbers</td>
<td>9:35</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws the minute hand</td>
<td>pointing at 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>3, 3:30</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b) Gives correct answer</td>
<td>7, 7:30</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Gives correct answer</td>
<td>11, 11:30</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>a) Correctly draws the minute hand</td>
<td>pointing at 6</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>8:30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Correctly draws the minute hand</td>
<td>pointing at 6</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>10:30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Correctly draws the minute hand</td>
<td>pointing at 12</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>5:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>a) Gives correct answer</td>
<td>p.m.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b) Gives correct answer</td>
<td>p.m.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Gives correct answer</td>
<td>a.m.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Gives correct answer for first row</td>
<td>8:30 p.m., 9:30 p.m., 10:30 p.m.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for second row</td>
<td>2:00 a.m., 3:00 a.m., 4:00 a.m.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Total Points /16
### Test (Lessons 29 to 34), p. V-59

**Common Core State Standards Emphasized:** 2.MD.C.7, 2.G.A.3, 2.NBT.A.2

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives 7 to 9 correct answers</td>
<td>12, 1, 3, 5, 6, 7, 8, 10, 11</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>b) Gives 8 to 10 correct answers</td>
<td>1, 2, 3, 4, 5, 7, 8, 9, 10, 11</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>2</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>10, 10:30</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>2, 2:30</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>6, 6:00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>a) Correctly draws the hour hand pointing at 2</td>
<td></td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>b) Correctly draws the hour hand pointing at 6</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Correctly draws the hour hand pointing at 11</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>a) Gives correct answer</td>
<td>20</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>35</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>50</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>a) Gives correct answer</td>
<td>2, 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>5, 6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>11, 12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>a) Correctly gives the time in two ways</td>
<td>10:10, 10, 10</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>b) Correctly gives the time in two ways</td>
<td>7:25 or 07:25, 25, 7</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>c) Correctly gives the time in two ways</td>
<td>11:45; 45, 11</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>d) Correctly gives the time in two ways</td>
<td>5:05 or 05:05; 5, 5</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td>8</td>
<td>a) Gives correct answer</td>
<td>a.m.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>p.m.</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>p.m.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gives correct answer for first row</td>
<td>2:00 a.m., 2:30 a.m., 3:00 a.m., 9:30 p.m., 10:00 p.m., 10:30 p.m., 6:00 a.m., 6:30 a.m., 7:00 a.m.</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for second row</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for third row</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points** /27
<table>
<thead>
<tr>
<th>Common Core State Standard</th>
<th>Assessed by Question(s) …</th>
<th>Level 1 Can answer few, if any, questions accurately and independently.</th>
<th>Level 2 Can answer some questions accurately and independently.</th>
<th>Level 3 Can answer most questions accurately and independently.</th>
<th>Level 4 Can answer all or almost all questions, including bonuses, accurately and independently.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.C.7</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments
## Scoring Guides for Sample Unit Quizzes and Tests

### Unit 7: Measurement and Data

#### Quiz (Lessons 35 to 38), p. V-63

**Common Core State Standards Emphasized:** 2.MD.C.8, 2.NBT.A.2

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct value</td>
<td>10¢</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct name</td>
<td>dime</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct value</td>
<td>1¢</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct name</td>
<td>penny</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct value</td>
<td>25¢</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct name</td>
<td>quarter</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct value</td>
<td>5¢</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct name</td>
<td>nickel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gives correct answer</td>
<td>25, 50, 60, 70, 80, 85, 86¢</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Correctly circles groups of 10</td>
<td>10, 20, 30, 35, 36¢</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Correctly circles groups of 25</td>
<td>25, 50, 75, 80</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>no</td>
<td>yes / no</td>
<td>yes / no</td>
</tr>
<tr>
<td></td>
<td>Total Points</td>
<td>/9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Quiz (Lessons 39 to 43), p. V-66

**Common Core State Standards Emphasized:** 2.NBT.A.2, 2.NBT.B.5, 2.MD.C.8, 2.OA.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correctly shades coins to make a dollar</td>
<td>3 quarters, 2 dimes, 1 nickel</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gives correct answer for first row</td>
<td>2, 5, 6, $2.56</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for second row</td>
<td>8, 0, 3, $8.03</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Gives correct dollar amount</td>
<td>$2</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct cent amount</td>
<td>31¢</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer in dollar notation</td>
<td>$2.31</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Gives correct addend</td>
<td>37</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>72</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Gives correct subtraction</td>
<td>75 – 54</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>21¢</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct subtraction</td>
<td>100 – 59</td>
<td>yes / no</td>
<td>yes / no</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>41¢</td>
<td>yes / no</td>
<td>yes / no</td>
</tr>
<tr>
<td></td>
<td>Total Points</td>
<td>/9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Scoring Guides for Sample Unit Quizzes and Tests
#### Unit 7: Measurement and Data

**Test (Lessons 35 to 43), p. V-69**

**Common Core State Standards Emphasized:** 2.NBT.A.2, 2.NBT.B.5, 2.MD.C.8, 2.OA.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>5</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>10, 20, 30, 35, 40, 45, 50, 51</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>25, 50, 75, 85, 90, 91</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>Correctly orders coins</td>
<td>25, 10, 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>25, 35, 36</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>Correctly circles groups of 25 and 10</td>
<td>25, 50, 75, 85, 86</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>a) Correctly shades coins to make a dollar</td>
<td>2 dimes, 1 nickel</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Correctly shades coins to make a dollar</td>
<td>3 dimes, 1 nickel</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>6</td>
<td>Gives correct dollar amount</td>
<td>$3</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct cent amount</td>
<td>45¢</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer in dollar notation</td>
<td>$3.45</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>7</td>
<td>Gives correct answer</td>
<td>$1.25</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>8</td>
<td>Gives correct addend</td>
<td>46</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>98</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>9</td>
<td>Gives correct subtraction</td>
<td>55 – 49</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>6¢</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>10</td>
<td>a) Correctly draws coins</td>
<td>25 25 10 10 5 5 10 10 10 5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>yes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>5¢ more</td>
<td>yes / no</td>
<td>/2</td>
</tr>
</tbody>
</table>

**Total Points** /20
# Rubric for Unit 7: Measurement and Data

Test (Lessons 35 to 43), p. V-69

<table>
<thead>
<tr>
<th>Common Core State Standard</th>
<th>Assessed by Question(s) …</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.C.8</td>
<td></td>
<td>Can answer few, if any, questions accurately and independently.</td>
<td>Can answer some questions accurately and independently.</td>
<td>Can answer most questions accurately and independently.</td>
<td>Can answer all or almost all questions, including bonuses, accurately and independently.</td>
</tr>
<tr>
<td>Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, Bonus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

Name: __________________
### Scoring Guides for Sample Unit Quizzes and Tests
#### Unit 8: Geometry

#### Quiz (Lessons 1 to 4), p. V-73

**Common Core State Standards Emphasized:** 2.G.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correctly identifies shapes with a curved side</td>
<td>shapes 2, 3, 4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly identifies shapes with a straight side</td>
<td>shapes 1, 2, 3</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>a) Draws a correct answer</td>
<td>sample answer:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws a correct answer</td>
<td>sample answer:</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>4, 4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>4, 3</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>Correctly identifies the rectangle</td>
<td>shape 1 (shape 3)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly identifies the square</td>
<td>shape 3</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>a) Correctly identifies the square corner</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Correctly identifies all 4 square corners</td>
<td></td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>Correctly identifies 1, 2, or 3 square corners</td>
<td></td>
<td>(0.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Correctly identifies 2 square corners</td>
<td></td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>Correctly identifies 1 square corner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Correctly identifies the polygons</td>
<td>shapes 1, 4</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>closed, straight</td>
<td>yes / no</td>
<td></td>
</tr>
<tr>
<td>Total Points</td>
<td></td>
<td></td>
<td></td>
<td>/12</td>
</tr>
</tbody>
</table>

#### Quiz (Lessons 5 to 8), p. V-76

**Common Core State Standards Emphasized:** 2.G.A.1

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correctly matches all 5 pairs</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly matches 1, 2, or 3 pairs</td>
<td></td>
<td>(0.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly circles both quadrilaterals</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly circles one quadrilateral</td>
<td></td>
<td>(0.5)</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>Correctly identifies the rhombus</td>
<td>shape 3</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>3</td>
<td>a) Correctly measures the sides</td>
<td>4, 3, 4, 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly names the shape</td>
<td>rectangle</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Correctly measures the sides</td>
<td>2, 2, 2, 2</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td></td>
<td>Correctly names the shape</td>
<td>rhombus</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Correctly identifies both cubes</td>
<td>shapes 2, 5</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td></td>
<td>Correctly identifies one cube</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Points</td>
<td></td>
<td></td>
<td></td>
<td>/8</td>
</tr>
</tbody>
</table>
### Scoring Guides for Sample Unit Quizzes and Tests

**Unit 8: Geometry**

<table>
<thead>
<tr>
<th>Quiz (Lessons 9 to 12), p. V-79</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer</td>
<td>third</td>
<td>1</td>
<td>1/3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>half</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>fourth</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>✓, ✓, ×, ×</td>
<td>1</td>
<td>1/3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✓, ×, ✓, ×</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>✓, ✓, ✓, ✓</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>a) Correctly connects the dots</td>
<td>[Diagram]</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Correctly connects the dots</td>
<td>[Diagram]</td>
<td>1</td>
<td>1/4</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Skip counts correctly</td>
<td>5, 10, 15, 20</td>
<td>0.5</td>
<td>1/1</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>20</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>Draws a correct shape</td>
<td>sample answer: yes / no</td>
<td>0.5</td>
<td>1/2</td>
</tr>
</tbody>
</table>

**Total Points** /11
<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer</td>
<td>3, 3</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>4, 4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>triangle, 3, 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>□, 4, 4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>○, pentagon, 5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>hexagon, 6, 6</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>✓, x, ✓</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✓, ✓, ✓</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer</td>
<td>✓, ✓, x</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✓, x, x</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>a) Shades correct fraction</td>
<td>shades 1 part</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Shades correct fraction</td>
<td>shades 3 parts</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Shades correct fraction</td>
<td>shades 2 parts</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td>6</td>
<td>Correctly skip counts</td>
<td>5, 10, 15</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>15</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>8</td>
<td>yes / no</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Points</strong></td>
<td><strong>14</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Rubric for Unit 8: Geometry

### Test (Lessons 1 to 12), p. V-82

**Common Core State Standard** | **Assessed by Question(s) ...** | **Level 1** | **Level 2** | **Level 3** | **Level 4**
--- | --- | --- | --- | --- | ---
2.G.A.1  
Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. | 1, 2, 3, 4, Bonus | Can answer few, if any, questions accurately and independently. | Can answer some questions accurately and independently. | Can answer most questions accurately and independently. | Can answer all or almost all questions, including bonuses, accurately and independently. |
2.G.A.3  
Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. | 5 | | | | |
2.OA.C.4  
Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. | 6 | | | | |

**Comments**
### Scoring Guides for Sample Unit Quizzes and Tests

**Unit 9: Measurement and Data**

**Quiz (Lessons 44 to 48), p. V-85**

Common Core State Standards Emphasized: 2.MD.D.10, 2.OA.B.2

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Gives correct answer</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>T-shirts, shorts</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>1</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>Correctly draws all 4 bars</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws 1, 2, or 3 bars</td>
<td>(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Gives correct answer</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>pine</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>17</td>
<td>1</td>
<td>/5</td>
</tr>
</tbody>
</table>

**Total Points** /12
## Scoring Guides and Rubrics to accompany Sample Unit Quizzes and Tests
### Unit 9: Measurement and Data

#### Common Core State Standards Emphasized: 2.MD.D.10, 2.OA.B.2

<table>
<thead>
<tr>
<th>Question</th>
<th>How to Score</th>
<th>Answer</th>
<th>Number of Points</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>a) Gives correct answer</td>
<td>1</td>
<td>1</td>
<td>/5</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) Gives correct answer</td>
<td>Apples</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>a) Gives correct answer</td>
<td>3</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>13</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Correctly draws pictures for all 3 phases</td>
<td>2</td>
<td>/2 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws pictures for 1 or 2 phases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>a) Gives correct answer</td>
<td>☑️</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>☑️</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>☑️</td>
<td>yes / no</td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>a) Gives correct answer</td>
<td>3</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Correctly draws all 3 bars</td>
<td>2</td>
<td>/2 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws 1, or 2 bars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Advanced 7</strong></td>
<td>a) Correctly draws line plot for all 3 heights</td>
<td>2</td>
<td>/2 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws line plot for 1 or 2 heights</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Correctly draws all 4 bars</td>
<td>2</td>
<td>/1 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly draws 1, 2, or 3 bars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>no</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>line plot</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Total Points /16
## Rubric for Unit 9: Measurement and Data

Test (Lessons 44 to 48), p. V-88

<table>
<thead>
<tr>
<th>Common Core State Standard</th>
<th>Assessed by Question(s) …</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.D.10</td>
<td>1, 2, 3, 4, 5, 6, 7 (Advanced)</td>
</tr>
</tbody>
</table>

*Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.*

### Comments

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can answer few, if any, questions accurately and independently.</td>
<td>Can answer some questions accurately and independently.</td>
<td>Can answer most questions accurately and independently.</td>
<td>Can answer all or almost all questions, including bonuses, accurately and independently.</td>
</tr>
</tbody>
</table>

Name: ____________________
Grade 2 Common Core State Standards Curriculum Correlations

NOTE: The italicized gray JUMP Math lessons contain prerequisite material for the Common Core standards.

Domain

OA Operations and Algebraic Thinking
NBT Number and Operations in Base Ten
MD Measurement and Data
G Geometry

Cluster

2.OA Operations and Algebraic Thinking

2.OA.A Represent and solve problems involving addition and subtraction.

2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA2-9, OA2-8</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OA2-23, OA2-25</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>OA2-28 to 30, OA2-31 to 35</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>OA2-36, OA2-39 to 43</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>NBT2-24</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>OA2-45 to 48</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA2-51 to 61</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>NBT2-45</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>MD2-26</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>MD2-41 to 43</td>
</tr>
</tbody>
</table>
### 2.OA  Operations and Algebraic Thinking

#### 2.OA.B  Add and subtract within 20.

2.OA.B.2  Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA2-1, OA2-2, 3, 6, 7, 10, 11</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OA2-17 to 22</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>OA2-26, 27</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>OA2-37, 38, 41, 42</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>NBT2-16</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>OA2-44</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>MD2-45, 47, 48</td>
</tr>
</tbody>
</table>

#### 2.OA.C  Work with equal groups of objects to gain foundations for multiplication.

2.OA.C.3  Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.

2.OA.C.4  Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA2-4 to 6</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA2-49</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA2-50</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>G2-11, 12</td>
</tr>
</tbody>
</table>
### 2.NBT. Understand place value.

<table>
<thead>
<tr>
<th>2.NBT.A</th>
<th>JUMP Math Grade 2 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.NBT.1</strong></td>
<td>Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>2.NBT.1a</strong></td>
<td>100 can be thought of as a bundle of ten tens—called a “hundred.”</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>2.NBT.1b</strong></td>
<td>The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>2.NBT.2</strong></td>
<td>Count within 1000; skip-count by 5s, 10s, and 100s.</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td><strong>2.NBT.3</strong></td>
<td>Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>2.NBT.4</strong></td>
<td>Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using “&gt;,” “=,” and “&lt;” symbols to record the results of comparisons.</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
## 2.NBT  Number and Operations in Base Ten

### 2.NBT.B Use place value understanding and properties of operations to add and subtract.

| 2.NBT.B.5 | Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. |
| 2.NBT.B.6 | Add up to four two-digit numbers using strategies based on place value and properties of operations. |
| 2.NBT.B.7 | Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds. |
| 2.NBT.B.8 | Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900. |
| 2.NBT.B.9 | Explain why addition and subtraction strategies work, using place value and the properties of operations. |

### JUMP Math Grade 2 Lessons

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>NBT2-5, 7 to 14</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>NBT2-15 to 23</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>MD2-41, 42</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>NBT2-10, 11</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>NBT2-19</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>NBT2-31 to 34, 36 to 40</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>NBT2-45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>NBT2-2, NBT2-6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>NBT2-41 to 44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>NBT2-10, 11</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>NBT2-35, 38 to 40</td>
</tr>
</tbody>
</table>
## 2.MD Measurement and Data

### 2.MD.A Measure and estimate lengths in standard units.

<table>
<thead>
<tr>
<th>2.MD.A</th>
<th>JUMP Math Grade 2 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.A.1</td>
<td>Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2.MD.A.2</td>
<td>Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2.MD.A.3</td>
<td>Estimate lengths using units of inches, feet, centimeters, and meters.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2.MD.A.4</td>
<td>Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

### 2.MD.B Relate addition and subtraction to length.

<table>
<thead>
<tr>
<th>2.MD.B</th>
<th>JUMP Math Grade 2 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.B.5</td>
<td>Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2.MD.B.6</td>
<td>Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

### 2.MD.C Work with time and money.

<table>
<thead>
<tr>
<th>2.MD.C</th>
<th>JUMP Math Grade 2 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.C.7</td>
<td>Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2.MD.C.8</td>
<td>Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2.MD.D.9</td>
<td>Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.MD.D.10</th>
<th>Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</th>
<th>JUMP Math Grade 2 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part</td>
<td>Unit</td>
<td>Lessons</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>MD2-44 to 48</td>
</tr>
</tbody>
</table>
### Geometry

#### 2.G.A Reason with shapes and their attributes.

<table>
<thead>
<tr>
<th>2.G.A.1</th>
<th>Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JUMP Math Grade 2 Lessons</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.G.A.2</th>
<th>Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JUMP Math Grade 2 Lessons</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.G.A.3</th>
<th>Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JUMP Math Grade 2 Lessons</td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>