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 3  Operations and Algebraic Thinking: Problem Solving with Pictures, Models, and Equations

Introduction

In this unit, students will solve problems involving parts and totals, comparisons between quantities, and changing quantities. Students will use a variety of strategies and tools, including drawings, models, and number sentences (with unknowns in all positions). Students will identify coins and solve problems involving money.

In many lessons, students will use diagrams of the following type:

These are traditionally called “part-total diagrams” or “part-whole diagrams.” However, in this unit we call them “part-total pictures” because the words “total” and “picture” are more familiar to Grade 1 students. We recommend you use the word “whole” occasionally with students and let them know that it means “total” or “all.” You might mention this in the context of “the whole class,” meaning all the students in the class or the total number of students. We also recommend that you tell students that “part-total pictures” are often called “part-whole diagrams.”

Materials. In Lessons OA1-71 and OA1-72, students will be using play coins. If you do not have a class set of play coins, we have provided BLM Coins to Cut Out, but several of the activities in these lessons will only work if you are using physical coins.

In addition, Extensions 2 and 3 in Lesson OA1-71 suggest that students bring special coins (for example, from other countries) from home. You will need to alert students about this ahead of time if you want to use these extensions.

Recurring games. Several of the lessons feature activities with these games:

1. Picking pairs. Use, for example, pairs of cards from BLM Memory Cards. The deck that students use depends on the lesson. Students can play in teams or individually. Place a $3 \times 4$ array of cards face up on a table. Students take turns picking pairs of matching cards and placing them on a common discard pile. When a pair of cards is removed from the array, more cards are added to it. If the array does not have any matches, shuffle those cards with the remaining cards and make a new array. (Keep the matched cards in the discard pile.) The goal is to place all the cards in the discard pile. If students have any non-matching cards left at the end of the game, then some of their cards must have been matched incorrectly.
2. **I Have ____ , Who Has ____ ?** Each student needs one card to play. The top and bottom of each card are filled with numerals or other representations of numbers, such as an arrangement of dots, base ten blocks, or an addition or subtraction sentence. For example:

<table>
<thead>
<tr>
<th>I have 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who has 6</td>
</tr>
</tbody>
</table>

You may be asked to make the cards in advance, or students may be asked to make their own cards. Use **BLM I Have ____ , Who Has ____ ? Game Cards** as a template in these cases. The student with the card shown above begins by saying, “I have 3. Who has 7?” The student who has 7 on the top of his card says, “I have 7. Who has [whatever is on the bottom of the card]?” At first, when only the numbers 1 to 10 are available, students will have to play in smaller groups so that two people do not have the same number.

3. **Memory.** Arrange cards from **BLM Memory Cards** in an array face down on a table. Students turn over two cards at a time. If the cards match by number or value, students set these cards aside; otherwise, they turn them face down again and continue playing. Play this first as a whole class, with volunteers taking turns. Students can play individually or cooperatively in pairs. In either case, the goal is to find and remove all the pairs of matching cards. If playing with a partner, Player 1 leads by choosing and turning over a card and Player 2 follows by choosing and turning over another card. Player 2 then states whether it is a match. If Player 1 does not agree, encourage students to discuss their ideas. For the next turn, Player 2 turns over the first card and Player 1 turns over the next card and states whether it is a match.

In addition to the BLMs provided at the end of the unit, the following Generic BLM, found in section P, is used in Unit 3:

**BLM I Have ____ , Who Has ____ ? Game Cards** (p. P-15)
Goals

Students determine the total in an addition sentence using pictures and models.

Prior Knowledge Required

Can add by counting and drawing objects
Knows the meaning of the addition sign and the equal sign

Materials

16 blocks (or other objects) that are the same size, shape, and color
2 flat surfaces (e.g., 2 desks, 2 chairs, 2 ends of a table)

Review equal (=). Put two desks at the front of the class and stand between them. SAY: We call each desk a side. Put 3 blocks on each desk. One at a time, point to each group of blocks and ASK: How many blocks are on this side? (3) Does each side have the same number of blocks? (yes) SAY: When the sides have the same number of blocks, we say “the sides are equal.” Add a fourth block to one side and ASK: Are the sides equal now? (no) Add a fourth block to the other side and ASK: Are the sides equal now? (yes)

Remove all of the blocks from one side and ASK: Are the sides equal? (no) Write “=” on the board. SAY: You have seen this sign many times before. ASK: What does it mean? (equal) Put 4 blocks on the empty side. Point to one side and ASK: How many blocks are on this side? (4) Write a “4” on the board on the left side of the equal sign. Repeat the question for the other side. Write a “4” on the board on the right side of the equal sign. ASK: Are the sides equal? (yes) SAY: Since the sides are equal, we write an equal sign between the two sides. The picture should look like this:

4 = 4

SAY: We say “four equals four.” It means that each side is 4 and the two sides are equal.

Review not equal. Put one more block on one desk. Have students count the blocks on both sides and tell you the numbers. (4 and 5) Write on the board:

4 5

ASK: Are the sides equal? (no) SAY: Since the sides are not equal, we cannot write an equal sign between 4 and 5.

Using pictures to represent equal and not equal. Draw on the board:
SAY: I drew two tables. Draw 2 balls on each table and explain that they stand for the blocks but balls are easier to draw. Have students count the balls on each side. Draw a box below each table and write “2” as shown below:

2 2

ASK: Do the sides have the same number of balls? (yes) Are the sides equal or not equal? (equal) Write “2 2” on the board. ASK: Can I write an equal sign between the two 2s? (yes) Write “=” between the two 2s on the board.

Draw another ball on the right table and ASK: How many balls are on this side now? (3) Replace the 2 in the box under the right table with a 3 and write “2 3” on the board. ASK: Can I write an equal sign between the numbers? (no) Why? (2 and 3 are not the same, 2 and 3 are different numbers, or 2 and 3 are not equal) How do we say this? (two does not equal three)

Repeat the activity drawing a variety of configurations that show equal and not equal, and alternate the table that has more balls (e.g., 3, 3; 3, 5; 5, 4). For each case, have students identify the number of balls on each side and say if they are equal or not equal.

**Equal and not equal.** Draw on the board:

```
  O O
  2
```

ASK: How many balls do you see in the picture? (4) Point out that the four balls are in two groups. Ask a volunteer to circle the two groups. Draw a box under each group. ASK: How many balls are in each group? (1 and 3) Write “1” and “3” in the boxes. The final picture should look like this:

```
  O O O O
  1 3
```

Write “+” between the 1 and 3 and SAY: We use the plus sign to show adding the number of balls in the two groups to find the total number of balls.

Draw a new table to the right showing four balls, as shown below:

```
  O O O O
  1 + 3
```
Ask a volunteer to count the balls on the new table and write the number in the box. Point to the table on the left and ASK: How many balls are there altogether? (4) Point to the table on the right and ASK: How many balls are there? (4) Do the tables have the same number of balls? (yes) Pointing from the left table to the right table, ASK: Is the number of balls on this table equal to the number of balls on this table? (yes) Write “=” between the tables to make an addition sentence for the two tables. The final picture should look like this:

![Addition Sentence Example]

Erase the second table and the equal sign. Draw a new table on the board beside the first table, as shown below:

![New Table Example]

SAY: The first table is exactly the same as before, but the second table is different. Have a volunteer count the number of balls on the table on the right and write “7” in the box. ASK: Are the number of balls the same on the two tables? (no) Can we say they are equal? (no) Can we write an equal sign between the two sides? (no)

**Introduce number sentences with a missing number.** Draw on the board:

![Missing Number Example]

Tell students that the equal sign shows there are the same number of balls on each table, but the balls on the right side are hidden in a box. Ask a volunteer to draw the correct number of balls in the box (so the same number of balls is on each table). Ask another volunteer to complete the number sentence, as shown below:

![Completed Number Sentence]

Draw several more questions of this type on the board, such as $3 + 1 = 4$ and $2 + 5 = 7$, and ask volunteers to draw the hidden balls and complete the number sentence.
In the exercises below, point to the box in each question and ASK: How many balls are hidden in the box? Point to the empty square in the number sentence and ASK: What number should I write here? **NOTE:** The pictures are too complex for students to copy, so they can show their answers by signaling.

**Exercises:** How many balls are hidden in the box?

a) 3 + 3 =

b) 4 + 3 =

c) 4 + 2 =

**Answers:** a) 6, b) 7, c) 6

**Using more abstract pictures.** Draw on the board:

\[ \begin{array}{c}
\begin{array}{c}
\bigcirc \bigcirc \bigcirc + \bigcirc \bigcirc = \\
3 + 2 = \\
\end{array}
\end{array} \]

Tell students that this picture is similar to the ones you drew earlier, but this time you didn’t draw the tables. Ask a volunteer to draw the hidden balls and complete the number sentence. Repeat this exercise with several more questions, such as 6 + 3 and 2 + 4.

Now change your picture so that it is even more abstract by replacing the balls in the top row with numbers, as shown below:

\[ \begin{array}{c}
\begin{array}{c}
3 + 2 = \\
3 + 2 = \\
\end{array}
\end{array} \]

Again, have volunteers draw the hidden balls and complete the number sentence.

Repeat this with several more questions before assigning the exercises on the next page.
Exercises: Draw the missing balls. Write the total.

<table>
<thead>
<tr>
<th>a) [3 + 1 = \ldots]</th>
<th>b) [2 + 3 = \ldots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3 + 1 = \text{ }]</td>
<td>[2 + 3 = \text{ }]</td>
</tr>
</tbody>
</table>

Answers

<table>
<thead>
<tr>
<th>a) [3 + 1 = \ldots]</th>
<th>b) [2 + 3 = \ldots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3 + 1 = 4]</td>
<td>[2 + 3 = 5]</td>
</tr>
</tbody>
</table>

Extensions

1. Find the missing numbers.

<table>
<thead>
<tr>
<th>a) [3 + 2 = \ldots]</th>
<th>b) [4 + 1 = \ldots]</th>
<th>c) [2 + 6 = \ldots]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[30 + 20 = \text{ }]</td>
<td>[40 + 10 = \text{ }]</td>
<td>[20 + 60 = \text{ }]</td>
</tr>
</tbody>
</table>

Answers: a) 5, 50; b) 5, 50; c) 8, 80

2. Write "\[2 + 1 = \ldots\] " on the board. ASK: What does two plus one equal? (3) What should I write in the blank? (3) Write "3." Now write an incorrect addition sentence, as shown below:

\[2 + 1 = 3\]
\[2 + 1 = 9\]

Explain that there is a mistake in the bottom addition. ASK: What is the mistake? (two plus one equals three, not nine) NOTE: If students do not recognize the mistake, draw a picture of two balls and one ball on a table and have students count the balls. Explain that the picture shows that two plus one equals three, which means that two plus one cannot equal nine.

Ask students if the sentence is correct. They can check by drawing circles.

<table>
<thead>
<tr>
<th>a) [5 + 3 = 7]</th>
<th>b) [3 + 7 = 10]</th>
<th>c) [3 + 4 + 2 = 9]</th>
</tr>
</thead>
</table>

Answers: a) not correct, b) correct, c) correct
Goals

Students will determine an unknown addend in a number sentence by using pictures.

PRIOR KNOWLEDGE REQUIRED

Knows that the plus sign means add
Can represent a quantity of objects with a number
Can recognize when there are an equal number of objects in two groups
Knows the meaning of the equal sign (=)

MATERIALS

16 blocks (or other objects) that are the same size, shape, and color
2 flat surfaces (e.g., 2 desks, 2 chairs, 2 ends of a table)
a box with no lid (e.g., a shoebox)
10 blocks or counters and a paper bag per pair of students

Two groups that have the same number of objects. Arrange eight blocks on two desks as shown below:

Have students count how many blocks are in each group. SAY: We will call each desk a side. There are two sides, each with four blocks. Add one block to one side. ASK: Do the two sides have the same number of blocks? (no) How can we make the sides the same again? (by adding one block to the other side) Add one block to the side with fewer blocks. ASK: Do the two sides have the same number of blocks? (yes) SAY: When the numbers on the two sides are the same, we say that the sides are equal. When the numbers on the two sides are not the same, we say that the sides are not equal.

For the following exercises, write each pair of numbers on the board and ask students if they are equal or not equal. Students can signal thumbs up for equal and thumbs down for not equal.

Exercises: Are the numbers equal or not equal?

a) 1  3  b) 6  6  c) 17  18  d) 10  10  e) 21  12

Answers: a) not equal, b) equal, c) not equal, d) equal, e) not equal

Ask students to tell you some pairs of numbers that are equal (e.g., 5 and 5 are equal). Ask them to tell you some pairs that are not equal (e.g., 6 and 7 are not equal).
Groups can have the same number of objects even if they are not visible. Arrange six blocks on two desks as shown below:

ASK: Are the sides equal or not equal? (equal) Cover one block with a box, as shown below:

Show students that the block is in the box. SAY: Even though we cannot see all the blocks, we know that one block is in the box. Since we saw all the blocks at the beginning, we know the sides are equal. ASK: Are there still three blocks on each desk? (yes) Repeat with two blocks in the box. Ask students to close their eyes. On the table with the box, put three blocks outside the box and one in the box. Put four blocks on the other table. Have students open their eyes and tell them that you have placed the same number of blocks on each table. ASK: How many blocks did I hide in the box? (one block) Ask students to explain the strategies they used to figure out how many blocks are hidden. (sample answers: if 3 blocks are visible on the table with the box and 4 blocks are on the other table, count on from 3 to 4; draw a box and 3 blocks on one side of a page and 4 blocks on the other, then draw one block at a time in the box until there are 4 blocks on both sides) Repeat several times with different numbers of blocks.

Knowns and unknowns. Draw on the board:

Point to the equal sign and remind students that an equal sign means that there is the same number of balls on one side of the sign as on the other side. SAY: The sides are equal but we can only see all the balls on one side. Point to the group of 4 balls. Point to the box in the addition sentence and SAY: This box stands for the number we do not know. Pointing to the right side, SAY: I know this side has four balls and that the sides are equal. ASK: So how many balls are there altogether on the other side? (4) SAY: I will make the sides equal by drawing one ball at a time in the big box until both sides have four balls. ASK: How many balls should I draw to make the sides equal? (1) Draw it. Pointing to the box in the addition sentence, ASK: What number should I write in this box? (1) SAY: The “1” in the box stands for the one ball I drew. Point to “3” and ASK: What does the 3 stand for? (3 balls) Point to “4” and ASK: What does the 4 stand for? (4 balls) Point to the addition sign and ASK: What does this sign tell you to do? (add)
Point to the left side of the addition and ASK: What is $1 + 3$? (4) The final picture should look like this:

\[
\begin{array}{c}
\text{0} \\
1
\end{array} \\
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\text{++++++}
\end{array} \\
1 + 3 = 4
\]

Draw on the board:

\[
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\square
\end{array}
\]

Have students tell you what to put in each blank by counting the balls on each side. Draw a ball in the box and ASK: Are the sides equal now? (no) Draw another ball in the box and ASK: Are the sides equal now? (yes) Ask students where to write the number for the balls you drew. (in the box in the addition) ASK: How many balls did I draw? (2) Write “2” in the small box. The final picture should look like this:

\[
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\square
\end{array} \\
\begin{array}{c}
\text{5}
\end{array} = \begin{array}{c}
\text{3}
\end{array} + \begin{array}{c}
\text{2}
\end{array}
\]

Repeat the steps above with $6 = 4 + 2$. The final picture should look like this:

\[
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\text{+++}
\end{array} \\
\begin{array}{c}
\square
\end{array} \\
\begin{array}{c}
\text{6}
\end{array} = \begin{array}{c}
\text{4}
\end{array} + \begin{array}{c}
\text{2}
\end{array}
\]

Ask students to show their answers by signaling. Point at the big box and ASK: How many balls are hidden in the box? (4) Point to the small box in the number sentence and ASK: What number should I write here? (4) Repeat this exercise with other examples.

**Exercises:** Draw the missing balls in the box. Write the number of balls.

a) \[
\begin{array}{c}
\text{++++++}
\end{array} \\
\begin{array}{c}
\square
\end{array} = \begin{array}{c}
\text{+++++++}
\end{array}
\]

b) \[
\begin{array}{c}
\text{++++++}
\end{array} \\
\begin{array}{c}
\square
\end{array} = \begin{array}{c}
\text{+++}
\end{array}
\]

c) \[
\begin{array}{c}
\text{++}
\end{array} \\
\begin{array}{c}
\square
\end{array} = \begin{array}{c}
\text{++}
\end{array}
\]

**Answers:** a) [4]; b) [1]; c) [3]
Draw on the board:

\[
\begin{align*}
3 + \underline{\phantom{5}} &= 7 \\
3 + \underline{\phantom{5}} &= 7
\end{align*}
\]

SAY: In the last questions, I drew a picture of the balls. But in this picture I have given you the numbers of balls instead. Ask a volunteer to draw the balls in the box and to write the number in the addition sentence. (4)

**Exercises:** Draw the balls in the box. Write the number.

a) \[2 + \underline{\phantom{5}} = 6\]
   \[2 + \underline{\phantom{5}} = 6\]
b) \[5 + \underline{\phantom{5}} = 7\]
   \[5 + \underline{\phantom{5}} = 7\]
c) \[3 + \underline{\phantom{5}} = 8\]
   \[3 + \underline{\phantom{5}} = 8\]

**Answers:** a) \[\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \], 4; b) \[\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \], 2; c) \[\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \], 5

**ACTIVITY**

Each pair of students is a team. Give each team a set of 10 blocks (or counters), a paper bag, and a piece of paper. Player 1 writes “Game 1” on the sheet of paper, selects some blocks from the set, and records the number. (Player 2 can see the number.) Player 1 hides some of the blocks that were selected in the bag and puts the rest beside the bag. Player 2 determines how many are in the bag. If Player 2’s answer is correct, she writes an addition sentence for the blocks next to the heading “Game 1.” If Player 2 is not correct, Player 1 says “try again” until Player 2 gets the correct answer and writes the addition sentence. Players then switch roles.

The team gets one point every time a player’s first guess is correct, but only if the addition sentence from the round hasn’t already been used. (Tell students that addition sentences made with the same numbers count as the same sentence, even if the numbers are in a different order. For example: \[3 + 4 = 7\] counts as the same sentence as \[4 + 3 = 7\] or \[7 = 3 + 4\] or \[7 = 4 + 3\] ) The team gets an extra point for every correct first guess where the number of blocks inside the bag is greater than two. The team has completed the game when they get 20 points. (Teams don’t compete against each other.)
Extensions

1. Draw the missing balls in the box. Write the number of balls.

   a) \( \bigcirc + \bigcirc + \square = \bigcirc \bigcirc \bigcirc \bigcirc \square \)

   \[ 1 + 2 + \square = 5 \]

   b) \( \bigcirc \bigcirc \bigcirc \bigcirc + \bigcirc + \square = \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \square \)

   \[ 3 + 1 + \square = 6 \]

   c) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc + \bigcirc + \square = \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \square \)

   \[ 4 + 1 + \square = 8 \]

   **Answers:** a) \( \bigcirc \bigcirc \), 2; b) \( \bigcirc \bigcirc \), 2; c) \( \bigcirc \bigcirc \bigcirc \bigcirc \), 3

2. Find the missing number.

   a) \( 2 + 3 + \square = 6 \)

   b) \( 4 + 2 + \square = 8 \)

   c) \( 5 + 5 + \square = 13 \)

   **Answers:** a) 1, b) 2, c) 3

3. Find the missing numbers.

   a) \( 2 + \square = 6 \)

   b) \( 4 + \square = 9 \)

   c) \( 7 + \square = 8 \)

   \[ 20 + \square = 60 \]

   \[ 40 + \square = 90 \]

   \[ 70 + \square = 80 \]

   **Answers:** a) 4, 40; b) 5, 50; c) 1, 10

4. Place six blocks on one table. Place four blocks and a box with two blocks hidden in it on the other table. Tell students that there is the same number of blocks on each table. Ask them to draw six blocks on one side of their page and four blocks plus a large box (for the box that is on the table) on the other side. Ask students to draw blocks in the large box one at a time until the two sides have the same number of blocks. The number of blocks they drew is the number of blocks in the box on the table. (draw 2 blocks, so there are 2 blocks hidden in the box on the table) Repeat with different arrangements of blocks.
Goals
Students will write addition sentences for statements of the form “5 is 3 more than 2.”

PRIOR KNOWLEDGE REQUIRED
- Can count to 20
- Can add within 20
- Understands “more than” as addition

MATERIALS
- 2 different-colored pencils
- BLM I Have ——, Who Has ——? Game Cards (p. P-15)
- BLM Memory Cards (1), (2), and (6) (pp. L-98–99, p. L-103)

Practicing one-digit addition. Write a series of one-digit additions, such as 3 + 4, 5 + 2, and 8 + 1, on the board and have students hold up the correct number of fingers to signal answers. (7, 7, 9)

Practicing “more than.” Draw on the board: 

Ask a volunteer to draw four more flowers using a different color. ASK: How many more flowers did the volunteer draw? (4) Write “4 more than” on the board above the flowers. ASK: How many flowers were there before? (5) Complete the sentence on the board. The final picture should look like this:

4 more than 5

Repeat the activity by drawing a number of shapes (e.g., triangles or squares) and asking a volunteer to draw another number of the same shape. Repeat until students are comfortable with the concept of “more than.”

Connecting “4 more than” to “+ 4.” Write on the board:

4 more than 1

Ask a volunteer to draw circles to show four more than one. Have the volunteer use one color to draw one circle and a different color to draw four more circles. SAY: You drew one circle. Write “1” below the first circle. SAY: You drew four more circles. ASK: How do we show adding
in a number sentence? (plus sign) Write “+ 4” under the four circles, as shown below:

4 more than 1

\[ \begin{array}{ccc}
\text{1} & + & 4 \\
\end{array} \]

SAY: I wrote “1” first because we started with one circle and then we added four more circles. We could write “4 + 1” but we will start the same way as the picture does with one circle and then add four circles. When we change the word sentence “4 more than 1” into the number sentence “1 + 4,” we change the order. Draw arrows as shown below:

\[ \begin{array}{ccc}
\text{1} & \rightarrow & 4 \\
\end{array} \]

Repeat with “4 more than 2.” (2 + 4)

**Exercises:** Draw a picture to show “more than.” Write an addition.

a) 4 more than 3  
   b) 4 more than 4  
   c) 4 more than 5

**Answers:**

a) \[ 3 + 4 \]  
   b) \[ 4 + 4 \]  
   c) \[ 5 + 4 \]

**Connecting “more than” to addition generally.** SAY: We have been drawing pictures and writing additions to show “4 more than” different numbers. ASK: Does this only work when we are adding four? (no) SAY: Let’s try some other numbers. Draw five circles. Ask a volunteer to draw three more circles. ASK: How many more circles did we draw? (3) How many circles did we start with? (5) How can we write “three more than five” using numbers? (5 + 3)

Write on the board:

6 more than 3

ASK: How do we write the addition? (3 + 6) Remind students to reverse the order in the addition. Write on the board:

\[ \begin{array}{ccc}
3 & + & 6 \\
\end{array} \]

**Exercises:** Write the addition.

a) 5 more than 2  
   b) 7 more than 6  
   c) 3 more than 8  
   **Bonus:** 3 more than 1 + 2

**Answers:**

a) \[ 2 + 5 \]  
   b) \[ 6 + 7 \]  
   c) \[ 8 + 3 \], **Bonus:** \[ 1 + 2 + 3 \]
ACTIVITY 1

I Have ___, Who Has ____? Cut out cards from BLM I Have ___, Who Has ____? Game Cards. For “I have,” show a picture of addition. For “Who has,” write a “more than” statement. For example:

<table>
<thead>
<tr>
<th>I have</th>
<th>Who has</th>
</tr>
</thead>
<tbody>
<tr>
<td>☺☺☺☺☺</td>
<td>4 more than 1</td>
</tr>
</tbody>
</table>

Draw on the board:

3 more than 4

○○○○○

___ + ___ = ___

Ask a volunteer to draw the extra circles and to write an addition sentence for the picture. The final picture should look like this:

3 more than 4

○○○○○○○○○

4 + 3 = 7

Repeat with several questions, such as 2 more than 6, and 5 more than 3.

Exercises: Draw the missing circles. Write the addition sentence.

a) 4 more than 2  

○○

___ + ___ = ___

b) 2 more than 5  

○○○○○

___ + ___ = ___

Answers: a) ○ ○ ○ ○ ○, 2 + 4 = 6; b) ○ ○ ○, 5 + 2 = 7

SAY: Let’s try to solve these types of problems without drawing a picture. Let’s just write an addition sentence to find the answer. Have students signal their answers as you work through the exercises below as a class.

Exercises: Write an addition sentence to find the answer.

a) 3 more than 2  

○○○

___ + ___ = ___

b) 4 more than 5  

○○○○○

___ + ___ = ___

Answers: a) 2 + 3 = 5, b) 5 + 4 = 9

For the following exercises, encourage students to add by counting on, and to keep track on their fingers if they want to.
Exercises: Add.

a) 3 more than 14  
   b) 4 more than 11  
   c) 3 more than 17

Answers: a) 17, b) 15, c) 20

ACTIVITY 2

Have students play Picking Pairs and Memory (see unit introduction) using BLM Memory Cards (1) and (2). Students match cards with a number sentence and a word sentence that mean the same thing. For example, “4 more than 3 is 7” matches “3 + 4 = 7.” BLM Memory Cards (6) has blank cards that you can use to create extra cards.

Extensions

1. Write “8 is 1 more than 7” on the board.

   SAY: Let’s write this as a number sentence. ASK: The word sentence starts with eight, so what does the number sentence start with? (8) Write “8” below the 8. ASK: What does “is” mean? (equals) How do we write it? (equal sign) Write “=” below “is.” ASK: How do we write “1 more than 7”? (7 + 1) Write “7 + 1” as shown below:

   8 is 1 more than 7
   \[ 8 = 7 + 1 \]

2. Write the number sentence.

   a) 6 is 2 more than 4.  
   b) 11 is 2 more than 9.
   c) 10 is 4 more than 6.  
   d) 9 is 6 more than 3.

Bonus: 31 is 13 more than 18.

Answers: a) 6 = 4 + 2, b) 11 = 9 + 2, c) 10 = 6 + 4, d) 9 = 3 + 6,
Bonus: 31 = 18 + 13

3. Add.

   a) 3 more than 24  
   b) 4 more than 41  
   c) 3 more than 67

   Answers: a) 27, b) 45, c) 70

(MP7)  

4. a) What number is 38 more than 5? Find a fast way to answer the question.

   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

   Answers: a) 43; b) sample explanations:
   • I know that 38 more than 5 is 5 + 38, which is the same as 38 + 5, so I counted on 5 more from 38 to 43.
   • know that 38 more than 5 is 2 less than 40 more than 5, which is 45, and 2 less than 45 is 43.
Goals
Students will count on to find the unknown addend in addition problems.

PRIOR KNOWLEDGE REQUIRED
Can count on
Understands that a box in an addition sentence represents an unknown number
Can draw circles to represent numbers

MATERIALS
15–20 blocks or counters and a paper bag per pair of students

Drawing circles for addends. Draw on the board:

Ask a volunteer to draw the balls that are hidden in the box. (2) SAY: We can write a number sentence to show how many balls are on each table. Write on the board under the tables:

\[
3 + \boxed{} = 5
\]

ASK: What is the missing number? (2) Write “2” in the box.

SAY: We can find the number of balls in the box by drawing a simpler picture. We can use shaded circles for the number we know and unshaded circles to find the number we do not know. Pointing to the number sentence on the board, ASK: How many shaded circles should I draw? (3) Draw three shaded circles under the number sentence. ASK: How many unshaded circles should I draw? (2) Draw two unshaded circles under the number sentence. The picture should look like this:

\[
3 + 2 = 5
\]

SAY: This picture looks like the picture in the last lesson, with three circles and two more added, for a total of five circles.

Exercises: Draw shaded and unshaded circles to find the missing number.

\[
a) \ 2 + \boxed{} = 6 \quad b) \ 3 + \boxed{} = 7 \quad c) \ \boxed{} + 6 = 9
\]

Answers
\[
a) \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet, 4; \ b) \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet, 4; \ c) \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet, 3
\]
Finding an addend by counting on with fingers. Write on the board:

\[ 15 + \square = 18 \]

draw 15 shaded circles under the 15 and draw three unshaded circles under the box, as you count out loud, “16, 17, 18.” SAY: It took me a long time to draw the 15 shaded circles and to draw the three extra circles to make 18. So I’m going to show you a faster way to find the missing number. Leave this picture on the board.

Write on the board:

\[ 15 + 3 = \]

SAY: You know how to add 15 plus 3 using your fingers. You say “15” with your fist closed then count up until you raise three fingers. (Demonstrate this for the class.) The answer is the total. (18) Write “18” on the board.

Write on the board:

\[ 15 + \square = 18 \]

SAY: In this number sentence we know the total. We need to find out how many fingers we raise when we count up to the total. Point to your picture with the circles and SAY: Instead of drawing 15 circles, I could have said “15” with my fist closed to mean the 15 circles. Instead of drawing the first extra circle, I could have said “16” and put one finger up to count the circle. I could have said “17” and put another finger up to count this circle. I could have said “18” and raised one more finger to count the last circle. (Demonstrate raising your fingers as you point at the unshaded circles.) SAY: I have raised three fingers to get to the total. So I know I added three circles without even drawing them. The missing number is three. Write “3” in the box.

Write on the board:

\[ 14 + \square = 16 \quad 13 + \square = 18 \quad 7 + \square = 12 \]
\[ 8 + \square = 11 \quad 17 + \square = 20 \]

As a class, have students find the missing number in each addition sentence by counting up on their fingers from the known number.

(2, 5, 5, 3, 3)

Exercises: Count on to find the unknown number.

a) \[ 15 + \square = 20 \]  
b) \[ 11 + \square = 14 \]  
c) \[ 9 + \square = 13 \]

Bonus: \[ 45 + \square = 49 \]

Answers: a) 5, b) 3, c) 4, Bonus: 4
ACTIVITY

Students repeat the activity in Lesson OA1-55, but this time each team gets 15 blocks. Students find the number of blocks hidden in the bag by counting up from the number of blocks they can see. To ensure that students don’t have to count on more than 10 times, establish the rule that if a player selects more than 10 blocks, he has to leave at least five outside the bag.

For a more advanced version, give students 20 blocks and don’t put any restriction on the number of blocks outside the bag. Students will sometimes have to count on more than 10 times to find the answer. For example, if Player 1 selects 18 blocks and hides 16 in the bag, then two blocks will be left outside the bag. Player 2 will say “2” with her fist closed and count on, raising one finger at a time. By the time Player 2 says “12,” she will have 10 fingers up. For “13,” she will need to start with only one thumb up again and remember that she already raised 10 fingers and that this finger raised shows she has counted on 11 times. Similarly, when she says “17,” she has raised 15 fingers. (Five fingers are up, and the player remembers the 10 fingers she raised before starting over.) By the time she stops counting at 18, she will have raised 16 fingers altogether.

If you observe a situation where the player has to count on more than 10 times, you might encourage the player to find the answer by guessing and checking. In the example above, Player 2 could try to find the number of blocks in the bag by guessing a number and adding two. If the result is 18, the player knows that the number he guessed is the answer. If not, the player guesses again until he finds the answer. (16) You may want to demonstrate guessing and checking to the whole class. When students are given an opportunity to think about whether they can find a missing number more quickly by counting on or by making an educated guess (or by using a known number fact), they develop a deeper understanding of numbers.

Extensions

1. a) Add 12 + 3.
   b) Add 22 + 3.
   c) Add 32 + 3.
   d) Are you adding 3 the same way each time? Explain.
   e) What else is the same each time?
   f) Add 72 + 3 without counting on.
   g) In pairs, explain how you did part f). Do you agree with each other? Discuss why or why not.
Answers: a) 15; b) 25; c) 35; d) yes, I am counting on 3 more; e) the ones digits I say are the same each time; f) 75; g) I knew the ones digit will be 5 and the answer will be in the seventies, so 72 + 3 is 75.

NOTE: In part b), encourage partners to ask questions to understand and challenge each other’s thinking (MP3)—see p. A-43 for sample sentence and question stems.

2. Count on to add. Hint: Start with the number that is easier to count on from.
   
   a) $2 + 5$
   b) $2 + 25$
   c) $2 + 65$
   d) Is there a pattern? Describe it.
   
   Answers: a) 7; b) 27; c) 67
   
   Sample answer: d) Yes, when the ones digits are 2 and 5 the ones digit in the total is always 7.

3. Add by counting on twice. Hint: Start with the number that is easier to count on from.
   
   a) $13 + 3 + 4$
   b) $2 + 11 + 4$
   c) $5 + 2 + 12$
   
   Answers: a) 20, b) 17, c) 19
Goals

Students will subtract by counting on from the smaller number.

PRIOR KNOWLEDGE REQUIRED

Understands subtraction as taking away
Can read and write subtraction sentences
Can subtract by counting back using fingers

Subtracting by counting on. Draw on the board:

\[
\begin{array}{ccccccc}
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
\end{array}
\]

\[
7 - 2
\]

SAY: I have drawn seven circles because I want to subtract two from seven. Remind students that earlier in the year they learned to subtract by counting back and they used their fingers to keep track of how many times they counted back. In this case, they want to take away two so they will raise two fingers as they count back. SAY: I have seven circles so I say “seven” with my fist closed. Hold up a closed fist. SAY: Six. Raise one finger as you cross out the circle over the 7. SAY: Five. Raise another finger and cross out the circle over the 6. Point out to students that there are five circles left and five is the last number you said as you raised two fingers, so \(7 - 2 = 5\).

Erase the crossing out on the last two circles so that the picture looks like the one shown above. SAY: I am going to teach you another way to subtract, which is sometimes easier and faster. This time when I subtract I am going to cross out the first two circles instead of the last two. Cross out two circles on the left side and SAY: To find the answer to \(7 - 2\), I need to count how many circles are not crossed out. I will show you how to do this by counting on from 2. I will use my fingers to keep track of how many circles I have counted. Point to the two crossed out circles and SAY: I have crossed out two circles so I say “two” with my fist closed. (see picture below)

\[
\begin{array}{ccccccc}
\times & \times & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
\end{array}
\]

\[
7 - 2
\]

Make this fist and say “two.”

SAY: I count circle number three by saying “three” and raising one finger. Shade the circles as you count them. (see picture below)

\[
\begin{array}{ccccccc}
\times & \times & \bullet & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
& & & & & & \\
\end{array}
\]

\[
7 - 2
\]

Say “three” and raise one finger to count circle number three.
SAY: I count circle number four by saying “four” and raising one more finger. Continue in this way, counting circles five, six, and seven. SAY: I stopped counting at seven because it is the last circle. Seven is the number I subtracted two from. When you count on to subtract, you always stop counting at the number you are subtracting from. ASK: How many fingers do I have up now that I have stopped counting? (5) SAY: Five is the answer to $7 - 2$. There are five circles left when you take away two from seven. The number of fingers that you have raised when you stop counting is the answer to the subtraction.

Repeat with $6 - 4$ and $8 - 3$. (2, 5) In each example, draw a picture like the one above (where the circles are numbered and crossed out from the left). Refer to the picture as the class counts on using their fingers.

Tell students that this method of subtracting is very useful because it works even if you don’t draw a picture. Demonstrate how to subtract by only counting on using your fingers, with $10 - 7$, $15 - 12$, and $19 - 13$. (3, 3, 6) Ask the whole class to count out loud with you. Invite volunteers to show how they would find $16 - 11$, $19 - 14$, and $13 - 9$. (5, 5, 4)

In the first exercise below, have students draw and cross out circles for parts a) and b) to check if their answer is correct.

### Exercises

1. Subtract by counting on using your fingers.
   
   a) $8 - 4$  
   b) $7 - 5$  
   c) $15 - 13$
   d) $20 - 17$  
   e) $14 - 8$

   **Answers:** a) 4, b) 2, c) 2, d) 3, e) 6

2. Subtract.
   
   a) $12 - 9 =$  
   b) $17 - 13 =$  
   c) $=$ $20 - 16$  
   d) $=$ $19 - 14$

   **Answers:** a) 3, b) 4, c) 4, d) 5

### Word problems

Draw a leaf on the board and draw five bugs (or circles to represent bugs) on the leaf. Write on the board:

5 bugs are on a leaf. 3 fly away. How many are left?

Ask students how they would find the answer. (by crossing out 3 bugs or by subtracting $5 - 3$)

Write on the board:

17 bugs are on a leaf. 14 fly away. How many are left?

Point out that it would take some time to draw 17 bugs and cross out 14. It is easier to find the answer by subtracting $17 - 14$. Ask a volunteer to demonstrate how to find the answer by counting on.
Exercises: Find the answer.

a) 19 bugs are on a leaf. 16 fly away. How many are left?

b) 18 frogs are on a log. 14 jump off. How many are left?

c) Pat has 13 cherries. He eats 7. How many does he have now?

Answers: a) 3, b) 4, c) 6

Extensions

1. Count on to subtract bigger numbers.

a) 25 – 23  

b) 37 – 32

c) 56 – 5

d) 62 – 58

e) 81 – 77

Answers: a) 2, b) 5, c) 5, d) 4, e) 4

2. Draw lines to match the additions or subtractions that give the same answer.

\[
\begin{align*}
9 - 4 & \quad 23 - 21 \\
2 + 1 & \quad 3 + 2 \\
15 - 13 & \quad 6 - 3
\end{align*}
\]

Answers

\[
\begin{align*}
9 - 4 & \quad 23 - 21 \\
2 + 1 & \quad 3 + 2 \\
15 - 13 & \quad 6 - 3
\end{align*}
\]

3. Count on to subtract.

a) 6 – 2  

b) 16 – 12

c) 26 – 22

Answers: a) 4, b) 4, c) 4

NOTE: After students have done this extension, point out that the tens digits are the same in each part. The ones digits are 6 and 2 in each part, so you always count on 4.

4. Point out to students that they know the following two ways to subtract. Let students practice both methods with one-digit numbers.

Method 1: Count back to subtract. To find 17 – 3 by counting back, follow these steps: Say “17” with your fist closed. Then count backward, raising one finger for each number you say (to keep track of how many you have taken away). Stop when you have raised three fingers. This means you will say “16, 15, 14” and stop. The last number you say (14) is the answer.
Method 2: Count on to subtract. Use the method taught in this lesson.

Ask students to say whether the question is easier to subtract by counting on or by counting back. Have students find the answer using the method of their choice.

a) 16 − 3  
b) 17 − 15  
c) 19 − 14  
d) 18 − 4  
e) 16 − 5

Answers: a) 13, count back; b) 2, count on; c) 5, count on; d) 14, count back; e) 11, count back

5. A birthday cake is cut into 12 pieces. There are 10 people at the birthday party. After everyone who wants a piece has one, there are 5 pieces left. How many people at the party didn’t want a piece of cake?

a) In pairs, talk about the problem: What do you know about the pieces of cake? What do you know about the people at the party? What do you need to find out? How are you going to model the problem?

b) Answer the question by yourself. Explain what each step means in the story.

Sample answers
a) There are 12 pieces of cake, some are eaten, and then 5 are left. There are 10 people at the party, and some have a piece of cake, and some don’t. We need to find out how many don’t have cake. We could use counters for the pieces of cake and craft sticks for the people.
b) I used 12 counters for the pieces of cake and 10 craft sticks for the 10 people. I counted out 5 counters for the pieces of cake that were left. The rest were eaten by a person, so I matched the “eaten” counters with craft sticks. Those craft sticks are people who got a piece of cake. There are 3 craft sticks without cake, so 3 people didn’t want a piece of cake.

Redirecting students: ASK: Which numbers in the problem are about cake pieces? (the 12 pieces that the cake is cut into and the 5 pieces left) You may need to write the word “piece” so that students can look for it. ASK: What does the number 10 mean in the story? (how many people are at the party) Will the answer to the question be a number of people or a number of pieces of cake? (a number of people) What will you use to model the 10 people at the birthday party? What will you use to model the 12 pieces of cake?
Goals
Students will determine an unknown number in addition sentences (where the unknown is in various positions) using the strategies learned in the previous lessons.
Students will recognize when a number sentence is true.

Prior Knowledge Required
Can add by counting and drawing objects
Can count on to add

Materials
10 counters per student

Introduce parts and total. Write on the board:

\[ 5 + 3 = 9 \]

Point to the 9 and SAY: In an addition sentence, the number that is alone on one side of the equal sign is called the total. The two numbers that are added are the parts. (You might also tell students that the parts are called “addends,” although the Common Core State Standards don’t require that they know this in Grade 1.) Write on the board:

\[
\begin{align*}
2 + 6 &= 8 \\
9 + 7 &= 16 \\
14 &= 5 + 9 \\
13 &= 6 + 7 \\
\text{Bonus: } 92 &= 31 + 61
\end{align*}
\]

Ask volunteers to circle the total. (8, 16, 14, 13, Bonus: 92)

Write on the board:

\[
\begin{align*}
13 + 2 &= 15 \\
4 &= 2 + 2 \\
17 &= 10 + 7 \\
20 &= 16 + 4 \\
\text{Bonus: } 34 + 35 &= 89
\end{align*}
\]

Ask volunteers to underline the parts and circle the totals. \((13 + 2 = 15), \quad 4 = 2 + 2, \quad 17 = 10 + 7, \quad 20 = 16 + 4, \quad \text{Bonus: } 34 + 35 = 89\)

Write on the board:

\[
\begin{align*}
3 + \boxed{} &= 8 \\
5 + 4 &= \boxed{}
\end{align*}
\]

Ask students to tell you what is the same and what is different about each sentence. (Sample answers: they are both addition sentences; in one sentence, one of the parts is not known, in the other sentence, the total is not known) Ask students to discuss how they would find the answer to each question. (see sample answers on next page)
For the first sentence:

Draw circles for the part you know, then draw extra circles until you have the total.

Count on from the smaller number using your fingers until you reach the total. The number of fingers up when you stop counting is the missing part.

For the second sentence:

Draw the two parts using circles, then count them to find the total.

Use number facts to add.

Write several more addition sentences with an unknown as a part or the total and ask volunteers to demonstrate how they would find the unknown number, such as $7 + 2 = \square$, $3 + \square = 14$, $10 = \square + 5$, $\square = 7 + 7$, and $14 + 5 = \square$. (9, 11, 5, 14, 19)

**Exercises:** Find the missing number.

a) $4 + \square = 6$  
b) $15 = 10 + \square$  
c) $\square + 9 = 11$

d) $7 + 5 = \square$  
e) $\square = 8 + 8$  
f) $3 + \square = 10$

**Answers:** a) 2, b) 5, c) 2, d) 12, e) 16, f) 7

**Recognizing a true addition sentence.** Remind students that when a sentence is correct we say it is true. Tell them that when a sentence is not correct (or not true) we say it is false. Write on the board:

$$3 + 2 = 6$$

Ask students to put their thumbs up if they think the sentence is correct (or true) or down if they think it is not correct (or false). Ask volunteers to explain how they would check if the sentence is correct. After the discussion, point out that there are many ways you could check if the sentence is true. (Sample answers: draw 3 circles and 2 circles and count them to see if they make 6; check by raising 3 fingers and then 2 fingers; say “three” with your fist closed and count on two more fingers, if you haven’t said “six” when you stop, then 3 plus 2 is not 6; use addition facts)

Write on the board:

$$5 + 1 = 6$$  
$$2 + 4 = 7$$  
$$1 + 1 = 3$$  
$$5 + 5 = 10$$

$$3 + 7 = 10$$  
$$10 + 5 = 15$$  
$$8 = 7 + 1$$  
$$73 + 2 = 75$$

Ask students to put their thumbs up if they think the sentence is true or thumbs down if they think it is false. (up, down, down, up, up, up, up)

For the following exercises, remind students to write “true” or “T” if the sentence is true, and to write “false” or “F” if the sentence is not true.
Exercises

1. True or false?
   a) 3 + 1 = 4  
   b) 2 + 2 = 5  
   c) 5 + 3 = 8  
   d) 10 + 6 = 16 
   e) 10 + 8 = 17

   **Answers:** a) true, b) false, c) true, d) true, e) false

2. Zack writes 4 + 2 = 7. Is he correct? How do you know?
   **Sample answer:** He is not correct. To check, I drew 4 circles and 2 circles, and counted 6 circles, not 7 circles.

**Writing number sentences for word problems.** Ask students to draw a big leaf on a sheet of paper. Give each student 10 counters and tell them to imagine that the counters are bugs. Write on the board:

7 bugs are on a leaf. 5 fly away. How many are left?

Ask students to show or model the problem using counters. (put 7 counters on the leaf and take 5 away) Ask students to write a subtraction sentence for the model, using a square for the number of bugs that are left. 

\(7 - 5 = \square\)

Repeat with several more questions about bugs that fly away, such as 8 bugs on a leaf, 3 fly away.

Write on the board:

6 bugs are on a leaf. 2 more crawl on. How many bugs are on the leaf now?

Ask students to show how they would model the problem with counters. (put 6 counters on the leaf and add 2 more) Ask students to write an addition sentence for the model, using a square for the number of bugs that are on the leaf at the end. 

\(6 + 2 = \square\)

Repeat with several more questions, such as 9 bugs on a leaf, 3 crawl on.

For the following exercises, tell students to draw a square for the number they don’t know.

**Exercises:** Write a number sentence.

a) 8 bugs are on a leaf. 4 fly away. How many are left?

b) 15 bugs are on a leaf. 3 more crawl on. How many are on the leaf now?

c) 6 rabbits are in a field. 4 hop away. How many are in the field now?

d) 5 children skate on a pond. 3 more join them. How many children are skating?

**Answers**

a) 8 − 4 =  

b) 15 + 3 =  

c) 6 − 4 =  

d) 5 + 3 =
Extensions

1. Write “true” if the sentence is true. Write “false” if the sentence is false.
   a) $3 + 2 + 1 = 6$
   b) $4 + 4 + 1 = 10$
   c) $10 + 4 + 2 = 16$
   d) $2 + 2 + 2 + 2 = 8$

   Answers: a) true, b) false, c) true, d) true

2. True or false?
   a) $3 + 2 = 4 + 1$
   b) $7 + 1 = 6 + 2$
   c) $2 + 2 = 4 + 1$
   d) $4 + 4 = 5 + 3$
   e) $5 + 4 = 6 + 2$
   f) $6 + 4 = 3 + 7$
   g) $15 + 2 = 13 + 4$
   h) $10 + 7 = 14 + 2$
   i) $6 - 2 = 3 + 1$
   j) $4 + 3 = 8 - 2$

   Answers: a) true, b) true, c) false, d) true, e) false, f) true, g) true, h) false, i) true, j) false

(MP1, MP2, MP4)

3. a) Hanna gives Glen 6 marbles. Now Glen has 11 marbles. How many marbles did Glen have at the beginning?

   b) In pairs, explain how you did part a). Say what each step means in the story.

   Answer: a) Glen had 5 marbles to start; b) sample explanations:
   • I counted 6 red cubes for the 6 marbles that Hanna gives Glen. I added yellow cubes until there were 11 in total. I counted 5 yellow cubes, so Glen had 5 cubes to start.
   • I used a box for the number that Glen had at the beginning. I added 6 because Glen gets 6 more from Hanna. Now the total is 11, so I wrote $\boxed{6} + 6 = 11$, and I counted on from 6 to 11. When I got to 11, I had counted 5 numbers, so 5 is the missing number.

   NOTE: Some students might use a trial and error approach by trying different starting numbers of cubes and then adding 6 to see if they get 11. It is important that students differentiate between the starting marbles and the given marbles. Some students might not realize they need to differentiate until partway through.

   Redirecting students: If students don’t know how to start because they don’t know how many marbles Glen started with, encourage them to try different starting numbers to help them understand the problem.

   Whole-class follow-up: Have volunteers share their strategies. Then present and compare the two solutions above. ASK: Which way seems easiest? Which way would be fastest? How are the cubes used to show counting on from the 6? (you start with 6 and add one cube at a time until you get 11) Emphasize that in one solution, you added one cube at a time until you got to 11, and in the other, you said one number at a time until you got to 11, but they are really doing the same thing.
Goals

Students will write and solve word problems.
Students will solve and write simple addition word problems.
Students will distinguish the parts (addends) and total involved in an addition.

PRIOR KNOWLEDGE REQUIRED

Can add within 20
Can read and write simple sentences
Can write numerals

MATERIALS

3 red pencils and 4 blue pencils for demonstration
BLM Writing Word Problems (pp. L-104–105)
BLM Apple Trees (p. L-106, see Extension 1)

What is being added together? Draw four red balls and two blue balls on the board. Write “4 red balls” and “2 blue balls” above the pictures. Discuss what is the same and what is different about the pictures. (both pictures show balls; the balls are different colors; there are different numbers of balls in each group)

Have a volunteer underline the words that are the same for both pictures. (balls) Explain that this tells you what objects are being added together. There are red balls in one picture and blue balls in the other, but they are all balls. The two groups of balls (four red and two blue) are the parts that are being added. And when you add the parts, you get the total of six balls. Repeat the steps above for green pencils and yellow pencils, new pencils (unsharpened) and used pencils (sharpened), happy faces and sad faces.

Writing full sentences for pictures. Show students three red pencils. ASK: What are these? (red pencils) Write on the board:

There are 3 red pencils.

Show students four blue pencils and write the corresponding sentence on the board. (There are 4 blue pencils.) Have a volunteer circle the words that describe what is being added together. (pencils) Have students decide how many there are altogether, or in total, and write it using both the number and item. (There are 7 pencils in total.) The sentences on the board should look like this:

There are 3 red pencils.
There are 4 blue pencils.
There are 7 pencils in total.
Repeat for two new pencils and four used pencils, and three happy faces and two sad faces.

**What is different?** Give each student a copy of BLM Writing Word Problems. You might want to write the words from the top of the first page of the BLM on the board for students to copy as necessary. Have students use the words and the pictures on the first page of the BLM to make word problems for each picture on the second page of the BLM. Do the first problem together and cross out the words as you use them. (3 short and 2 tall) Have students write the remaining problems individually.

**NOTE:** Remind students that if they do not know how to spell a word, they can copy from the board. (2. 2 new, 4 used; 3. 3 shaded, 1 unshaded; 4. 3 full, 2 empty)

After students complete the BLM, draw three red fish and four green fish on the board for the following exercises.

**Exercises:** Write a sentence to answer the question.

a) How many green fish are there?

b) How many red fish are there?

c) How many fish are there in total?

**Answers:** a) There are 4 green fish. b) There are 3 red fish. c) There are 7 fish in total.

**Parts and totals in word problems.** Write on the board:

- There are 4 red pencils.
- There are 2 blue pencils.
- There are 6 pencils altogether.

Ask students to tell you the total. (6 pencils) Ask them to tell you the parts that make up the total. (4 red pencils and 2 blue pencils) Repeat with several other examples. Ask students to make up their own example and identify the parts and the total.

**Extensions**

1. **Create subtraction word problems from pictures.** Draw an apple tree with four apples on the branches and five on the ground. ASK: How many apples are there altogether? (9) How many fell out of the tree? (5) How many are left in the tree? (4) Write the following subtraction problem from the picture on the board:

   There were 9 apples in the tree.
   5 of them fell.
   How many are left?

   Have students write similar subtraction problems for the pictures on BLM Apple Trees. Students can cut the pictures out, paste them in their notebooks, and write the problem next to each picture. Have
students write a number sentence and solve the problem. **NOTE:** Allow students to use the same wording and just change the numbers, or challenge students to write a new problem.

**Selected sample answer:**

1. 7 apples were on a tree. Some fell. How many fell?

2. Write on the board:

   There are 8 marbles. 6 of them are red.

   **ASK:** What can we say about the other marbles? (they are not red)
   What is the total? (8 marbles)
   What are the two parts? (6 red marbles and the ones that are not red)
   How many are red? (6)
   How many are not red? (there are 8 marbles and 6 are red, so 2 are not red)
   What is an addition sentence for this situation? (6 + 2 = 8)

   Make up several other examples of this sort and ask similar questions.

3. Emma gives Zack 3 apples and she gives Ted 5 apples. Now Zack has 8 apples and Ted has 9 apples. Who had more apples to start, Zack or Ted? Use any tool you think will help.

   **Answer:** Zack had 5 apples to start and Ted had 4 apples to start, so Zack had more apples to start. Sample strategies:

   - Use different colors for Zack’s and Ted’s apples. To tell apart the apples they start with and the apples they get, put them in different piles.
   - Draw red circles for all of Zack’s 8 apples and circle the 3 he got from Emma; then draw green circles for Ted’s 9 apples and circle the 4 he got from Emma. The ones not circled are the ones they started with. Then match them up to see which is more, or count them.

   Redirecting students: **ASK:** What do you know about Zack’s apples? (Zack had some apples, got 3 more and now he has 8) What do you know about Ted’s apples? (Ted had some apples, got 5 more, and now he has 9) What do you need to find out? (who had more apples to start)
**OA1-61 Drawing Pictures to Find Parts and Totals**

**STANDARDS**
1.OA.A.1

**VOCABULARY**
in total
part
total

**Goals**
Students will determine an unknown addend in a word problem by drawing circles to show the total and shading circles to show one of the parts.

Students will determine the total by drawing the two parts given in a word problem.

**PRIOR KNOWLEDGE REQUIRED**
Can add and subtract one-digit numbers
Understands simple word problems
Understands how a picture relates to a situation

**MATERIALS**
10 red and 10 green counters
a paper bag
10 two-colored counters per student (optional)

**Finding an addend, given the total and the other addend.** Show students red and green counters and ask them to pretend that the counters are red and green apples. Hide three red and two green counters in a bag. SAY: I put five apples in the bag. So, I will draw five circles on the board to show the apples. The five circles show there are five apples in total in the bag.

Draw on the board:

○○○○○

ASK: What are some numbers of red and green apples that could be in the bag? PROMPTS: How many red and how many green apples might I have hidden? What numbers add to five? (1 red and 4 green, 4 green and 1 red, 2 red and 3 green, and so on)

ASK: Can you know for certain how many apples of each color are in the bag without looking? (no) If I tell you how many red apples are in the bag, could you figure out how many green apples are in the bag? (yes) If I tell you that three red apples are in the bag, can you tell me the number of green apples in the bag? (yes) Write “3 red” on the board under the circles and ask students to think about how they could use the five circles that you drew to figure out how many of the apples are green. PROMPT: Do I know how many red apples there are? (yes) How can I show this number using the circles? (shade or color some of the circles) How many should I shade? (3) Shade three circles to show the three red apples. ASK: Can we see from the picture how many apples are green? (yes, 2 of the circles are not shaded, so there are 2 green apples) Repeat the exercise, hiding different numbers of red and green counters in the bag, such as five red and three green, or six green and zero red. For each example, ask volunteers to come to the board to draw the circles.
Ask students to answer the following questions by drawing and shading circles. Have volunteers write their answers on the board, and leave them displayed for later.

**Exercises:** Draw circles to show the total. Shade circles to show how many are red. How many apples are green?

a) There are 6 apples.  
   4 are red.  
   **Answers:** 2 green

b) There are 7 apples.  
   3 are red.  
   **Answers:** 4 green

c) There are 8 apples.  
   6 are red.  
   **Answers:** 2 green

Remind students that a total is made of parts. For example, you have 7 apples. 3 of them are red and 4 are green. The total is 7, and the two parts are 3 and 4. Draw on the board:

\[
\begin{align*}
3 & + 4 = 7 \\
\text{part} & \quad \text{part} \quad \text{total}
\end{align*}
\]

Point to the questions from the exercise above and SAY: In these questions, I told you the total and one of the parts, and you found the other part. Now, I will give you the two parts and ask you to find the total.

**Finding the total from the two parts.** Hide three red and four green counters in the bag. SAY: I have hidden some red and green apples. ASK: Can you tell me how many I hid without looking in the bag? (no) What if I tell you how many are red—can you tell me the total? (no) What if I tell you how many are red and how many are green—can you tell me the total? (yes) SAY: I put three red and four green apples in the bag. Ask a volunteer to draw a picture to find the total number of apples in the bag. Suggest that the volunteer use shaded circles for the red apples and unshaded circles for the green apples. Repeat this exercise several times, for example with nine red and four green counters, and with five red and six green counters.

**Exercises:** Draw a picture to find the total.

a) There are 4 red apples and 5 green apples.  
   9 apples in total  
   **Answers**

b) There are 6 red apples and 3 green apples in a bowl.  
   9 apples in total  
   **Answers**

c) Paul has 3 red apples and 3 green apples.  
   6 apples in total  
   **Answers**

Point to the questions in the last exercise and SAY: In all of these questions, I told you the numbers for the two parts, and you found the total. Point to the questions in the previous exercise and SAY: In all of these questions, I told you the total and the number for one of the parts, and you found the other part. In all of these problems, two parts add up to a total. To solve the problems, you need to think about what information you are given. You need to be able to tell if the numbers you are given are the
two parts, or the total and one of the parts. Remember that the parts are always smaller than the total and can be put together to make the total.

**NOTE:** You can have volunteers answer the following questions on the board, or you could ask the whole class to answer by signaling (thumbs up if they think it is a total or thumbs down if they think it is a part).

**Exercises:** Circle the numbers that are totals. Underline the numbers that are parts.

a) There are 7 apples. 3 are green. 4 are red.

b) There are 5 green apples. There are 9 apples. There are 4 red apples.

c) Tom has 2 green apples and 6 red apples. He has 8 apples in total.

d) 9 apples are in a bag. Sally takes 3 green apples. Then she takes 6 red apples.

**Answers**

a) There are 7 apples. 3 are green. 4 are red.

b) There are 5 green apples. There are 9 apples. There are 4 red apples.

c) Tom has 2 green apples and 6 red apples. He has 8 apples in total.

d) 9 apples are in a bag. Sally takes 3 green apples. Then she takes 6 red apples.

Write on the board:

There are 6 apples. 3 are green. How many are red?

There are 5 red apples and 2 green apples. How many apples are there?

Ask volunteers to underline the parts and circle the totals in each problem.

(circle 6 and underline 3, underline 5 and 2) SAY: In the top question, we know the total and one of the parts. ASK: How can I find the other part by drawing a picture? (draw 6 circles for the total and shade 3, the unshaded circles are the 3 red apples) Draw a picture on the board to show the solution. SAY: In the next question, we know the two parts. ASK: How can I draw a picture to find the total? (draw 5 shaded circles for the 5 red apples and 2 unshaded circles for the 2 green apples; the total is 7 apples) Draw a picture on the board to show the solution. Repeat with several other examples by changing the numbers.

**Exercises:** Draw a picture to find the answer.

a) There are 6 apples. 3 are red. The rest are green. How many apples are green?

b) There are 8 apples in a bowl. 2 are green. The rest are red. How many are red?

c) There are 2 red apples and 9 green apples in a bowl. How many apples are in the bowl?
Answers
a) 〇〇〇〇〇〇. 3 apples are green.
b) 〇〇〇〇〇〇〇〇. 6 apples are red.
c) 〇〇〇〇〇〇〇〇〇〇〇〇. There are 11 apples in the bowl.

SAY: We can use a similar picture when solving problems about other things, not just apples.

Exercises: Draw a picture to find the answer.

a) There are 6 frogs in a pond. 4 are big. The rest are small. How many are small?
b) Mark has 3 pairs of short socks and 4 pairs of long socks. How many pairs of socks does he have?
c) There are 5 cows and 4 horses in a barn. How many animals are in the barn?
d) Pam has 8 pencils. 5 are used and the rest are new. How many are new?

Answers
a) 〇〇〇〇〇〇. 2 frogs are small.
b) 〇〇〇〇〇〇〇〇. Mark has 7 pairs of socks.
c) 〇〇〇〇〇〇〇〇〇〇. 9 animals are in the barn.
d) 〇〇〇〇〇〇〇〇〇. 3 pencils are new.

Extensions
1. Draw a picture with shaded and unshaded circles to solve the problem.
   a) Ben has 7 flowers. 4 are red. How many are not red?
   b) Ella has 5 crackers. 3 are broken. How many are not broken?

   Answers
   a) 〇〇〇〇〇〇. 3 flowers are not red.
   b) 〇〇〇〇〇. 2 crackers are not broken.

2. Which problem is not like the other ones? Explain using the word “part.”

   Problem A: Kathy has 8 balloons. 5 are red. The rest are green. How many are green?
   Problem B: There are 8 fruits in a basket. 5 are bananas. The rest are apples. How many are apples?
   Problem C: There are 8 people swimming in a pool. There are 5 people playing soccer. How many more people are swimming than playing soccer?

   Answer: Problem C is different because it is comparing two different groups. The other two are about two parts of a total; the 5 people playing soccer are not part of the 8 people swimming, but in the other two problems, the 5 red balloons are part of the 8 balloons and the 5 bananas are part of the 8 fruits.

Operations and Algebraic Thinking 1-61 L-35
OA1-62  Parts and Totals
Pages 110–113

STANDARDS
1.OA.A.1, 1.OA.D.8

VOCABULARY
in total
part
part-total picture
total

Goals
Students draw part-total pictures and use them to find unknown numbers.

PRIOR KNOWLEDGE REQUIRED
Knows that two parts add to make a total
Can add within 20 using objects or drawings
Can add numbers within 10

MATERIALS
12 counters per student
BLM Large Bond Picture (p. L-107)
12 counters (or paper circles) for demonstration tape
transparency of BLM Large Bond Picture (p. L-107)
overhead projector
BLM Large Part-Total Picture (p. L-108)
BLM Part-Total Picture Templates (p. L-109)

Using bond pictures for addition problems. Explain that sometimes word problems have a lot of information in them and it is helpful to have a picture. Project BLM Large Bond Picture on the board:

NOTE: Diagrams of this type are called “bond diagrams,” but there is no need to introduce students to this term.

SAY: This picture helps keep track of the parts and total. The total is at the top because it is made up of both of the parts. Suppose we have two kinds of apples—some are red and some are green. I need to know how many apples we have in total. We can put the apples in two parts. Point to the box on the bottom left and SAY: Let’s put the red apples in this “part” box. Let’s say there are two red apples. Use tape to place two counters in the part box and write “2 red” under it. SAY: Let’s say there are also four green apples. Place four counters in the second part box and write “4 green” under it. The picture should look like this:

Using bond pictures for addition problems. Explain that sometimes word problems have a lot of information in them and it is helpful to have a picture. Project BLM Large Bond Picture on the board:

NOTE: Diagrams of this type are called “bond diagrams,” but there is no need to introduce students to this term.

SAY: This picture helps keep track of the parts and total. The total is at the top because it is made up of both of the parts. Suppose we have two kinds of apples—some are red and some are green. I need to know how many apples we have in total. We can put the apples in two parts. Point to the box on the bottom left and SAY: Let’s put the red apples in this “part” box. Let’s say there are two red apples. Use tape to place two counters in the part box and write “2 red” under it. SAY: Let’s say there are also four green apples. Place four counters in the second part box and write “4 green” under it. The picture should look like this:
SAY: To find the total, we put all the apples together. The top box is for the total. Move the counters from the two part boxes to the total box. 

ASK: How many apples altogether? (6) SAY: $2 + 4$ is 6 apples altogether. Write “6 apples” above the top box.

Distribute BLM Large Bond Picture and 12 counters to each student. 

Write on the board:

I have 3 red apples and 1 green apple. How many apples do I have altogether? 

Have students use their counters to work along with you as you solve the problem on the board. Do not have them label the boxes. (4 apples altogether)

Have students use BLM Large Bond Picture and their counters for the following exercises.

**Exercises:** Find the total apples. Use counters.

a) 5 red apples and 2 green apples
b) 4 green apples and 3 red apples

**Bonus:** 5 red apples and 7 green apples

**Answers:** a) 7, b) 7, Bonus: 12

**Using bond pictures to find an addend.** Project BLM Large Bond Picture on the board. SAY: We can use these pictures to find a missing part, too. Suppose there are six flowers in a vase. ASK: Where does the total go? (in the total/top box) Place six counters in the total box. Write “6 flowers” above the box. Have students follow along with their counters on BLM Large Bond Picture, as shown below:

6 flowers

![Bond Picture](image)

SAY: Let’s say one flower is red and the rest are yellow. To find the number of yellow flowers, we can take away one red flower from the total. Move one counter from the total to the part box on the left and have students do the same with their counters. Write “1 red” under the part box. SAY: The rest are yellow. Move the remaining counters to the other part box and have students do the same. ASK: How many flowers are yellow? (5) SAY: $1 + 5$ is 6, so there are 5 yellow flowers. Write “5 yellow” under the second part box. The final picture should look like this:

6 flowers

![Bond Picture](image)

1 red 5 yellow
Repeat with 5 flowers. 3 are red and the rest are yellow. Have students use their counters to work along with you. Do not have them label the boxes. (2 yellow flowers) Leave this on the board.

Have students use BLM Large Bond Picture and their counters for the following exercises.

**Exercises:** How many flowers are yellow?

a) 4 flowers in total. 2 are red.
b) 8 flowers in total. 5 are red.

**Bonus:** 12 flowers in total. 4 are red.

**Answers:** a) 2, b) 3, Bonus: 8

**Using part-total pictures.** Explain that the pictures they just used take a lot of space. There is a way to draw these pictures smaller. Beside the previous example involving flowers, draw a part-total picture, as shown below:

5 flowers

3 red 2 yellow

SAY: This is called a **part-total picture**. The total still goes in the top and the two parts still go in the bottom boxes. Draw a blank part-total picture and write on the board:

5 children are at the park. 3 of them are girls. How many are boys?

Distribute **BLM Large Part-Total Picture.** Have students use their counters to work along with you as you solve the problem on the board. SAY: We moved the three counters for girls first, and two counters were left over. So we subtracted three from five. How much is 5 − 3? (2) SAY: There are two boys at the park.

**Exercises:** How many boys are at the park?

a) 8 children are at the park. 2 of them are girls.
b) 9 children are at the park. 6 of them are girls.

**Answers:** a) 6, b) 3

**Drawing circles in part-total pictures.** SAY: If we draw circles instead of using counters, we can see all the information in one picture. Say we have six apples altogether. Two are green and four are red. Draw on the board:

6 apples

2 green 4 red
Distribute **BLM Part-Total Picture Templates**. To present the exercises, you can draw a large part-total picture on the board and change the numbers as you go.

**Exercises:** Copy the words and numbers. Draw the circles.

a) 6 apples  
   ![Part-Total Picture](image1)
   1 red 5 green

b) 3 apples  
   ![Part-Total Picture](image2)
   2 red 1 green

c) 8 apples  
   ![Part-Total Picture](image3)
   5 red 3 green

**Bonus:** 5 apples  
   ![Part-Total Picture](image4)
   5 red 0 green

**Answers**

a)  
   ![Answer](answer1)

b)  
   ![Answer](answer2)

c)  
   ![Answer](answer3)

**Bonus:**  
   ![Answer](answer4)

**SAY:** In these pictures, the two parts on the bottom always add to the total on top. Draw on the board:

![Board Diagram](board_diagram)

**ASK:** How many circles are in the bottom left part? (2) How many circles are in the other part? (3) How many circles go in the total box on top? (5) Draw five circles in the top box. **SAY:** 2 + 3 is 5, so 5 circles go on top.

**Exercises:** Copy the picture. Draw circles to find the missing number.

a) ___ circles  
   ![Part-Total Picture](image5)
   4 circles 1 circle

b) ___ circles  
   ![Part-Total Picture](image6)
   3 circles 3 circles

**Answers**

a) 5 circles  
   ![Answer](answer5)

b) 6 circles  
   ![Answer](answer6)

Operations and Algebraic Thinking 1-62
SAY: Let’s look at a picture where a part is missing. Draw on the board:

```
  ●●●

  ○
```

ASK: How do we find how many circles go in the unknown part? (subtract, count on, find the missing number in an addition sentence) Have a volunteer count on to find how many circles are missing. (3) Do another example but this time leave the left side empty.

**Exercises:** Copy the picture. Draw circles to find the missing number.

a) 3 circles

```
  ●●●

  ○
```

1 circle ___ circles

b) 8 circles

```
  ●●●●●●●●

  ○○
```

___ circles 2 circles

**Answers**

a) 3 circles

```
  ●●●

  ○
```

1 circle 2 circles

b) 8 circles

```
  ●●●●●●●●

  ○○
```

6 circles 2 circles

**Finding numbers in part-total pictures.** SAY: An even easier way to use these pictures is to write in numbers instead of drawing circles. Draw on the board:

```
  total

  3 2
```

SAY: To find the total, we moved the counters in each part together, so we actually added the numbers. ASK: If there are three in one part and two in the other, how many are there in total? (5) SAY: 3 + 2 is 5. Write “5” in the top box.

Have students signal their answers for the following exercises by raising the number of fingers equal to the number that should appear in the empty total box.

**Exercises:** Find the missing number.

a) 3 6

```
  3

  6
```

d) 6 4

```
  6

  4
```

**Answers:**
a) 9, b) 10, c) 8, d) 10
SAY: Let’s see what happens if a part is missing. Draw on the board:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>part</td>
<td>part</td>
</tr>
</tbody>
</table>

SAY: When we solved this kind of problem with counters, we moved one counter from the top box to the part box on the left, and moved the rest of the counters to the other part box. This means we were taking away counters, or subtracting. ASK: What subtraction should we do? (5 – 1) What number goes in the empty box? (4) SAY: 5 – 1 is 4. Or we can count on from 1 to 5. Repeat with a picture that has total 6 and 2 in the part box on the right. The missing part should be 6 – 2 = 4.

Have students signal their answers for the following exercises by raising the number of fingers equal to the number that should appear in the empty part box.

**Exercises:** Find the missing number.

<table>
<thead>
<tr>
<th>a) 8</th>
<th>b) 9</th>
<th>c) 10</th>
<th>d) 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

**Answers:** a) 2, b) 7, c) 3, d) 1

**Extensions**

1. Find the missing number.

<table>
<thead>
<tr>
<th>a) 27</th>
<th>b) 64</th>
<th>c) 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>61</td>
<td>32</td>
</tr>
</tbody>
</table>

**Answers:** a) 2, b) 3, c) 56

2. In a part-total picture, the two parts must add up to the total. Circle the pictures that are correct. Cross out the ones that are not correct.

<table>
<thead>
<tr>
<th>a) 10</th>
<th>b) 19</th>
<th>c) 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

**Answers:** a) correct, b) not correct, c) not correct

3. Use numbers in a part-total picture to find the answer.

a) There are 5 cats and 7 dogs at a pet store. How many animals are there in the store altogether?

b) There are 15 birds in a tree. 8 are jays. The rest are sparrows. How many sparrows are in the tree?
4. a) A group of 50 people reserve dinner at a restaurant, so the restaurant needs to set the tables so that everyone gets a fork, a knife, and a plate. The restaurant has 48 plates, 53 knives, and 60 forks. Does the restaurant have enough plates, knives, and forks?

b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

Answers: a) the restaurant has enough knives and forks, but not enough plates; b) sample explanation: everybody needs a plate, but they only have 48 plates and there are 50 people, so there are more people than plates. That means not everyone can get a plate. But they have more knives than people and more forks than people, so they have enough knives and forks.

Redirecting students: If students struggle to start the problem, encourage them to model a similar problem with smaller numbers to get a feel for what the problem is asking.

Individual or small-group follow-up: If students still struggle, you may need to suggest some smaller numbers to start with, such as setting the table for 5 people using 3 forks, 4 knives, and 7 plates. Encourage students to find a way to model the problem. Tell them that they need to find something to use to model the people, forks, knives, and plates. Allow students to choose how they will model each item, then guide them through the solution with the smaller numbers. After they have solved the easier problem, ASK: Can you use what you found from solving this problem to answer the question with larger numbers? (we’re just checking if there is enough of each; we need 50 plates but we have only 48, so there are not enough plates, but there are enough knives and forks). Emphasize that solving problems with smaller numbers is often easier than solving problems with larger numbers, and they can use what they learned with smaller numbers to see if it makes the harder problem easier. They can even make up their own smaller numbers to try.
Goals
Students will complete part-total pictures and write addition sentences for part-total pictures.

PRIOR KNOWLEDGE REQUIRED
Knows that two parts add to make a total
Understands part-total pictures
Can solve addition sentences with the unknown in various positions

MATERIALS
BLM Part-Total Picture Templates (p. L-109)

Writing addition sentences from a part-total picture. Draw on the board:

\[
\begin{array}{ccc}
& 6 & \\
2 & 4 & \\
\end{array}
\]

\[2 + 6 = 4 \quad 4 + 6 = 2 \quad 2 + 4 = 6\]

SAY: I want to write an addition sentence using the numbers in the picture. ASK: Which of these sentences is correct? (2 + 4 = 6) Which number in the sentence tells you the total number of things? (6) Which numbers are the parts? (2 and 4) Emphasize that the parts are the numbers in the boxes on the bottom, and the total is in the box on the top. Remind students that they add the parts to get the total. Also remind students that in an addition sentence the total is on one side of the equal sign, and the addition of the parts is on the other side of the equal sign.

NOTE: Make sure students know that it doesn’t matter what order you write the two parts in or whether you write the parts first or the total first. All that matters is that the parts are added together on one side of the equal sign and the total is on the other side.

Distribute BLM Part-Total Picture Templates for students to use as needed throughout this lesson.

Exercises: Write an addition sentence for the picture.

a) \[
\begin{array}{ccc}
17 & \\
2 & 15 & \\
\end{array}
\]

b) \[
\begin{array}{ccc}
20 & \\
7 & 13 & \\
\end{array}
\]

c) \[
\begin{array}{ccc}
9 & \\
5 & 4 & \\
\end{array}
\]

Sample answers: a) \(2 + 15 = 17\), b) \(7 + 13 = 20\), c) \(5 + 4 = 9\)
Draw on the board:

```
7
5
```

SAY: One of the numbers in the picture is missing. But we can still write an addition sentence for the picture. Draw a square in the part box on the right and SAY: I can draw a square to stand for the missing number. And I can use the square to write an addition sentence. Write on the board:

```
5 + □ = 7
```

Tell students that they can write addition sentences like this for any part-total picture where there is a missing number.

Draw several more part-total pictures in which the number in the part box on the right is missing. Ask volunteers to write addition sentences for the pictures, using a box to stand for the missing number, as shown below:

```
8 2
+ □ = 8
```

**Exercises:** Write an addition sentence for the picture. Use a box for the missing number.

a) 8 3
b) 15 10
c) 20 18

**Answers:**

a) 3 + □ = 8, b) 10 + □ = 15, c) 18 + □ = 20

Repeat the process with examples where the number in the part box on the left is missing and where the number in the top box is missing. (see examples below)

```
10
3
□ + 3 = 10
```

(7, 11)

**Exercises:** Write an addition sentence for the picture.

a) 5 2
b) 6 2
c) 3 1

**Answers:**

a) 5 + □ = 6, b) 2 + □ = 6, c) 1 + □ = 3

Go through the pictures and addition sentences in the exercises above one at a time. **ASK:** What is the missing number in the picture? What should be the missing number in the sentence? (7, 4, 2) Ask students to explain how they found the number.
Exercises: Write an addition sentence for the picture. Write the missing number in the box.

a) 4
   2
b) 2
   6
c) 15
   13

Answers: a) 2 + 2 = 4, b) 2 + 6 = 8, c) 2 + 13 = 15

Extensions

1. Show students that they can write a subtraction sentence for a part-total picture as follows:

   7 – 4 = 3

   The number left over (3) is the number of the other part.

   Write two subtraction sentences for the picture.

   a) 9
      7
      2
   b) 10
      3
      7
   c) 15
      3
      12

   Answers: a) 9 – 7 = 2, 9 – 2 = 7; b) 10 – 3 = 7, 10 – 7 = 3; c) 15 – 3 = 12, 15 – 12 = 3

   (MP3, MP6) 2. a) Is the missing number a part or the total? 6 = 2 + ___

   b) In pairs, explain your answers to part a). Use math words. Do you agree with each other? Discuss why or why not.

   Answers: a) a part; b) sample explanation: in an addition sentence, the two parts are on the same side of the equal sign, so the missing number is a part; the plus sign is between the two parts, so the missing number is a part

   NOTE: In part b), 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.

   Redirecting students: If some pairs of students agree that the blank is the total because it is last, ASK: Do you add the parts or the total in an addition sentence? What symbol do you put between the two parts, the plus sign or the equal sign? Why?
**Goals**

Students will use part-total pictures to solve word problems and write number sentences.

**PRIOR KNOWLEDGE REQUIRED**

- Can find missing numbers in a part-total picture
- Can write an addition sentence from a part-total picture
- Can identify parts and totals in word problems
- Can solve a number sentence

**MATERIALS**

BLM Part-Total Picture Templates (p. L-109)

**Recording information from word problems in part-total pictures.**

Remind students that a total is made by putting two (or more) parts together. It is larger than the parts. If you have red and blue crayons, the number of different kinds of crayons (the red crayons and the blue crayons) are the parts. They are put together to make the total. Two boys and three girls are parts that make up a total of five children. Five small trees and four large trees are parts that make up a total of nine trees.

Write on the board:

There are 4 birds in a tree.
3 of them are red.
The rest are blue.
How many birds are blue?

ASK: Are there different kinds of things in this question? (yes) SAY: We have red birds and blue birds in this question. These are the parts. Red birds and blue birds are both birds, so the total is the number of birds altogether. Ask a volunteer to circle the total if it is given and underline any parts in the text beside the picture. Ask a second volunteer to write the given numbers in the correct positions in the part-total picture and a question mark for the number they don’t know. The final picture should look like this:

There are 4 birds in a tree.
3 of them are red.
The rest are blue.
How many birds are blue?
Write on the board:

8 children go sailing.
3 of them are boys.
How many are girls?

Ask volunteers to circle the total and underline the part in the text and to fill in the picture. The final picture should look like this:

Repeat this process with several other word problems in which the total and one part are given. Give students a copy of BLM Part-Total Picture Templates to use for the exercises throughout this lesson.

Exercises: Write the numbers in a part-total picture. Write a question mark for the missing number.

a) Liz has 10 pencils.
   3 are yellow.
   The rest are purple.
   How many are purple?

b) There are 9 fish in a bowl.
   5 are gold fish.
   The rest are angel fish.
   How many are angel fish?

Answers: a) 10
         3 ?

b) 9
   5 ?

Solving problems in which the parts are given. Write on the board:

June has 4 lion stickers and 3 zebra stickers.
How many stickers does she have?

Ask a volunteer to circle the total if it’s given and underline any parts in the text. (no total, underline 4 and 3) Ask another volunteer to write the given numbers in the correct positions in the part-total picture and write a question mark for the unknown number. The final picture should look like this:

Repeat this exercise several times but change the numbers (e.g., 7 lion stickers, 4 zebra stickers, total: 11).
Write on the board:

There are 8 boys and 11 girls in a class. How many children are in the class?

Ask volunteers to identify the total and parts and to fill in the picture, as shown below:

<table>
<thead>
<tr>
<th>Total</th>
<th>Part</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>11</td>
</tr>
</tbody>
</table>

Repeat with other word problems in which the total and one part are given.

Exercises: Write the numbers in a part-total picture. Write “?” for the unknown number.

a) Bill has some pencils. 3 are yellow and 5 are red. How many pencils does Bill have?

b) There are 8 small frogs and 3 big frogs in an aquarium. How many frogs are in the aquarium?

Answers: a) ? 3 5  b) ? 8 3

Mixed problems. Give students a mixture of problem types, some in which the total and one of the parts are given and some in which both parts are given. Ask students to fill in the picture with a question mark for the unknown and to find the answer using methods they learned in earlier lessons. For example, if both parts are known, students can add the numbers using their knowledge of numbers or any of the adding strategies they have learned. If the total and one part are given, students can count up from the part until they reach the total, keeping track of how many times they counted up on their fingers. Allow students to determine the answer directly from the picture rather than writing a number sentence.

Exercises: Write the numbers in a part-total picture. Find the missing number.

a) There are 3 cows and 5 horses in a barn. How many animals are in the barn?

b) Ben has 3 coats. 1 is a winter coat and the rest are spring coats. How many spring coats does he have?

c) Jane has 12 pets. 3 are cats and the rest are fish. How many fish does she have?
In the next set of exercises, students should solve the number sentences in one of three ways:

- mentally, using number facts that they remember
- using counting on strategies learned in Lesson OA1-57 or, if necessary, by drawing dots to represent the given amounts
- writing the family of related addition facts for a given total

**Exercises:** Fill in the part-total picture. Write the addition sentence. Find the answer.

a) 9 balls are in a gym. 5 are baseballs and the rest are basketballs. How many basketballs are there?

b) Raj sees 8 birds in the forest. 5 are jays. The rest are robins. How many robins does he see?

c) 4 boys and 12 girls go swimming. How many children are swimming?

**Answers**

a) 4 basketballs

b) 3 robins

c) 16 children

For a more advanced class or for bonus work for individual students, assign a variety of types of problems. Ask students to fill in the picture (with a question mark for the unknown) and to write an addition sentence for the picture. Ask students to solve the addition sentences.

**ACTIVITY**

Write a word problem about girls and boys on the board, such as: There are 3 boys and 4 girls on a bus. Ask a volunteer to select students to come up to the front of the class to model the situation. Make sure a part is missing in some of the problems, such as: There are 8 children on a bus. 3 are girls. How many are boys? If a volunteer has trouble making a model for this kind of question, suggest that he start by bringing 3 girls to the front of the class. He should either calculate mentally how many boys are needed or bring boys up one at a time until there are 8 children. Repeat with a variety of problems about girls and boys.
Extensions

1. Make up a story for the part-total picture.
   a) 20
      14 6
   Sample answers
   a) There are 20 students in a class. 14 are girls and 6 are boys.
   b) Ben has 3 cats and 5 fish. He has 8 pets altogether.

2. Make up a word problem for the picture.
   a) 6
      2
   Sample answers
   a) There are 6 horses in a field. 2 are white and the rest are brown. How many are brown?
   b) Vicky sees 3 red bikes and 4 blue bikes. How many bikes does she see altogether?

3. Draw a part-total picture to solve the problem.
   a) There are 60 fish in a pond. 20 are green and the rest are brown. How many are brown?
   b) Eric sees 40 blue kites and 50 red kites. How many kites does he see?

Answers
a) 60
   20 40
b) 90
   40 50

4. Ravi is 5 years old. His older brother Carl’s birthday cake has 3 red candles, 3 blue candles, and 3 yellow candles.
   a) How much older is Carl than Ravi? Show your work with numbers, symbols, pictures, and words.
   b) What did you use about birthday cakes and candles that I didn’t say in the problem?

Answers: a) 4, sample explanations:
   • I drew Carl’s candles. I drew 5 candles for Ravi. I matched Ravi’s candles with Carl’s candles. Carl has 4 more candles, so Carl is 4 years older.
   • I added $3 + 3 + 3 = 9$. Carl has 9 candles on his birthday cake, so Carl is 9 years old. Ravi is 5 years old and 9 is 4 more than 5.
   • Carl is 9 years old and Ravi is 5 years old. 10 is 5 more than 5, so 9 is 4 more than 5.
   b) I used the fact that the number of candles is how old Carl is turning.
Goals
Students will solve word problems by writing a number sentence with a missing number.

PRIOR KNOWLEDGE REQUIRED
Understands simple word problems
Can solve an addition sentence with the unknown in any position
Can write a number sentence using information in a word problem

MATERIALS
10 paper circles
tape

SITUATIONS IN WHICH A QUANTITY CHANGES. Remind students that in the last lesson they worked on problems in which a total (or whole) was made up of two parts. For example, in a problem about birds, some were blue and some were red; in a problem about frogs, some were small and some were big; in a problem about children, some were girls and some were boys. SAY: Not all problems are about a total that is made of two different parts. In some problems, the same thing changes over time. Write on the board:

Yu has 4 crayons.
She buys 5 more.
Now she has 9 crayons.

Ask students to identify what changed in the situation. (the number of crayons that Yu has) Ask them to think about how they would write an addition sentence for the problem. SAY: In some problems where a number changes, you can write an addition sentence like this:

\[ \text{number at the start} + \text{number added} = \text{number at the end} \]

ASK: What number of crayons did Yu have at the start (or at the beginning), before she bought more crayons? (4) Write “4” under the phrase “number at the start.” ASK: Do we know the number added, or how many crayons she bought? (5) Write “5” under the phrase “number added,” and write a plus sign between the 4 and 5. ASK: Do we know the number at the end, or the number of crayons Yu has after she buys the extra crayons? (9) Write “9” under the phrase “number at the end” and write an equal sign to the left of the 9. The final picture should look like this:

\[ 4 + 5 = 9 \]

Take students through the same line of questions with several more examples, such as: I have 5 books. Ms. White gives me 8 books.
Now I have 13 books. In each case, help them write an addition sentence by placing numbers under the phrases “number at the start,” “number added,” and “number at the end.”

**Exercises:** Circle the number at the start. Underline the number added. Write an addition sentence.

a) 3 birds are in a tree. 2 more join them. Now there are 5 birds.

b) Pam paints 2 pictures. She paints 4 more pictures. She paints 6 pictures in all.

**Answers**

a) 3 + 2 = 5

b) 2 + 4 = 6

**Solving problems where a quantity changes.** SAY: You can also use an addition sentence to solve a problem where a number is unknown. Write on the board:

Alex has 3 stickers.
He buys some more.
Now he has 10 stickers.
How many did he buy?

number at the start + number added = number at the end

ASK: What number of stickers does Alex have at the start, or before he buys more? (3) Write “3” under “number at the start.” ASK: Do we know the number added, or how many stickers he buys? (no) SAY: We can use a box for the number we don’t know. Draw a square under “number added” and write a plus sign between the 3 and the square. ASK: Do we know the number at the end, or the number of stickers Alex has now? (10) Write “10” under “number at the end” and write an equal sign to the left of the 10. The final picture should look like this:

4 + □ = 10

**Exercises:** Write an addition sentence. Use a box for the missing number.

a) Annie has 5 flowers, She picks some more. Now she has 9 flowers. How many did she pick?

b) Some frogs are in a pond. 4 more jump in. There are 6 frogs in the pond. How many were in the pond to start?

**Answers**

a) 5 + □ = 9

b) □ + 4 = 6
Knowing which sentence to use. Write on the board:

6 cats are in a basket. \[ 6 + 2 = \square \quad 2 + \square = 6 \]
2 more crawl in.

How many cats are in the basket now?

number at the start + number added = number at the end

ASK: What information am I given in the problem? Do I know the number at the start? (yes, 6 cats) Put a check mark over the phrase “number at the start.” ASK: Do I know the number added? (yes, 2 crawled in) Put a check mark over the phrase “number added.” ASK: Do I know the number at the end? (no) Put a question mark over the phrase “number at the end.” Point to the two addition sentences and ASK: Which addition sentence should I use to solve the problem? (6 + 2 = \square) Circle “6 + 2 = \square” on the board. ASK: How do you know? (you know the number at the start and the number added)

Write on the board:

Pat has 3 berries.
She takes some more berries. \[ 3 + 5 = \square \quad 3 + \square = 5 \]
She has 5 berries in total.

How many berries did she take?

number at the start + number added = number at the end

Repeat the same line of questions as above. (you know the number at the start and the number at the end, but you don’t know how many were added, so \[ 3 + \square = 5 \] is the one you should use to solve the problem)

Mixed problems. NOTE: This is an advanced section that mixes all of the types of problems learned so far. Students might need a great deal of practice beyond what is provided in this lesson to master distinguishing between the types of problems.

Write on the board:

a) Pam has 3 red grapes and 5 green grapes. How many grapes does she have?

b) Amy sees 5 birds. 3 are jays. The rest are robins. How many robins does she see?

c) 13 horses are in a field. 3 more walk into the field. How many horses are in the field now?

d) 6 kittens are in a basket. Some more crawl in. 10 kittens are in the basket now. How many crawled in?

Tell students that some word problems are about a situation in which the number of objects changes. For example, people buy or get things, people or animals come and go, people eat, lose, or give away things. Other problems are about a situation in which there are two kinds of things.
(or parts) that make a total. For example, red and blue pencils, big and small frogs, and so on. Point to each problem above and SAY: Is this a situation in which the number of objects changes or in which there are two kinds of things that make a total? (the first two problems involve two kinds of things, or parts, that make a total, the last two problems are about situations in which the number of things changes)

Tell students that in problems where there are two kinds of things that make a total, it helps to ask whether you know any of the parts or the total. ASK: For problems a) and b), what do you know? What don’t you know? (in a) you know the two parts but not the total, in b) you know the total and one of the parts) Then ask volunteers to write addition sentences for the problems, as shown below:

a) \(3 + 5 = \)  
b) \(3 + \square = 5\)

Tell students that in problems where the number of objects changes, it helps to ask whether you know the number at the start, the number added, or the number at the end. ASK: For problems c) and d), what do you know? What don’t you know? (in c) you know the number at the start and the number added, in d) you know the number at the start and the number at the end but not the number added) Ask volunteers to write addition sentences for the problems, as shown below:

c) \(13 + 3 = \)  
d) \(6 + \square = 10\)

Repeat the line of questions with a mixture of problem types from this lesson and the last. Ask students to solve each problem by writing an addition sentence. If any students find it too hard to write an addition sentence for a particular problem, let them draw a picture, act out the problem, or solve the problem mentally. (It takes time for students to learn to write number sentences.)

**Exercises:** Write an addition sentence. Find the answer.

a) Ron peels 3 oranges. Then he peels some more. He peels 6 oranges in total. How many more does he peel?

b) 17 horses are in a field. 2 more horses walk in. How many horses are in the field now?

c) 4 boys are in a class. The class has 12 students. How many girls are in the class?

d) 13 frogs are in a pond. 5 more frogs jump in. How many frogs are in the pond now?

**Answers**

a) \(3 + \square = 6\), 3 more oranges

b) \(17 + 2 = \square\), 19 horses

c) \(4 + \square = 12\), 8 girls

d) \(13 + 5 = \square\), 18 frogs
**Using a model to help you decide whether to add or subtract.** Students can solve simple word problems mentally, by adding or subtracting, rather than writing a number sentence.

Write on the board:

```
  o  
```

Use tape to place 10 paper circles on the board beside the rectangle.

**SAY:** There are two horses in a yard. Move two circles into the rectangle and write “2” in the first blank. **SAY:** Four more horses went into the yard. Move four more circles into the rectangle and write “4” in the second blank. **SAY:** I had two circles and I added four more circles. **ASK:** Should I show this with a plus or a minus sign? (a plus sign) Write “+” inside the circle in the number sentence.

Remove the circles from the rectangle and erase the numbers and plus sign from the number sentence. **SAY:** Josh makes four pieces of toast. **ASK:** How many circles should I put in the box this time? (4) Move four circles into the rectangle and write “4” on the first blank. **SAY:** Josh eats two pieces of toast. **ASK:** Should I add two circles to the box or take away two circles? (take away) Remove two circles from the box and write “2” in the second blank. Point to the number sentence and **ASK:** Should I write a plus or minus sign here? (a minus sign) **Why?** (because you took away 2)

Repeat the exercise with different stories (see examples below).

- 5 cats are in a basket. 2 crawl out.
- Sara puts 4 flowers in a vase. She puts in 3 more.
- Paul makes 3 pies. He gives away 2.
- Ed runs up 7 stairs. He runs up 3 more stairs.

Explain that in the next exercises students should try to imagine the counters moving in and out of the box. They can either find the answer in their head or write an addition or subtraction sentence if that is easier.

**Exercises:** Find the answer.

a) 4 frogs are in a pond. 4 more jump in. How many frogs are in the pond now?

b) Amy buys 11 stamps. She buys 4 more. How many stamps does she buy altogether?

c) Ken buys 10 apples. He gives 6 to his friends. How many apples does he have now?

**Answers:** a) 8 frogs, b) 15 stamps, c) 4 apples
Extensions

1. Write on the board:
   \[ \text{number at the start} - \text{number taken away} = \text{number at the end} \]

   Ask students to write a number sentence with a subtraction sign for the problems below. If needed, help them solve the problems by identifying the “number at the start” and the “number taken away” and by writing numbers and boxes under the template above.

   a) Jane has 8 pencils. She loses some pencils. Now she has 4 pencils. How many did she lose?
   b) 7 birds are in a tree. Some fly away. Now there are 2 birds in the tree. How many flew away?

   **Answers**
   a) \[ 8 - \_ = 4, \text{ 4 pencils} \]
   b) \[ 7 - \_ = 2, \text{ 5 birds} \]

2. a) Anna eats 3 grapes. She had 14 to start. How many does she have now? Write your answer using a number sentence and a word sentence.
   b) In pairs, explain how you did part a).

   **Answers:**
   a) \[ 14 - 3 = 11, \text{ Anna has 11 grapes now} \]
   b) sample explanation: I counted out 14 counters. I took away 3 counters. There are 11 counters left. Anna has 11 grapes.

   Redirecting students: If students decide they can’t do the problem because they don’t know how to model the first sentence, point out that there might be something in the second sentence that will help.

   Whole-class follow-up: ASK: What made this problem hard? (the story isn’t told from beginning to end) How did reading the whole story help you know what to do with the first sentence? (I could use that she started with 14 and model that first, then I could model eating 3)
OA1-66 Subtracting and How Many More

Pages 123–125

STANDARDS
1.OA.B.4, 1.OA.C.5

GOALS
Students will subtract by completing statements of the form “5 is ___ more than 3.”

PRIOR KNOWLEDGE REQUIRED
Can write an addition sentence for statements of the form “6 is 2 more than 4”
Can count back from any one-digit number
Can subtract
Can write a subtraction sentence

MATERIALS
2 colors of connecting cubes (e.g., blue and red), 8 blocks of each color per group of 5 students
BLM Memory Cards (3) and (4) (pp. L-100–101)
2 colors of paper squares (8 of one color and 9 of the other color) for demonstration
5 blue cubes and 3 red cubes for demonstration

Review “more than.” Draw on the board:

7 is ___ more than 3.

SAY: I have three circles and I want to find out how many more seven is. So I will draw circles until I have seven circles altogether. Draw the extra circles, counting on as you draw them. SAY: I had to draw four extra circles to make seven, so seven is four more than three. Write “4” in the blank.

Exercises: Draw circles to find the missing number.

a) 5 is ___ more than 2.  b) 6 is ___ more than 4.

c) 8 is ___ more than 3.

Answers
a) 5 circles; b) 6 circles; c) 8 circles

ACTIVITY
Have students play Picking Pairs and Memory (see unit introduction), using BLM Memory Cards (3) and (4). Two cards match if one shows a model and the other shows a phrase that fits the model, similar to the pictures in the answers to the exercises above.
Demonstrate the usefulness of an organized model. Distribute two colors of connecting cubes to groups of four or five students (about eight blocks of each color for each group). Tell students to spread out the cubes and not to link them. ASK: Which color do you have more of? How many more? After giving them time to decide, ask how they decided. (sample answers: we counted, we paired cubes and counted the extra ones) Make sure to ask any groups that were well-organized.

Randomly place paper squares in two colors (8 of one color and 9 of the other color) on the board, as shown below:

ASK: Do I have more white boxes or more gray boxes? (hard to tell) How can we find out? (sample answers: cross them out in pairs and look for a leftover color, count the number of each color and compare) Choose one of the methods that students suggest and count or ask a volunteer to count the boxes. ASK: Are the boxes easy to count? (no) How can we place the boxes so that they are easier to compare? (move them into lines like connecting cubes) Move the squares into two rows, as shown in the margin.

ASK: Which is more? (white) How many more? (1)

Using a model to show subtraction. Have each student take some cubes of each color from the group pile. Have students connect their cubes into one long line, with the colors grouped. Do the same with five blue cubes and three red cubes, as shown below:

Hold up your cubes and SAY: I have eight cubes altogether. If I take away the five blue cubes, I have three red cubes left. So $8 - 5 = 3$. Write “$8 - 5 = 3$” on the board. Ask several volunteers to hold up their line of blocks and say a subtraction sentence that gives the number of red blocks. (For example, if there are seven blocks and three are blue, then there are $7 - 3 = 4$ red blocks.) Ask students to write a subtraction sentence for their blocks.

For the following exercises, ask students to make two-color chains and write a subtraction sentence giving the number of red blocks as the answer.

Exercises: Write a subtraction sentence.

a) 3 red blocks and 5 blue blocks  
b) 2 red blocks and 4 blue blocks

Answers: a) $8 - 5 = 3$, b) $6 - 4 = 2$
Modeling “more than.” Separate your cubes so that you have one line of each color. Hold up your cubes with the blue cubes on top so the edges of the two lines are aligned, as shown below:

\[
\begin{array}{c}
\text{blue cubes} \\
\text{red cubes}
\end{array}
\]

SAY: I can see from my cubes that I have two more blue cubes than red cubes. I have five blue cubes and three red cubes, so five must be two more than three. Draw on the board:

\[
\begin{array}{c}
\text{blue cubes} \\
\text{red cubes}
\end{array}
\]

Count the two extra cubes and write the number in the extra cubes. Continue writing on the board:

\[
\begin{array}{c}
1 & 2 \\
\end{array}
\]

5 is 2 more than 3.

Have the class create their own “more than” sentence using their cubes.

Bringing the two models together. SAY: We can show “more than” and subtraction together. Draw on the board:

\[
\begin{array}{c}
\text{boxes in the top row} \\
\text{boxes in the bottom row}
\end{array}
\]

SAY: Let’s count the boxes. Write the numbers between the two rows of cubes as you count, as shown below:

\[
\begin{array}{c}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
\end{array}
\]

SAY: There are nine boxes in the top row and six boxes in the bottom row. We can color the boxes that match the row that has less. Color six boxes in each row as shown below. SAY: We can count the extra boxes to find how many more there are. Count and write the extra boxes. Write the “more than” sentence under the picture as shown below:

\[
\begin{array}{c}
1 & 2 & 3 \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
\end{array}
\]

9 is 3 more than 6.

SAY: So nine is three more than six. If we take away the six shaded boxes, we have three left: \(9 - 6 = 3\).
Exercises: Find the missing number.

a) \[ \begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \]
\[ \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{array} \]
7 is \_\_\_ more than 3.
\[ 7 - 3 = \_\_\_ \]

b) \[ \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \end{array} \]
\[ \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \end{array} \]
8 is \_\_\_ more than 2.
\[ 8 - 2 = \_\_\_ \]

Bonus:
\[ \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \]
\[ \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \]
6 is \_\_\_ more than 2.
\[ 6 - 2 = \_\_\_ \]

Answers: a) 4, b) 6, c) 5, Bonus: 4

Extensions

1. Fill in the missing number.
   a) 9 is 4 more than 5. So 9 – \_\_\_ = 5.
   b) 12 is 3 more than 9. So 12 – \_\_\_ = 9.
   c) 19 is 4 more than 15. So 19 – \_\_\_ = 15.
   d) 22 is 3 more than 19. So 22 – \_\_\_ = 19.
   e) 39 is 3 more than 36. So 39 – \_\_\_ = 36.
   f) 72 is 5 more than 67. So 72 – \_\_\_ = 67.

   Answers: a) 4, b) 3, c) 4, d) 3, e) 3, f) 5

(MP1, MP2) 2. a) Bev has 8 butterfly stickers. She has 3 more butterfly stickers than pony stickers. How many pony stickers does she have? Write your answer using a full sentence.
   b) In pairs, explain how you did part a).

   Answer: a) Bev has 5 pony stickers; b) sample strategies:
   • I used white cubes for butterfly stickers and brown cubes for pony stickers. I put 8 white cubes all in a row. I lined up brown cubes beside the white cubes so that there are 3 extra white cubes.
   I counted 5 brown cubes.
   • I rewrote “Bev has 3 more butterfly stickers than pony stickers” as “Bev has 3 fewer pony stickers than butterfly stickers.” I found 8 – 3 = 5.
   • The number of pony stickers plus 3 more is equal to the number of butterfly stickers, so I wrote \_\_\_ + 3 = 8, so I found 8 – 3 = 5. Bev has 5 pony stickers.
Redirecting students: If some students write the equation as \(8 + 3 = 11\) and answer that Bev has 11 butterfly stickers, ASK: Does Bev have more butterfly or pony stickers? If the students say ponies because 11 is more than 8, cover up the 3 in the second sentence and have them read it, then ask the same question again. If some students get confused by their model of which objects represent which items, encourage them to use labels such as a simple drawing of a butterfly and a picture of a pony, or the letters “B” and “P”. If students use a picture, emphasize that the drawing just has to be detailed enough to tell the difference easily between a pony and a butterfly—it doesn’t have to be colored in or pretty.

Whole-class follow-up: Take up various solutions. Then compare two different solutions. For example, to compare the last two solutions above, emphasize that thinking of addition is just as correct as thinking of subtraction, but it is one of the numbers being added that is missing, not the total. To compare the first and last solutions above, ASK: How do the cubes lined up show the addition sentence \(5 + 3 = 8\)? (there are 5 cubes in the pony line and 3 extra in the butterfly line, so there are 8 cubes in the butterfly line)
Goals
Students will draw charts to solve word problems in which they must find a number that is a given amount more than (or less than) another number.

PRIOR KNOWLEDGE REQUIRED
Can count on from any number within 20
Understands the terms fewer and more
Understands that to find how many more or how many fewer you can count the difference
Can read sentences
Can deduce who has more from a sentence with “more” or “fewer”

MATERIALS
BLM More Than with Pictures (p. L-110), 2 copies per student

More than, the simple case. Draw on the board:

Blanca has 5 marbles.
Cam has 2 more marbles than Blanca.
How many marbles does Cam have?

Ask a volunteer to write “Blanca” in the top-left box of the picture and to draw circles, one in each box beside “Blanca,” to show how many marbles Blanca has. (5) ASK: Who has more marbles, Blanca or Cam? (Cam) How many more does he have? (2 more) Ask another volunteer to write “Cam” under Blanca’s name and to draw circles to show Cam’s marbles.
PROMPT: Draw the same number of circles as Blanca then add two more. The final picture should look like this:

Ask the volunteer to say how many marbles Cam has. (7) Assign several more questions where the person with the unknown number has more than the person with the known number. Give each student two copies of BLM More Than with Pictures for the following exercises.
Exercises: Draw circles to show how many each person has. Answer the question.

a) Pam has 5 fish.
   Carlos has 2 more fish than Pam.
   How many fish does Carlos have?

b) Ray has 3 comics.
   Grace has 3 more comics than Ray.
   How many comics does Grace have?

Answers

a) Pam
   Carlos
   Carlos has 7 fish.

b) Ray
   Grace
   Grace has 6 comics.

Fewer than, the simple case. Draw on the board:

David has 7 toy cars.
Rob has 2 fewer cars than David.
How many cars does Rob have?

Ask a volunteer to write “David” in the top-left box of the picture and to draw circles, one in each box beside “David,” to show how many toy cars David has. (7) ASK: Who has fewer cars, David or Rob? (Rob) How many fewer does he have? (2) Write “Rob” in the bottom-left box of the picture and draw two Xs in the bottom row under the last two circles in David’s row. The final picture should look like this:

David
Rob

SAY: I drew two Xs because I know that Rob has two fewer cars than David. When I draw Rob’s circles, I will not draw any circles in the two boxes that have Xs. That way, when I draw Rob’s circles I know I will draw two fewer than David’s circles, Ask a volunteer to draw Rob’s circles. ASK: How many cars does Rob have? (5)

Assign several more questions where the person with the unknown number has fewer than the person with the known number. (see examples below)

Rose has 3 fewer stickers than Jane.
Jane has 7 stickers.
How many stickers does Rose have?

Ari has 8 stickers.
Tina has 5 fewer stickers than Ari.
How many stickers does Tina have?

(Rose has 4 stickers, Tina has 3 stickers.)
Students can use BLM More Than with Pictures for the following exercises.

**Exercises:** Draw O to show how many each person has. Draw X to show how many fewer. Write your answer under the picture.

a) Kate sees 7 birds.
   Abdul sees 2 fewer birds than Kate.
   How many birds does Abdul see?

b) Raj reads 4 books.
   Emma reads 2 fewer books than Raj.
   How many books does Emma read?

**Answers:** a) 5 birds, b) 2 books

**More than and fewer than, the harder case.** Draw and write on the board:

<table>
<thead>
<tr>
<th>Greg</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eva</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Greg has 8 cherries.
He has 2 more cherries than Eva.
How many cherries does Eva have?

**ASK:** Who has more cherries? (Greg) Whose row of cherries should be longer, Eva’s or Greg’s? (Greg’s) How much longer? (2 longer, because Greg has 2 more) **SAY:** Because I know Greg has two more, I will draw two Xs under the last two circles in Greg’s row. That way, when I draw Eva’s cherries, I won’t use those two boxes. So I will make sure that, in my picture, Greg has two more. Add two Xs to the picture as shown below:

<table>
<thead>
<tr>
<th>Greg</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eva</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Tell students that this problem is tricky because the word “more” makes it sound like you should add to solve the problem. But if you draw a picture you can see that you have to take away cherries to find the answer. Complete the picture, as shown below:

<table>
<thead>
<tr>
<th>Greg</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eva</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**ASK:** What if Greg had three more cherries than Eva? How many Xs would I draw? (3)

**Exercises:** Use BLM More Than with Pictures to find the answer.

a) Sal has 3 more cherries than Hanna.
   Sal has 7 cherries.
   How many cherries does Hanna have?
b) Amy has 6 cherries. 
   She has 4 more than Joe. 
   How many cherries does Joe have?

**Answers:** a) 4 cherries, b) 2 cherries

Write on the board:

Nina has 4 cherries. 
She has 2 fewer cherries than Abdul. 
How many cherries does Abdul have?

Tell students that this is another tricky problem, because the word “fewer” makes it sound like you should subtract to solve the problem. But if you draw a picture, you can see that you have to add cherries to find the answer. Draw on the board:

```
Nina ||||
Abdul
```

ASK: Who has fewer cherries? (Nina) Whose row of cherries should be longer? (Abdul’s) How much longer? (2 longer, because Nina has 2 fewer cherries) SAY: Because I know Nina has two fewer, I will make Abdul’s row two longer. The final picture should look like this:

```
Nina ||||
Abdul |||||
```

ASK: How many cherries does Abdul have? (6)

Give students another copy of BLM More Than with Pictures for the following exercises.

**Exercises:** Use BLM More Than with Pictures to find the answer.

a) Fred has 3 fewer cherries than Anne. 
   He has 5 cherries. 
   How many cherries does Anne have?

b) Sun has 3 cherries. 
   She has 4 fewer cherries than Jin. 
   How many cherries does Jin have?

**Answers:** a) 8 cherries, b) 7 cherries

Write on the board:

Marco has 3 fewer cherries than Kate. 
Bill has 4 more apples than Emma. 
Raj has 5 fewer stickers than Jen. 
Carlos has 1 fewer apple than Ron. 
John has 3 more apples than Sue.

Ask volunteers to underline the name of the person who has more. (Kate, Bill, Jen, Ron, John)
In the following exercises, ask students to write the name of the person who has more. Students can check their answer by making sure that the person who has more has a longer row of circles. If needed, provide students with another copy of BLM More Than with Pictures.

**Exercises:** Draw a picture using O and X to solve the problem.

a) Sam has 4 more apples than Kim.
   - Sam has 5 apples.
   - How many apples does Kim have?

b) Fred has 3 fewer apples than Dan.
   - Dan has 6 apples.
   - How many apples does Fred have?

**Answers**

a) Sam has more

\[
\begin{array}{c|cccccc}
& O & O & O & O & O & O \\
Sam \\
& O & X & X & X & X & X \\
Kim \\
\end{array}
\]

Kim has 1 apple.

b) Dan has more

\[
\begin{array}{c|cccccc}
& O & O & O & O & O & O \\
Dan \\
& O & O & O & X & X & X \\
Fred \\
\end{array}
\]

Fred has 3 apples.

**Extensions**

1. Have students model and solve the following problems.

   a) Bill has 5 apples. He has 3 fewer apples than Don. How many apples does Don have?

   b) Maria has 6 shells. Bev has 3 fewer shells than Maria. How many shells does Bev have?

   c) Marco has 7 toy boats. He has 3 more boats than Raj. How many boats does Raj have?

   d) Alex has 4 more pears than Zara. Zara has 3 pears. How many pears does Alex have?

   e) Pat climbs 3 more trees than Sam. Pat climbs 9 trees. How many trees does Sam climb?

**Answers:** a) 8 apples, b) 3 shells, c) 4 boats, d) 7 pears, e) 6 trees

Redirecting students: Some of these questions are of the harder type and some are of the easier type. Students will have to choose a method of solution depending on the type. Ask students to start by underlining the name of the person who has more. They should draw pictures using BLM More Than with Pictures to find the answer.
2. a) Jim has 4 more toy cars than toy trucks. He has 8 toy trucks. How many toy cars does Jim have? Write your answer using a number sentence and a word sentence.

b) In pairs, explain how you answered the question.

Answers: a) $8 + 4 = 12$, Jim has 12 toy cars; b) sample explanation: I used 8 cubes for the trucks and lined them up. I put cubes beside it for cars, but I made sure there were 4 extra cars. I counted 12 in total in the cars line, so Jim has 12 toy cars. I wrote $8 + 4 = 12$ because that shows 4 more than 8.

Redirecting students: If students decide they can’t do the problem because they don’t know how to model the first sentence, point out that there might be something in the second sentence that will help.

Whole-class follow-up: ASK: What made this problem hard? (you don’t use the facts in order; you don’t use the numbers in order) How did reading the whole story help you know what to do with the first sentence? (I could show the 8 toy trucks first, then I could show 4 more)
Goals

Students will subtract to solve word problems involving how many more.

PRIOR KNOWLEDGE REQUIRED

Can subtract
Understands the meaning of more than
Can write a subtraction sentence
Can read and understand a simple word problem

MATERIALS

BLM Memory Cards (3) to (5) (pp. L-100–102)
BLM I Have ____, Who Has ____? Game Cards (p. P-15)
BLM How Many More (pp. L-111–112)
2 paper bags
Glue

Writing a subtraction sentence for a picture. Draw on the board:

○ ○ ○ ○ ○

ASK: How many circles did I draw altogether? (5) SAY: First I drew two unshaded circles. (Point at the circles.) Then I drew three shaded circles. (Point at the shaded circles.) That makes five circles altogether. I can see from the picture that five is three more than two. Write “5 is 3 more than 2” under the picture.

Draw three unshaded and four shaded circles on the board. ASK: How many circles did I draw altogether? (7) How many shaded circles did I draw? (4) How many unshaded circles? (3) Write “4” over the shaded circles and “3” over the unshaded circles. ASK: How can I use these numbers to write a “more than” sentence about 7? (7 is 4 more than 3)
PROMPT: Write “7 is ___ more than ___” on the board and ask a volunteer to write the numbers 4 and 3 in the blanks. Repeat with several more examples, such as 8 is 6 more than 2 and 9 is 3 more than 6.

Exercises: Write in the missing numbers.

a) ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   6 is ___ more than ___.

b) ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   5 is ___ more than ___.

c) ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   8 is ___ more than ___.

d) ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   9 is ___ more than ___.

Bonus: ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   ___ is ___ more than ___.

Answers: a) 5, 1; b) 1, 4; c) 3, 5; d) 5, 4; Bonus: 8, 5, 3
ACTIVITY 1

Give students cards from BLM Memory Cards (3) and (4) and have them play Picking Pairs and Memory (see unit introduction). Two cards match if one card has a picture and the other has a matching phrase as in the exercises above.

Draw on the board:

○○○○○

SAY: This picture shows five circles in total. ASK: If I cross out the shaded circles, how many circles are left? (2) SAY: I can write a subtraction sentence for this picture. Write “5 − 3 = 2” under the picture.

Draw on the board:

○○○○○○

ASK: What subtraction sentence can we write for this picture? (6 − 1 = 5) PROMPT: What is the total? (6) We take away, or subtract, the shaded circle. What number do we subtract? (1) SAY: Six take away one is five.

Exercises: Write a subtraction sentence for the picture.

a) ○○○○ ○  b) ○○○○○○○  c) ○○○

Answers: a) 5 − 3 = 2, b) 6 − 4 = 2, c) 3 − 2 = 1

ACTIVITY 2

Give students cards from BLM Memory Cards (4) and (5) and have them play Picking Pairs and Memory (see unit introduction). Two cards match if one has a picture and the other has a matching subtraction sentence as in the exercises above.

Relating “more than” to subtraction. Draw and write on the board:

○○○○○  

5 is 3 more than 2.

5 − 2 = ___

SAY: I know five is three more (point to the three shaded circles) than two. If I take two from five, how many are left? (3) Point to the two unshaded circles and SAY: If I know a “more than” sentence about five (point to the more than sentence), then I can also write a subtraction sentence. Point to the subtraction sentence and ASK: What number should I write here? (3) PROMPT: How many circles are left when I take away two circles? (3) Write “3” in the blank to complete the sentence. Repeat with several more examples, such as “8 is 5 more than 3”. (8 − 3 = 5)
Write on the board:

7 is 2 more than 5
so \(7 - 5 = \) __

ASK: If we know that seven is two more than five, do we need to subtract to find \(7 - 5\)? (no) What is \(7 - 5\)? (2) SAY: If we know that seven is two more than five, then we know that \(7 - 5\) must be 2. Write “2” in the blank to complete the sentence.

SAY: Let’s try another one. Write on the board:

9 is 3 more than 6.

ASK: Nine is how many more than six? (3) So what is \(9 - 6\)? (3) Write the subtraction sentence on the board. \((9 - 6 = 3)\)

**Exercises:** Use the word sentence to subtract.

a) 7 is 5 more than 2,
so \(7 - 2 = \) __

b) 14 is 4 more than 10,
so \(14 - 10 = \) __

c) 22 is 5 more than 17,
so \(22 - 17 = \) __

**Answers:** a) 5, b) 4, c) 5

**ACTIVITIES 3–4**

3. **I Have ____, Who Has ____?** (see unit introduction) In advance, make cards using BLM I Have ____, Who Has ____? Game Cards. For “I have,” show a model of subtraction. For “Who has,” write a subtraction sentence. A sample card is shown below:

![Sample Card]

4. **Picking Pairs and Memory.** Give students cards from BLM Memory Cards (3) and (5) and have them play Picking Pairs and Memory (see unit introduction). Two cards match if one card has a phrase such as “7 is 4 more than 3” and the other card has a matching subtraction sentence, such as “\(7 - 3 = 4\).”
Understanding “how many more” as subtraction. SAY: If I know that seven is two more than five, then I know that $7 - 5$ is 2. Now let’s look at what happens if I don’t know how many more it is. Write on the board:

11 is how many more than 8?

ASK: What can I do to answer the question? (subtract) Some students may explain how to subtract (“I can count on from 8 to 11” or “I can draw 11 circles, cross out 8, and count the rest”). If not, remind students that they’ve seen this kind of question before, written as 11 is ___ more than 8, in Lesson OA1-66, where they subtracted.

Write on the board:

10 is how many more than 3?

ASK: What subtraction can I write to answer this question? ($10 - 3$) Write on the board:

$10 - 3 = \ _$

Do the subtraction as a class and write the answer. (7)

Exercises: Subtract to find the answer.

a) 6 is how many more than 2?   b) 13 is how many more than 8?

c) 11 is how many more than 7?

Answers: a) $6 - 2 = 4$, b) $13 - 8 = 5$, c) $11 - 7 = 4$

Solving comparative word problems. SAY: Sometimes we need to find how many more in everyday life. Bev plays soccer and wants to know how many more goals her team scored than Eddy’s team. Write on the board:

Bev’s team scored 4 goals.
Eddy’s team scored 1 goal.

SAY: If we want to know how many more goals Bev’s team scored, we need to find out how many more four is than one. Write on the board:

4 is how many more than 1?

Ask students to write a subtraction sentence to answer the question. ($4 - 1 = 3$) SAY: Four is three more than one.

SAY: We can use this method for other kinds of questions, too. Write on the board:

Marco has 5 pears. Amy has 3 pears. How many more pears does Marco have?

Pat is 7 years old. Ron is 3 years old. How many years older is Pat?

ASK: What is the first problem asking in numbers? (5 is how many more than 3?) What is the next problem asking in numbers? (7 is how many more than 3?) Ask students to write a subtraction sentence to answer each question. ($5 - 3 = 2$, $7 - 3 = 4$)
Exercises: Write a subtraction sentence to find the answer.

a) Greg has 12 grapes.
   Sara has 9 grapes.
   How many more grapes does Greg have?

b) Team A has 16 players.
   Team B has 10 players.
   How many more players does Team A have?

c) Kate is 13 years old.
   Alex is 8 years old.
   How many years older is Kate?

Bonus: Jake has 9 books.
      Marta has 15 books.
      How many more books does Marta have?

Answers: a) 12 − 9 = 3, b) 16 − 10 = 6, c) 13 − 8 = 5, Bonus: 15 − 9 = 6

Cut out the sentences from BLM How Many More (1). Put the sentences about Tom and Sara in separate bags. Cut enough sentences so that each student can take three strips from Tom’s bag and three strips from Sara’s bag. SAY: Let’s build a word problem using the sentences in these two bags. Pick one sentence out of each bag. SAY: I chose two sentences. Write the sentences on the board:

Sara has 7 stickers. Tom has 2 stickers.

Read your sentences aloud. SAY: I need to answer the question, “How many more stickers does Sara have?” Write on the board:

How many more stickers does Sara have?

ASK: How can I find how many more stickers Sara has? (subtract) What do we subtract? (Tom’s stickers from Sara’s, 7 − 2) Write on the board:

7 − 2 =

ASK: What is 7 − 2? (5) Write the answer on the board.

ACTIVITY 5

Building word problems. Give students BLM How Many More (2). Using the same bags as before, have students choose one sentence from each bag. Ask them to glue their sentences in the first question on the BLM, one sentence in each rectangle. Then have them answer “How many more stickers does Sara have?” (NOTE: Sara will always have more.) SAY: You will need to subtract Tom’s stickers from Sara’s using the numbers you picked. Encourage students to count on or count back to subtract. When they complete the question, have them pick two new sentences from the bags and repeat the activity.
Extensions

1. Remind students that they know two ways to subtract: they can count back or count on. (See Extension 4 in Lesson OA1-58 for a review of the two methods.) Ask students to write a subtraction for each question below and to choose a method of subtraction to find the answer.

   a) 12 is how many more than 3?
   b) 14 is how many more than 11?

   **Answers**
   a) $12 - 3$, 12 is 9 more than 3
   b) $14 - 11$, 14 is 3 more than 11

2. Anne picked 5 apples. She wants to have 7. How many more does she need to pick? Draw a picture to show your answer.

   **Answer:** $7 - 5 = 2$, so she needs to pick 2 more.

3. Find the answer.

   a) What number is 4 more than 100?
   b) What number is 3 more than 105?

   **Answers:** a) 104, b) 108

4. Josh has some buttons. Cathy has 1 more button than Josh. Sandy has 3 more buttons than Cathy. Who has more buttons, Josh or Sandy? How many more? Use any tool you think will help.

   **Answer:** Sandy has 4 more buttons than Josh.

   Redirecting students: Encourage students who struggle to start the problem to pretend they know how many buttons Josh has and try different numbers for Josh’s buttons. **ASK:** What stays the same each time? (Sandy always has 4 more than Josh) Why is that? (1 extra and 3 extra makes 4 extra)

   **NOTE:** Students who do this problem by recognizing that 3 more than 1 more is 4 more (without needing to use specific examples and repetition) are looking for and making use of structure (MP7). Students who do this problem by investigating many examples and noticing that 3 more than 1 more is always 4 more are noticing and expressing regularity in repeated reasoning (MP8).
Goals

Students will write addition or subtraction sentences involving two or three numbers.
Students will write number sentences that combine addition and subtraction involving three numbers.

Prior Knowledge Required

Can add and subtract numbers less than 100
Can write and read number sentences
Can use strategies to solve simple word problems, such as drawing a diagram and writing a number sentence

Materials

20 paper circles for demonstration
10 counters per student

deciding what operation to use. Write on the board:

Ed has 7 crackers.
He eats 4 of them.
How many crackers does he have left?

NOTE: In this lesson, we refer to the picture with the blanks and the circle above as a template. Students are not expected to understand the word “template,” so use the word “picture” when referring to it. You will often be asking students which symbol, $+$ or $-$, should be written in the template’s circle. Have students signal the answer by making the plus sign with their index fingers and showing a horizontal forearm for the minus sign.

ASK: What is the biggest number in this question? (7) Do you think the answer to the question is bigger than that number? (no) Could Ed have more than seven crackers left? (no, because he ate some of the crackers) What number are you given first in the problem? (7) What does the seven tell you? (how many crackers Ed starts with) Write “7” in the first blank.

ASK: Will you add a number to seven or subtract a number from seven? (subtract) How do you know to subtract? (because he eats some crackers, so you need to take away) Write a minus sign in the circle. ASK: What number gets subtracted? (4) PROMPT: How many crackers does he eat? Write “4” in the second blank. The sentence should now read $7 - 4$.

ASK: What is $7 - 4$? (3)
Write on the board:

6 cows are in a field.
4 cows walk in.
How many cows are in the field now?

___ ___

ASK: What is the biggest number in this question? (6) Do you think the answer to the question is bigger than that number? (yes) PROMPT: Are there more than six cows in the field? (yes, because more came in) So to find the answer, would you add four to six or subtract four from six? Have students signal the answer, then have a volunteer explain the reason for the answer. (add, because something is being added; if you subtracted, you would get a number smaller than 6) Write “6 + 4” in the template, as shown below:

6  +  4

ASK: What is 6 + 4? (10)

Exercises

1. Write an addition or subtraction.
   a) Sal has 9 toy cars.
      His friend gives him 2 more.
      How many cars does he have now?
   b) 8 bunnies are in a field.
      3 hop away.
      How many are in the field now?
   c) Pat has 3 cats and 2 dogs.
      How many pets does he have?

   **Answers:** a) 9 + 2, b) 8 − 3, c) 3 + 2

2. Add or subtract the numbers in Exercise 1.

   **Answers:** a) 11, b) 5, c) 5

   **Using a model to help you decide whether to add or subtract.** Draw on the board:

   _____ _____

   **Operations and Algebraic Thinking 1-69**

   L-75
Prepare 15 paper circles that you can affix to the board. SAY: There are four ducks in a pond. Put four circles into the rectangle and write “4” in the first blank. SAY: Three more ducks land on the pond. Add three more circles to the rectangle and write “3” in the second blank. SAY: I had four circles and I added three more circles. ASK: Should I show this with a plus or a minus sign? (plus sign) Write “+” inside the first circle in the template. SAY: Now two more ducks land on the pond. Add two more circles into the rectangle and write “2” in the last blank. ASK: Should I write a plus sign or a minus sign to show this? (plus) Write “+” in the second circle. The final picture should look like this:

```
  4  +  3  +  2
```

Remove all the circles from the rectangle and write a blank template on the board. SAY: Kevin makes three pies. ASK: How many circles should I put in the box? (3) Put three circles in the rectangle and write “3” in the first blank. SAY: Kevin makes two more pies. ASK: Should I add two circles to the box or take away two circles? (add) Add two circles to the box and write “2” in the second blank. Point to the first circle in the template and ASK: Should I write a plus or minus sign here? (a plus sign because you added 2) The picture should look like this:

```
  3  +  2  
```

SAY: Now Kevin gives one pie to a friend. ASK: Should I put one more circle in the box or take one away? (take away) Move one circle out of the box and write “1” in the last blank. Have students signal plus or minus to show what should go in the second circle. (minus) Write “−” in the circle. The picture should look like this:

```
  3  +  2  −  1
```

Have a volunteer find the answer by counting the number of circles in the rectangle. (4)
ACTIVITY

Have each student draw a rectangle on a sheet of paper. Give each student 10 counters and ask them to move counters in and out of the rectangle as you read the stories below.

3 bugs are on a leaf. 5 more crawl onto the leaf. 3 fly away.
4 cats are in a basket. 2 crawl out. 2 more crawl out.
6 horses are in a field. 3 leave the field. 2 walk back in the field.
Tess puts 4 apples in a basket. She puts in 3 more. She eats 2 apples.
Paul makes 3 pies. He gives away 2. He makes 5 more.
Emma pours 4 cups of water. She drinks 1 cup. She gives 1 cup to a friend.

Repeat the activity with the same stories, but this time write the number sentence using a template as you say them. Each time they move the counters, ask them to signal whether you should write plus or minus in the corresponding circles of the template.

Draw on the board:

\[ \_ + \_ - \_ = \_ \]

Ask volunteers to explain how to find the answer to the first problem in the Activity above. (the number sentence is \( 3 + 5 - 3 = \_), so add \( 3 + 5 = 8 \), then subtract \( 8 - 3 = 5 \)) Students who struggle with keeping track of the numbers can write the result of the first addition under the template, as shown below:

\[ \begin{array}{c}
3 \\
+ \\
5 \\
- \\
3 \\
= \\
8 \\
5
\end{array} \]

Ask students to draw this picture on a piece of paper three times. For the following exercises, have them model with counters and then fill in the picture.

(MP.4) Exercises: Fill in the picture to find the answer.

a) Mark buys 2 muffins. Emma buys 3 muffins. Ron buys 1 muffin. How many muffins do they buy altogether?
b) 8 turtles are on a log. 3 crawl away. 3 more crawl away. How many turtles are on the log now?
c) 9 horses are in a field. 2 horses join them. 3 horses run away. How many horses are in the field now?

Answers: a) \( 2 + 3 + 1 = 6 \), b) \( 8 - 3 - 3 = 2 \), c) \( 9 + 2 - 3 = 8 \)
Ask students to try the following exercises without counters or a template.

**Exercises:** Write a number sentence for the story.

a) Peter makes 3 pies. He gives away 2 of the pies. He makes 4 more pies. How many pies does he have now?

b) Amy picks 5 flowers. She gives 2 flowers to a friend. She gives 1 to her mother. How many flowers does she have left?

**Answers:** a) $3 - 2 + 4 = 5$, b) $5 - 2 - 1 = 2$

**Extensions**

**NOTE:** Students can solve the problems below mentally or by drawing circles. To solve the problem by drawing circles, they draw circles for the known addends and draw extra circles until they get the total. The number of extra circles they draw is the answer.

1. Find the missing number.
   
   a) $3 + 2 + \square = 6$
   
   c) $7 + 4 + \square = 15$
   
   e) $\square + 2 = 8$
   
   b) $5 + 2 + \square = 9$
   
   d) $2 + \square + 7 = 10$
   
   f) $\square + 3 = 12$

**Answers:** a) 1, b) 2, c) 4, d) 1, e) 2, f) 3

2. Find the missing number.
   
   a) $3 + 2 - \square = 4$
   
   c) $3 + 6 - \square = 5$
   
   b) $3 + 1 - \square = 2$
   
   d) $8 - 2 - \square = 4$

**Answers:** a) 1, b) 2, c) 4, d) 2

3. Students work in pairs. Give each pair 10 counters. Player A divides the counters into three groups. Player B writes an addition for the groups of counters. (For example, if the groups have three, two, and five counters, Player B writes $3 + 2 + 5$.) Player A then puts two of the groups together and Player B writes a second addition for the new grouping. (For example, if Player A put the group with three counters together with the group of five counters, Player B writes $8 + 2$.) Finally, Player B writes a number sentence to show that even though Player A has grouped the counters in different ways, the number of counters is still the same. (For example, for the groups described above, the addition sentence would be $3 + 2 + 5 = 8 + 2$.) Players switch roles and play again.
Goals

Students will determine unknown numbers in addition sentences by making 10 mentally.
Students will solve subtraction sentences by solving related addition sentences.

PRIOR KNOWLEDGE REQUIRED

Knows all pairs of numbers that add to a given number up to 10
Can solve addition sentences for an unknown addend
Can add numbers by completing a ten

MATERIALS

BLM Memory Cards (1), (5), and (6) (p. L-96, pp. L-102–103)

Review decomposing numbers into smaller additions. Remind students that they can write all of the pairs of numbers that add up to a given number in order, starting with an addition that has a 1 in it. For example, the pairs for 7 are as follows:

1 + 6
2 + 5
3 + 4

Exercises: Write all of the pairs of numbers that add up to the number.

a) 6  b) 8  c) 9  d) 10

Answers: a) 1 + 5, 2 + 4, 3 + 3; b) 1 + 7, 2 + 6, 3 + 5, 4 + 4;
c) 1 + 8, 2 + 7, 3 + 6, 4 + 5; d) 1 + 9, 2 + 8, 3 + 7, 4 + 6, 5 + 5

Using numbers that add to 10 to make numbers in the teens. Draw 10 circles on the board. SAY: I have drawn 10 circles. I want to draw 13 circles altogether. How many extra circles do I need to draw to make 13? (3) Write “13” on the board. ASK: How can you tell, by looking at the number, how many more circles I need to add? (look at the ones digit to see that 13 is 10 plus 3; you need to add 3 circles to 10 to make 13) Draw three more circles on the board and count all of the circles to verify that there are 13. Repeat this exercise with other numbers in the teens.

Write on the board:

10 + □ = 14

Ask students how they could find the answer without drawing circles. (14 is 10 plus 4, so the missing number is 4) PROMPT: Look at the total 14. 14 is 1 ten and 4 ones. So what do you need to add to 10 to get 14? Erase the box in the number sentence on the board and write “4.”
Exercises: Find the missing number.
a) \[ 10 + \square = 15 \]  
b) \[ 10 + \square = 19 \]  
c) \[ 10 + \square = 11 \]  

Answers: a) 5, b) 9, c) 1

Solving number sentences by making 10. Draw on the board:

\[ \begin{array}{c}
\bigcirc & \bigcirc & \bigcirc & \bigcirc & \bigcirc & \bigcirc & \bigcirc \\
& + & + & & & & \\
8 & \rightarrow & 10 & \rightarrow & 13
\end{array} \]

SAY: I have eight circles on the board and I want to draw 13 circles altogether. How many extra circles do I need to draw to make 13? Point out to students that one way to solve this problem is by first making 10. ASK: How many circles do I need to add to make 10? (2) Draw two more circles and write “2” in the circle above the first arrow. ASK: How many more do I need to add to make 13? (3) Draw three more circles and write “3” in the circle above the second arrow. ASK: How many extra circles did I draw altogether? (2 + 3 or 5) Repeat this exercise with other pairs of numbers where the number of circles you draw is less than 10 and the number you want to end up with is in the teens, such as 7 \rightarrow 15. (8 extra circles)

Exercises: Find the missing numbers.

\[ \begin{array}{c}
a) \quad 6 - \bigcirc \rightarrow 10 \rightarrow 12 \\
c) \quad 8 - \bigcirc \rightarrow 10 \rightarrow 16
\end{array} \]

Answers: a) 4, 2; b) 5, 3; c) 2, 6

Finding unknowns using 10. Write on the board:

\[ 7 + \square = 13 \]

Tell students that they can find the missing number by first making 10. Ask a volunteer to draw a picture with arrows (as in the exercise above) to show how they would do this. Erase the box and write “6.” Repeat the exercise with other numbers, such as \[ 9 + \square = 17 \]. (8)

Solving subtraction sentences by solving related addition sentences.
Remind students that if they are given a subtraction sentence, they can write a related addition sentence. Draw on the board:

\[ \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \]

SAY: I can write a subtraction sentence for the picture using the number 3: \[ 5 - 2 = 3 \]. But I can also write an addition sentence using the number 3: \[ 3 + 2 = 5 \]. So, for the subtraction \[ 5 - 2 = 3 \], a related addition is \[ 3 + 2 = 5 \]. If I can take away two from five and get three, then I can add two to three to get five. Write both number sentences on the board under the picture.
Exercises: Write a related addition sentence.

a) $7 - 4 = 3$  
   b) $8 - 2 = 6$  
   c) $10 - 5 = 5$

d) $6 - 2 = 4$  
   e) $8 - 1 = 7$

Answers: a) $4 + 3 = 7$ or $3 + 4 = 7$, b) $2 + 6 = 8$ or $6 + 2 = 8$,  
   c) $5 + 5 = 10$, d) $2 + 4 = 6$ or $4 + 2 = 6$, e) $1 + 7 = 8$ or $7 + 1 = 8$

SAY: Even if a subtraction sentence has a missing number, you can still write a related addition sentence. Write on the board:

$$6 - \square = 2 \quad \quad \quad 2 + \square = 6$$

SAY: For the sentence $6 - \square = 2$, a related addition sentence is $2 + \square = 6$. If I can take away a number from 6 and get 2, then I can add that number to 2 and get 6.

Exercises

1. Write a related addition sentence.
   a) $13 - \square = 9$  
   b) $12 - \square = 4$

c) $16 - \square = 7$  
   d) $10 - \square = 6$

e) $7 - \square = 4$

Answers

a) $\square + 9 = 13$ or $9 + \square = 13$

b) $\square + 4 = 12$ or $4 + \square = 12$

c) $\square + 7 = 16$ or $7 + \square = 16$

d) $\square + 6 = 10$ or $6 + \square = 10$

e) $\square + 4 = 7$ or $4 + \square = 7$

2. Find the unknown number by writing a related addition sentence.
   a) $12 - \square = 8$  
   b) $13 - \square = 7$  
   c) $14 - \square = 9$

Answers

a) $\square + 8 = 12$ or $8 + \square = 12$, so $\square = 4$

b) $\square + 7 = 13$ or $7 + \square = 13$, so $\square = 6$

c) $\square + 9 = 14$ or $9 + \square = 14$, so $\square = 5$

ACTIVITY

For more practice with number sentences and pictures, students can play Memory (see unit introduction) using BLM Memory Cards (1) and (5). For an extra challenge, create some cards with larger numbers using BLM Memory Cards (6).
Extensions

1. Find the unknown number by writing a related addition sentence.
   a) $28 - \square = 24$  
   b) $57 - 52 = \square$  
   c) $79 - 76 = \square$

   **Answers**
   a) $24 + \square = 28$, $\square = 4$
   b) $52 + \square = 57$, $\square = 5$
   c) $76 + \square = 79$, $\square = 3$

2. Use the addition fact to write the missing numbers.
   a) $5 = 3 + 2$
   b) $5 = 2 + 3$

   **Answers**
   a) 40, 42; 50, 52; 60, 62
   b) 30, 33; 40, 43; 50, 53; 60, 63

3. Find the missing numbers.
   a) $36 - \square + 40 = 43$
   b) $25 + \square + 30 = 34$
   c) $68 - \square + 70 = 75$

   **Answers:** a) 3; b) 5, 4; c) 2, 5

4. A group of 45 people are having a barbecue at Sara’s place. Everyone needs to have a plate or a bowl. Sara has 21 bowls and 23 plates. Does she have enough so that everyone can have one, or will two people have to share? Explain.

   **Answer:** Sara has a total of $21 + 23 = 44$ bowls and plates. Everyone needs a bowl or plate, but there are 45 people. So 1 person will have to share with someone else.
Goals
Students will identify US coins by name, value, and appearance. Students will compare the values of coins.

PRIOR KNOWLEDGE REQUIRED
Can compare objects by size (bigger, smaller)

MATERIALS
play money or coins from BLM Coins to Cut Out (p. L-113), 8–10 coins per student, including at least 1 penny, nickel, dime, and quarter
white paper
scissors
glue
picture of a penny and nickel for demonstration
20 pennies and other coins (mostly nickels) per student
coins from different countries (see Extension 2)
quarters with different images (see Extension 3)

Introduce coins. Show students several coins. ASK: Does anyone know a word that describes this kind of money? Explain that these are called coins.

ACTIVITY 1
Matching coins by the two sides. Give students play coins (1 penny, 1 nickel, 1 dime, and 1 quarter). Ask students if they can tell which side is heads and which side is tails. ASK: Why do you think one side is called heads and the other side is called tails? (the heads side shows a head or face) Tell them to turn all the coins so that the heads sides are up. Give each student a sheet of white paper and ask them to fold the sheet in half so that the fold line separates the top from the bottom. Have students unfold the paper, place all the coins in a row under the top half of the page, and rub a pencil over the paper to make rubbings of the coin images. Students should turn each coin over, rearrange the coins in a different order, place the bottom half of their sheet over the coins, and rub the pencil over the paper again. Have them draw lines to match the heads side of each coin with its tails side.

NOTE: Activity 1 will not work if you do not have play coins.

NOTE: If needed, students can cut coins from BLM Coins to Cut Out and glue the heads and tails of each coin beside each other on paper to use for reference. They can also color the penny brown and the nickel, dime, and quarter silver to match the real coins.
Identifying coins by name. Tell students that a penny shows ONE CENT on it. ASK: How is it different from other coins? (it is brown) Ask students to hold up a penny. Write “penny” on the board and ask students to copy the word on the sheet they created in Activity 1. Repeat with the other coins. (the nickel is silver and has FIVE CENTS on it; the dime is silver, is the smallest coin, and has ONE DIME on it; the quarter is silver, is the largest of the four coins in this lesson, and has QUARTER DOLLAR on it) Ask students to hold up various coins. Students may refer to their sheets at first, but should eventually be able to identify coins by name without help. Students can stack the coins so they see that the coins from largest to smallest are the quarter, the nickel, the penny, and the dime.

ACTIVITY 2

Give each student eight to ten play coins and have them sort the coins by type. Ask them to label each group (penny, nickel, dime, or quarter). Ask students to describe the strategy they used to sort: Did they take each coin, look at it, and place it in the correct group? Did they choose all coins of a certain type, set them aside, and proceed to the next type? Continue until only coins of one type are left. Let students remix the coins and sort them using a new method. Did it produce the same result? Which way was easier? Why do they think that was?

Match coin values and names. Ask students if they can find the value in cents printed on the penny. (the words ONE CENT are printed on the coin) SAY: A penny is worth 1 cent. It is the coin that is worth the least. Find a nickel. It has “5 cents” written on it. This means that this coin alone is the same as 5 pennies. You can trade 5 pennies for a nickel. We say that the value of the nickel is 5 cents. We also say that it is worth 5 cents. A 10-cent coin (a dime) is worth more than a 5-cent coin (a nickel). Write on the board:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>penny</td>
<td>1 cent</td>
</tr>
<tr>
<td>nickel</td>
<td>5 cents</td>
</tr>
<tr>
<td>dime</td>
<td>10 cents</td>
</tr>
<tr>
<td>quarter</td>
<td>25 cents</td>
</tr>
</tbody>
</table>

Leave this on the board so students can refer to this list throughout the lesson. Show students pairs of coins of different denominations and ask them to say which coin is worth more.

Write the following exercises on the board and ask students to signal the coin that is worth more by pointing their thumbs right or left.

Exercises: Which is worth more?

a) 10 cents 25 cents  b) 1 cent 5 cents

Answers: a) 25 cents, b) 5 cents, c) 10 cents, d) 25 cents
ACTIVITY 3

Player 1 thinks of a coin. Player 2 identifies the coin by asking up to three questions, such as “Is it worth more than a nickel?” For an easier variation, if Player 1 thinks of a nickel, she could answer “it is a nickel” instead of “no” to the last question.

Introduce the cent symbol (¢). Review the meaning of the equal sign (is the same as, is the same number as). Explain that the equal sign can also mean “is worth as much as,” and this is the meaning we use when working with money. ASK: Why do we use the symbol instead of writing the words? (the symbol takes up less space) SAY: Look at the list on the board. ASK: What word do you think we use the most when we talk about money? (cents) PROMPT: Is there a word that is used more often than the others? ASK: Do you think there should be a symbol for that word like there is for equals, so that we don’t have to keep writing it? (yes) Ask if anyone already knows what symbol people invented for the word cent. Write on the board:

penny = 1¢  
nickel = 5¢  
dime = 10¢  
quarter = 25¢

ASK: How could I write 8 cents using the cent symbol? (8¢) Invite volunteers to write various amounts using the cent symbol. For the following exercises, say the amounts out loud and have students write them using the cent symbol.

Exercises: Write using the cent symbol.

a) 12 cents  b) 7 cents  c) 46 cents  d) 39 cents

Bonus

e) 100 cents  f) 200 cents  g) 1,000 cents

Answers: a) 12¢, b) 7¢, c) 46¢, d) 39¢, Bonus: e) 100¢, f) 200¢, g) 1,000¢

Comparing the values of coins. Display a picture of a penny and a nickel on the board and ASK: Which coin is worth more? (nickel) SAY: We can compare the value of two coins by first saying how much each coin is worth in cents. ASK: How many cents is a penny worth? (1 cent) How many cents is a nickel worth? (5 cents) SAY: A few lessons ago we learned to compare two numbers by drawing circles for each number. A penny is worth 1 cent so I will draw one circle. ASK: How many circles should I draw for the nickel? (5 circles because the nickel is worth 5 cents) Draw on the board:

| penny |      |      |      |
|       | O    |      |      |
| nickel| O O O O O |

SAY: From the picture we can see that the nickel is worth 4 cents more than the penny. ASK: What subtraction sentence can I write to find out how much more the nickel is worth? (5 − 1 = 4) Repeat the same exercise with a penny and a dime, and a nickel and a dime.
Exercises: Write a subtraction sentence to find the answer.

a) How much more than a penny is a nickel worth?

b) How much more than a penny is a dime worth?

c) How much more than a nickel is a dime worth?

d) How much more than a penny is a quarter worth?

e) How much more than a nickel is a quarter worth?

f) How much more than a dime is a quarter worth?

Answers: a) $5 - 1 = 4¢$, b) $10 - 1 = 9¢$, c) $10 - 5 = 5¢$, d) $25 - 1 = 24¢$,

e) $25 - 5 = 20¢$, f) $25 - 10 = 15¢$

Counting pennies. Explain that adding money is really easy when you
have only pennies because each penny is worth 1 cent. Demonstrate
counting out a pile of pennies: 1 cent, 2 cents, 3 cents, and so on. Give
each student a pile of play coins, predominantly pennies and nickels.
Have them separate the pennies from the other coins. Write an amount
on the board (up to 20¢) and tell students to count out that many pennies,
as though they are going to buy something for that price. Repeat with
different amounts.

Extensions

1. Teach students about the images on the heads side of each coin:
   penny: Abraham Lincoln
   nickel: Thomas Jefferson
   dime: Franklin Delano Roosevelt
   quarter: George Washington.

NOTE: Extensions 2 and 3 require students to bring coins from home.
You will need to alert students about this ahead of time if you want to use
these extensions.

2. If possible, have students bring in coins from different countries, or
   bring some in yourself. Students can sort them by country, make
   rubbings as in Activity 1, and create a display of pictures of international
   coins. Students can also subtract the values of coins from the same
   country to find out how much more one coin is worth than another.

3. Ask students to check if they have quarters at home with different
   images than what they’ve seen so far. What is shown on the tails side
   of the coins? How are the coins the same? How are they different?

(MP1, MP3, MP4)

4. a) There are 4 girls and 3 boys on the swings. There are 15 girls and
   13 boys playing soccer. How many more girls than boys are there?

   b) In pairs, explain your answers to part a). Do you agree with each
   other? Discuss why or why not.
**Answer:** a) there are 3 more girls than boys, b) sample explanations:

- I used red cubes for the girls and blue cubes for the boys. I used 4 red cubes and 3 blue cubes for the people on the swings. I used 15 red cubes and 13 blue cubes for the people playing soccer. Then I matched red cubes with blue cubes and there were 3 more red cubes, so there are 3 more girls than boys.
- There are $4 + 15 = 19$ girls and $3 + 13 = 16$ boys, so there are $19 - 16 = 3$ more girls than boys.
- There is 1 extra girl on the swings and 2 extra girls playing soccer, so there are $1 + 2 = 3$ extra girls altogether.

**NOTE:** In part b), encourage partners to ask questions to understand and challenge each other’s thinking (MP3)—see p. A-43 for sample sentence and question stems.
Goals

Students will count money (nickels and pennies) and represent amounts up to 30 cents.

Students will add and subtract amounts of money and learn to keep a running total.

PRIOR KNOWLEDGE REQUIRED

- Can add
- Can identify coins
- Knows the value of coins
- Can write number sentences

MATERIALS

- play money or coins from BLM Coins to Cut Out (p. L-113), 15 pennies, 10 nickels, 10 dimes, and several quarters for each student
- dice, one per student
- BLM Money Memory (p. L-114)
- BLM Food Store (pp. L-115–116)

Review counting pennies. Review with students what a penny looks like and how much it is worth. Tell students that adding money is easy when you have only pennies because each penny is worth 1 cent. Demonstrate counting out a pile of pennies: 1 cent, 2 cents, 3 cents, and so on.

Draw simple coins. Draw on the board:

1¢

SAY: This picture stands for a penny because it shows the value of the coin. Draw another circle on the board. ASK: What is a nickel worth? (5 cents) Write “5¢” in the circle. Repeat for a dime and a quarter.

Adding coin values. Tell students that you can add the values of coins to find out how much a collection of coins is worth altogether. Draw two nickels (a circle with 5¢, as above) and ask students to write an addition for the value of the coins. (5 + 5) ASK: What is the total value of the coins? (10 cents)

Exercises: Write an addition sentence for the value of the coins.

a) 5¢ + 10¢
b) 10¢ + 5¢
c) 1¢ + 10¢
d) 10¢ + 25¢

Answers: a) 5 + 10 = 15¢, b) 10 + 5 = 15¢, c) 1 + 10 = 11¢, d) 10 + 25 = 35¢
Comparing nickels and pennies. Draw five pennies on one side of the board and one nickel on the other side. Point to the pennies and SAY: This is Josh’s money. ASK: How much money does Josh have? SAY: Let’s count together. Pointing at one penny at a time, SAY: 1 cent, 2 cents, 3 cents, 4 cents, 5 cents. Point to the nickel and SAY: This is Samantha’s money. ASK: How much money does Samantha have? (5 cents) Who has more money, Josh or Samantha? (the same) Draw five more pennies to Josh’s side and another nickel to Samantha’s side. ASK: What is worth more, 10 pennies or 2 nickels? (they are worth the same)

Adding nickels. SAY: A nickel is worth 5 cents, so to find the value of some nickels you have to be able to add lots of 5s. Write on the board:

\[ 5 + 5 = 10 \]
\[ 5 + 5 + 5 = \]

ASK: How can you use the first addition to find the answer to the second? (the first two fives make 10, and 10 plus 5 is 15) Show students how they can keep track of an addition that has more than two addends by keeping track of adding underneath the addition, and adding after every addition. Write on the board:

\[ 5 + 5 + 5 + 5 + 5 = 15 \]
Ask volunteers to help you keep track of adding for the following additions:

\[ 5 + 5 + 5 + 5 = \]
\[ 5 + 5 + 5 + 5 + 5 + 5 = \]

The final picture should look like this:

\[ 5 + 5 + 5 + 5 = 20 \]
\[ 5 + 5 + 5 + 5 + 5 = 25 \]

Leave these additions on the board, and draw:

\[ 5\text{¢} \quad 5\text{¢} \quad 5\text{¢} \quad 5\text{¢} \quad 5\text{¢} \]

SAY: I want to write an addition sentence for the value of the nickels. How many times should I add five? (5 times because there are 5 nickels) Write “\(5 + 5 + 5 + 5 + 5\)” under the nickels and ASK: What is the total for this addition? Have students refer to the additions you wrote earlier to find the answer. (25) Write “= 25” to complete the addition sentence.

Exercises: Write an addition sentence. Add the money.

a) \[ 5\text{¢} \quad 5\text{¢} \quad 5\text{¢} \]
b) \[ 5\text{¢} \quad 5\text{¢} \quad 5\text{¢} \quad 5\text{¢} \]
Answers: a) \(5 + 5 + 5 = 15\)¢, b) \(5 + 5 + 5 + 5 = 20\)¢

NOTE: If students struggle with adding 5s, have them keep track of adding under the addition as shown above. If students can keep track of adding mentally, they do not need to write it down.

Write on the board:

\[
\begin{array}{c|c}
5 & 1 \text{ nickel} \\
5 + 5 & 2 \text{ nickels} \\
5 + 5 + 5 & 3 \text{ nickels} \\
5 + 5 + 5 + 5 & 4 \text{ nickels} \\
5 + 5 + 5 + 5 + 5 & 5 \text{ nickels}
\end{array}
\]

Tell students that if they learn to say the sequence of numbers 5, 10, 15, 20, 25, they can add sets of 5s very quickly. Using this strategy, they can find the value of sets of nickels quickly. Have students practice saying the numbers in the sequence and then display or draw sets of nickels on the board and have the class say the sequence as you point to the nickels. Write addition sentences involving two or more 5s and ask students to say the running total out loud as you point to each 5. (For example, in the addition \(5 + 5 + 5\), the students say “5” when you point to the first five, “10” when you point to the second five, and “15” when you point to the third five.)

Assign the exercise above again, but this time, erase all of the prior work from the board so that students have to find the additions themselves.

ACTIVITY 1

Adding nickels. Give each student a die and six nickels. Students roll the die, lay out as many nickels as the die shows, and add the money. Then they fill in the blanks in the sentence ___ nickels is ___ ¢. Repeat the activity several times.

Then have students put 10¢ to the side of their desks. They then roll the die, add as many nickels as the die shows, and add the money to their original 10¢. Repeat with 15¢, 20¢, and 25¢.

Trading pennies for nickels. Draw eight pennies on the board and ask students to say how much money that is. (8 cents) Invite a volunteer to trade five pennies for a nickel. ASK: Do we still have 8 cents? (yes) Verify by counting on from 5. Repeat with 7 cents (one nickel) and 12 cents (two nickels).

Counting pennies by 5s. Draw on the board:

![Diagram of pennies]

1¢ 1¢ 1¢ 1¢

1¢ 1¢ 1¢ 1¢
Draw 10 pennies scattered next to the picture. ASK: Which group of pennies will be easier to count, the pennies in the five-frames or the other pennies? (the pennies in the frames is easier to count because you can add by 5s) Invite several volunteers to check by counting both groups.

ASK: How could you arrange play money to make it easier to count? (put coins in rows or stacks of five) Demonstrate stacking pennies by 5s. Have students show various amounts of play money by stacking, such as 10¢, 20¢, 15¢, or 25¢.

Draw 18 pennies scattered on the board. SAY: I want to count the pennies quickly. I know that adding 5s is quicker than counting by 1s, so I’ll group the pennies by 5s. Draw circles around groups of five pennies, and add the 5s: 5 cents, 10 cents, 15 cents. Explain that there are not five more pennies, so we can’t make another group of five. ASK: How can we count from here? (count by 1s) Draw more groups of pennies in numbers that are not multiples of five for students to count.

**Adding nickels and pennies.** Write on the board:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>1¢</th>
<th>1¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>b)</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>c)</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Show students how they can add by keeping a running total under the first question, as shown below:

| 5 | 10 | 15 | 16 | 17 | 18 |

Have them copy the other three questions in their notebooks and add by keeping a running total. (b) 5, 10, 11, 12; c) 5, 10, 15, 16; Bonus: 5, 10, 15, 20, 21, 22)

**Exercises:** Add the 5s then the 1s.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>1¢</th>
<th>1¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>5¢</td>
<td>5¢</td>
<td>5¢</td>
<td>1¢</td>
</tr>
<tr>
<td>b)</td>
<td>5¢</td>
<td>5¢</td>
<td>5¢</td>
<td>1¢</td>
</tr>
</tbody>
</table>

**Answers:** a) 5, 10, 15, 16, 17; b) 5, 10, 15, 20, 21, 22, 23

**ACTIVITIES 2–3**

2. **Picking Pairs and Memory.** (see unit introduction) Cut out cards from BLM Money Memory. Have students play Memory by matching equivalent amounts of money.
3. Have students create a picture using play pennies and nickels (see example below). When they are finished, ASK: How much money is in your picture? (for example, 24¢)

Making money amounts with nickels and pennies. Draw a picture of an item (for example, a ball) with a price tag of 9¢. ASK: How could you make 9 cents to pay for this item? If nobody suggests using a nickel, ask students how many pennies you have to add to a nickel to get 9 cents. Repeat with other items and prices, up to 20¢. Students should lay out on their desks the necessary amount of money with play coins for each item. Encourage multiple solutions (e.g., 3 nickels and 2 pennies or 2 nickels and 7 pennies for 17¢).

Reordering coins does not change the total value. Draw one nickel and three pennies in a random arrangement on the board. ASK: How much money is this? (8 cents) How do you know? Write an addition sentence to show the total amount of money. (1¢ + 5¢ + 1¢ + 1¢ = 8¢) Show other amounts and have volunteers write the corresponding addition sentences, such as one nickel and two pennies, four pennies, and one nickel and one penny.

Ask students if they will get the same answer by counting the nickel first. Arrange the coins so the nickel is first, followed by the pennies. Write “5 + 1 + 1 + 1” under the coins. Rearrange the coins so the nickel is last and have a volunteer write the corresponding addition sentence underneath. (1 + 1 + 1 + 5) ASK: Does rearranging the coins change the total? (no) Write on the board:

\[ 5 + 1 + 1 + 1 = 1 + 1 + 1 + 5 \]

Remind students that “=” means “is the same number as.” ASK: Is this true? Does adding 5 + 1 + 1 + 1 give the same number as adding 1 + 1 + 1 + 5? (yes)

Adding the 5 first is more convenient. ASK: Did you find it easier to count the 5 first and count on by 1s or is it just as easy to count in any order? PROMPT: Demonstrate adding 1 + 1 + 1 + 5 in that order (1, 2, 3, 8) and then by counting the 5 first (5, 6, 7, 8). ASK: Did anyone find one way easier than the other? Was it easier to add 5 after you counted the 3 ones (3 + 5 = 8) or was it easier to count on from 5? (count on from 5) Which did you learn first: saying the numbers in order starting at 5 or adding 5 to a number? (saying the numbers in order starting at 5)

Draw three nickels and two pennies on the board. Add the money first in random order. For example, write 1 + 5 + 1 + 5 + 5 on the board and...
write the running total (1, 6, 7, 12, 17) below the addends. Then rewrite
the addition with the nickels first (5 + 5 + 5 + 1 + 1) and write the running
total (5, 10, 15, 16, 17) below the addends. Discuss which way of adding
is easier and why. Emphasize that adding the bigger number first is easier.
Have students practice counting various piles of coins.

**How much more money?** Draw on the board:

![Money diagram]

Ask students to count how much money is in each group. (8 cents, 4 cents)
Write the answers under the circles. ASK: Which group has more money?
(one with the nickel) How much more? (4 cents)

SAY: I have three pennies and Jasmine has five pennies. ASK: Who has more
money? (Jasmine) How much more? (2 cents) What number sentence do
you use to find out how many more pennies Jasmine has? (5 – 3 = 2) Have
students write subtraction sentences showing how much more money is
in one group than in another. Repeat with how much less money is in one
group than in the other.

Ask students to write an addition sentence to show the value of the money
in the exercises below. Then have students add the amount of money and
compare the value of the coins to the value of the item.

**Exercises:** How much money does the person have? Is it enough?

a) Pam wants to buy a stamp for 22 cents. She has 4 nickels
and 3 pennies.

**Bonus:** Jim wants to buy a sticker for 41 cents. He has a quarter, a dime,
and 3 pennies.

**Answers**

a) 5 + 5 + 5 + 1 + 1 + 1 = 23¢; yes, she has enough money

Bonus: 25 + 10 + 1 + 1 + 1 = 38¢; no, he does not have enough money

**ACTIVITIES 4–5**

4. Give each pair of students a set of cards from **BLM Money
Memory**. Each pair writes the numbers from 0 to 5 in order on a
separate sheet of paper. Players pull a card simultaneously from
the deck and turn them over. Players take turns writing subtraction
sentences to find out how much more money is on one card than
on the other, and cross out the result in their list. If there are no
more cards left in the pile, collect all the cards, shuffle them, and
start again. The goal is to cross out all the numbers.
5. Give each pair of students **BLM Food Store**, 10 nickels, and 15 pennies. Students cut out the items and the receipts and take turns being the cashier and the customer. Each customer has 10 nickels and should buy as many items as they can for 50¢. The cashier has 15 pennies to give change and writes out the receipts for the customer. Emphasize to students that the pictures are toy food, and not real items.

*Variation:* Students attempt to buy a balanced meal (one item from each food group).

**Extensions**

1. **Add.**
   
   a) $10 + 10 + 5$
   
   b) $10 + 5 + 5$
   
   c) $10 + 5 + 1$
   
   d) $10 + 5 + 5 + 1$

   **Bonus:** $10 + 10 + 5 + 1 + 1 + 1$

   **Answers:** a) 25, b) 20, c) 16, d) 21, Bonus: 28

2. Write 2 ways to make 15 cents with no pennies.

   **Answers:** one dime and one nickel, three nickels
Goals

Students will practice the various strategies for solving word problems and for writing and solving number sentences that they learned in this unit.

PRIOR KNOWLEDGE REQUIRED

Can add and subtract
Can write a number sentence for addition and subtraction problems

MATERIALS

BLM Fake Money Game (p. L-117)
tokens
dice
play coins or coins from BLM Coins to Cut Out (p. L-113)

NOTE: The questions on AP Book 1.2 pp. 144–145 are intended as a review of all the material learned in this unit. If students struggle with any of the questions, review the material from the relevant lesson.

ACTIVITY

Fake Money Game. Give each student BLM Fake Money Game, tokens, a die, and any 20 play coins or coins from BLM Coins to Cut Out. Students can play individually or co-operatively in pairs. Each cell on the game board has a picture of either a real coin or a fake coin. The goal is to fill the board with real coins.

To start, players place their token on any real coin and put all the play money in the center of the game board. Players take turns rolling a die and moving, according to the number rolled, around the board in any direction. Two players cannot be in the same cell at the same time, so if the number rolled takes a player to a cell that is already occupied, the player must go in the other direction. When a player’s token lands on a fake coin, the player puts a real coin of their choice from the center of the board in the cell. When all the fake coins are covered with real coins, the game is over.

Variation 1: Give each student 25 quarters, 10 dimes, 5 nickels, and 10 pennies. When players put real money in a cell with fake money, they must place the same amount of money as shown. For example, if a cell shows 30¢, players must place 30¢ there.

STANDARDS

1.OA.A.1, 1.OA.A.2, 1.OA.B.4, 1.OA.D.8

VOCABULARY

cent
coin
dime
money
nickel
penny
quarter
Variation 2: Each person or pair will need an additional token of a different color. Players are police officers chasing the “money faker” (maker of fake money) represented by the token of the third color. To start, the players position themselves on cells with real pennies, and the money faker is placed on the fake $1 coin at the top of the board. In addition to the regular rules of the game, after Player 1 makes a move, Player 2 moves the money faker one cell clockwise (using the arrow as a guide). The object of the game is to replace the fake money with real money and to catch the money faker. If a player’s token and the money faker happen to be on the same fake coin, the faker is caught and the faker token is “jailed” (removed). If the player and faker both land on a real coin, the faker cannot be caught.

Extensions

1. Write as many addition sentences as you can with 8 as the total.
   Example: $5 + 3 = 8$

2. True or false?
   a) $4 + 2 + 3 = 10$
   b) $10 + 6 + 2 = 18$
   c) $9 + 9 + 1 = 19$
   d) $5 + 5 + 5 + 1 = 16$

   Answers: a) false, b) true, c) true, d) true

3. Alice has 5 books. She buys 3 more. She gives 2 books to a friend. How many books does she have now?
   Answer: $5 + 3 - 2 = 6$

4. Draw a teddy bear (or other toy) on the board. Under the picture, write on the board:
   Store A: 9 dollars
   Store B: 10 dollars
   Store C: 8 dollars
   Store D: 13 dollars

   Tell students that these are the prices that four different stores charge for a teddy bear. Ask students to write a subtraction sentence to show how much money they would save if they buy the bear at Store A rather than Store B. Repeat with different pairs of stores. Draw a new item on the board and repeat the exercise with different prices in whole dollars.

5. Write and solve a related addition.
   a) $25 - \_\_ = 23$
   b) $37 - \_\_ = 34$
   c) $49 - \_\_ = 44$

   Sample answers: a) $23 + \_\_ = 25$, so $\_\_ = 2$;
   b) $34 + \_\_ = 37$, so $\_\_ = 3$; c) $44 + \_\_ = 49$, so $\_\_ = 5$
6. Answer all the questions. Look for something that is the same in all the questions.
   
a) Micky has 5 toy trucks. She has 1 more toy car than toy trucks. She has 1 more toy car than toy vans. How many toy vans does she have?

b) Micky has 5 toy trucks. She has 2 more toy cars than toy trucks. She has 2 more toy cars than toy vans. How many toy vans does she have?

c) Micky has 5 toy trucks. She has 3 more toy cars than toy trucks. She has 3 more toy cars than toy vans. How many toy vans does she have?

   **Answers:** a) 5, b) 5, c) 5

7. a) In pairs, discuss what is the same in all the questions from Extension 6.

b) In pairs, solve the following problem:
   
   Micky has 48 toy trucks. She has 57 more toy cars than trucks. She has 57 more toy cars than toy vans. How many toy vans does she have?

   **Answers:** a) the answer is always 5, because the number of trucks and the number of vans are the same—they are both the same amount less than the number of cars; b) 48
<table>
<thead>
<tr>
<th>Memory Cards (I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 + 4 = 7</td>
</tr>
<tr>
<td>1 + 3 = 4</td>
</tr>
<tr>
<td>6 + 2 = 8</td>
</tr>
<tr>
<td>2 + 2 = 4</td>
</tr>
<tr>
<td>3 + 5 = 8</td>
</tr>
<tr>
<td>5 + 2 = 7</td>
</tr>
<tr>
<td>11 + 4 = 15</td>
</tr>
<tr>
<td>6 + 3 = 9</td>
</tr>
<tr>
<td>7 + 5 = 12</td>
</tr>
<tr>
<td>4 + 8 = 12</td>
</tr>
</tbody>
</table>
# Memory Cards (2)

<table>
<thead>
<tr>
<th>4 more than 3 is 7.</th>
<th>3 more than 1 is 4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 more than 6 is 8.</td>
<td>2 more than 2 is 4.</td>
</tr>
<tr>
<td>5 more than 3 is 8.</td>
<td>2 more than 5 is 7.</td>
</tr>
<tr>
<td>4 more than 11 is 15.</td>
<td>3 more than 6 is 9.</td>
</tr>
<tr>
<td>5 more than 7 is 12.</td>
<td>8 more than 4 is 12.</td>
</tr>
</tbody>
</table>
# Memory Cards (3)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7 is 4 more than 3.</td>
<td>4 is 3 more than 1.</td>
</tr>
<tr>
<td>8 is 2 more than 6.</td>
<td>4 is 2 more than 2.</td>
</tr>
<tr>
<td>8 is 5 more than 3.</td>
<td>7 is 2 more than 5.</td>
</tr>
<tr>
<td>15 is 4 more than 11.</td>
<td>9 is 3 more than 6.</td>
</tr>
<tr>
<td>12 is 5 more than 7.</td>
<td>12 is 8 more than 4.</td>
</tr>
</tbody>
</table>
Memory Cards (4)
## Memory Cards (5)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$7 - 3 = 4$</td>
<td>$4 - 1 = 3$</td>
</tr>
<tr>
<td>$8 - 6 = 2$</td>
<td>$4 - 2 = 2$</td>
</tr>
<tr>
<td>$8 - 3 = 5$</td>
<td>$7 - 5 = 2$</td>
</tr>
<tr>
<td>$15 - 11 = 4$</td>
<td>$9 - 6 = 3$</td>
</tr>
<tr>
<td>$12 - 7 = 5$</td>
<td>$12 - 4 = 8$</td>
</tr>
</tbody>
</table>
Writing Word Problems (I)

new  shaded  empty  tall
full  short  used  unshaded

New shaded empty tall

Full short used unshaded

Writing Word Problems (I)
Writing Word Problems (2)

☐ Write the numbers and the words.

1. There are _____ _______________ trees.
   There are _____ _______________ trees.
   How many trees in total? _____

2. There are _____ _______________ pencils.
   There are _____ _______________ pencils.
   How many pencils in total? _____

3. There are _____ _______________ circles.
   There are _____ _______________ circles.
   How many circles in total? _____

4. There are _____ _______________ bowls.
   There are _____ _______________ bowls.
   How many bowls in total? _____
Apple Trees

1.

2.

3.

4.
Large Bond Picture
Large Part-Total Picture
Part-Total Picture Templates
More Than with Pictures
## How Many More (I)

<table>
<thead>
<tr>
<th>Sara has 11 stickers.</th>
<th>Tom has 2 stickers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sara has 13 stickers.</td>
<td>Tom has 4 stickers.</td>
</tr>
<tr>
<td>Sara has 12 stickers.</td>
<td>Tom has 6 stickers.</td>
</tr>
<tr>
<td>Sara has 9 stickers.</td>
<td>Tom has 5 stickers.</td>
</tr>
<tr>
<td>Sara has 8 stickers.</td>
<td>Tom has 1 sticker.</td>
</tr>
<tr>
<td>Sara has 7 stickers.</td>
<td>Tom has 2 stickers.</td>
</tr>
<tr>
<td>Sara has 13 stickers.</td>
<td>Tom has 4 stickers.</td>
</tr>
<tr>
<td>Sara has 9 stickers.</td>
<td>Tom has 6 stickers.</td>
</tr>
<tr>
<td>Sara has 10 stickers.</td>
<td>Tom has 3 stickers.</td>
</tr>
<tr>
<td>Sara has 10 stickers.</td>
<td>Tom has 2 stickers.</td>
</tr>
<tr>
<td>Sara has 11 stickers.</td>
<td>Tom has 2 stickers.</td>
</tr>
<tr>
<td>Sara has 13 stickers.</td>
<td>Tom has 4 stickers.</td>
</tr>
<tr>
<td>Sara has 12 stickers.</td>
<td>Tom has 6 stickers.</td>
</tr>
</tbody>
</table>
How Many More (2)

How many more stickers does Sara have?

____ - _____ = _____

How many more stickers does Sara have?

____ - _____ = _____

How many more stickers does Sara have?

____ - _____ = _____
Coins to Cut Out
Money Memory

[Diagram of different amounts of coins]
Food Store (I)

14¢  PASTA
9¢  Carrots
11¢  Celery
12¢  Bread
15¢  Eggs
10¢  Milk
12¢  Fish
13¢  Cheese
## Food Store (2)

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Paid</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Paid</th>
<th>Change</th>
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<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Paid</th>
<th>Change</th>
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</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Paid</th>
<th>Change</th>
</tr>
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<tbody>
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<td></td>
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</tr>
</tbody>
</table>
Fake Money Game
This Unit in Context

In this unit, students will be introduced to telling time, learning to tell time to the hour and half hour (1.MD.B.3). Students will learn how the counting sequence for time has a cyclical nature as they start over at 1 after arriving at 12. 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 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. Students will learn different representations for how we read time: using analog clocks, digital clocks, and words like “o’clock” and “half past” (1.MD.B.3).

In subsequent grades, students continue their work telling and writing time from analog and digital clocks, to the nearest five minutes in Grade 2 (2.MD.C.7) and to the nearest minute in Grade 3 (3.MD.A.1). Furthermore, in Grade 2, students will begin to 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). Then, in Grade 3, students will begin to measure how long an event takes by subtracting the time the event begins from the time the event ends. It is at this stage where many similarities between time and other measurement attributes become apparent.

As suggested by the Common Core progressions documents (although not required by the Common Core State Standards), this unit exposes students to direct comparisons involving areas (Lesson MD1-17) and both direct and indirect comparisons involving capacities (Lesson MD1-18), preparing them for later standards. By seeing the same direct comparison approach for different types of measurements, students will deepen their understanding of the connections between the different measurements concepts (length, area, and capacity) done in this grade. This increases their flexible understanding of the concepts. Furthermore, being exposed to basic area concepts now will make their work in 1.2 Unit 5 easier when they partition rectangles and areas into equal parts (1.G.A.3).

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.

**MP2:** In MD1-14 Activity 1, students reason abstractly and quantitatively when they record their activities when the hour hand is pointing at various numbers and then use this to get a sense of abstract times.

**MP4:** In MD1-18 Extension 4, students model a real-world problem mathematically when they show two different ways that 15 people can sit on
a bus given that the bus has 10 rows of seats, 3 people can sit in each row, and no one wants to sit alone.

MP.5: In MD1-13 Extension 3, students use tools strategically when they determine how many marbles one person has to give to another person in order to each have the same number. For example, students might choose to use two piles of tens and ones blocks to represent each person’s marbles.
Unit 4 Measurement and Data: Telling and Writing Time

Introduction

In this unit, students will learn to tell time to the hour and half hour using analog and digital clocks. They also learn to read digital times and to draw times on analog clocks.

In Lessons MD1-15 and MD1-16, students will have the opportunity to solve simple word problems about elapsed time. This topic is not specified in the Common Core State Standards for Grade 1 and you will find content related to it almost exclusively in extensions.

In addition, we have provided two introductory lessons—one on area and one on capacity. Neither of these topics is mentioned in the Common Core State Standards, but the K–5 Progressions recommend that students be introduced to these topics informally in Grade 1. The lesson on area is useful preparation for the lessons on fractions in the next unit. (Students will be formally introduced to the measurement of area and capacity in Grade 3.)

Materials. Three different types of analog clocks are used in the unit:

• An analog clock that shows the current time and that students can consult as needed throughout the day. You likely have such a clock hanging on the wall in your classroom already. We sometimes refer to it as the classroom clock.
• At least one smaller, portable analog clock on which to show different times and to change the time. A toy clock can be used in most cases, but a real clock is preferable (and required in Lesson MD1-16).
• Paper clock faces with moveable hands that students can use throughout the unit. Students have the opportunity to make such clock faces in Lesson MD1-13. You could make a similar clock face yourself for demonstration purposes; it can be used in place of a toy analog clock.

Recurring games. Variations on Picking Pairs and Memory are used several times in this unit. See p. B-3 for a full description of the games. For both games, use pairs of cards from BLM Time Cards (pp. M-34–37). The deck that students use depends on the lesson. You can cut the cards out ahead of time and laminate them.
Goals
Students will become familiar with the details on a clock face.

PRIOR KNOWLEDGE REQUIRED
Can use number lines

MATERIALS
analog clock with three hands (hour, minute, second)
masking tape, string, or a Hula-hoop
cards numbered 1 to 12
BLM Make Your Own Clock (p. M-30)
paper plates
scissors
glue
pencils
paper fasteners
BLM Clocks (p. M-31, optional)

NOTE: Students will need to copy the hands on the classroom clock at different times throughout the day.

Compare clocks to number lines. Show students an analog clock and SAY: This is a clock. Indicate the front of the clock and SAY: This is called the clock face. Point out how the clock face has numbers all around, beginning with 1 and ending with 12. Draw on the board:

<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>

Discuss how the clock is like a number line that goes in a circle. Ask students what comes before, after, and between various numbers from 1 to 12, first on the number line and then on the clock. (Example: What comes before 3 on the number line? On the clock?) Finish with the number 12. SAY: The next number on a clock is 1, and the next number on a number line is 13. ASK: What comes before 1 on the number line? (0) What comes before 1 on the clock? (12) Emphasize that clocks are like number lines, except the clock only goes from 1 to 12 and then starts over again at 1.

Putting the numbers on a clock face. Tell students to look closely at a clock face and to try to remember where all the numbers go. ASK: Which number is at the top? (12) Tell students to think about the numbers at the bottom and the sides. (6, 3, 9) Gather the class around a large “clock” on the floor: a circle (made from masking tape, string, or a Hula-hoop) with cards numbered 1 to 12 placed face down in the correct positions. Tell students where the top of your clock is. Make sure students have their
backs to the actual classroom clock or hide it if possible. Have volunteers turn over cards of their choice after predicting the number.

ASK: Which numbers were easier to remember? (most students will likely say 12 and 6, some will say 3 and 9) Why do you think they were easier to remember? Explain that the numbers at the top, bottom, left, and right are usually the easiest to remember. Take away all the cards. ASK: Where does the 12 go? Have a volunteer place it in the correct position. 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 numbers come before and after the 3? (2 and 4) Have volunteers place those numbers, and repeat for 6 and 9. End with 12. Emphasize that the clock face shows only numbers 1 to 12.

SAY: We said that 2 comes right before 3 and that 1 comes after 12. That means the 1 comes right before 2. Does 1 come right before 2 on a number line? (yes) Repeat with more numbers on the clock. Explain that when students can solve the same problem in two different ways and get the same answer, then they must have done the problem correctly. SAY: If we know that 5 comes right before 6 and right after 4, and both pieces of information make the number go in the same place, the answer must be correct.

**Exercise:** Write the missing numbers on the clock face.

![Clock face diagram]

**Answers:** 2, 3, 4, 8, 9

**Discuss differences between hands on a clock.** Draw students' attention to the hands on a clock. SAY: These are called *hands*. Brainstorm how the hands are different, and record students' answers. Depending on the clock you have, answers might include:

- Two are thicker, one is thinner.
- The thin one is moving (reflect this back as: only the thin hand looks like it's moving).
- They are different lengths (or one of the thick hands is longer than the other)
- Two are black and the other one (or the faster one) is red.

**All the hands are moving.** Explain that all the hands on a clock move, but two of them move so slowly that they don't look like they're moving. Compare this to the position of the Sun. You do not see the Sun moving, but the position of the Sun is different when you go to school and when you return home.
ACTIVITIES 1–2

1. **Make a clock face.** Give each student a copy of BLM Make Your Own Clock, a paper plate, scissors, glue, a pencil, and a paper fastener. Students glue the clock template onto their paper plate. They make a hole (with the pencil) in the center of the paper plate and make holes in the hands as well. Students write the numbers in the correct positions on the clock and attach the hands to the plate with the paper fastener. Students should save their clocks to use in the next three lessons.

   **NOTE:** Suggest that students poke the holes in the hands before cutting them out, so if they make a hole a little too big, they can cut the hand a little wider to maintain the hole in the hand.

2. Pause throughout the day to have students look at the short and long hands on the classroom clock. Ask students to move the hands on their own clocks into the same position as the hands on the real clock. (If you prefer, students could draw the hands on the blank clock faces on BLM Clocks.)

**Extensions**

1. Ask students to draw a clock face on a blank sheet of paper. Students will now have to draw the circle too, something they didn’t have to do during the lesson.

2. Have students watch the fast hand (the second hand) go around a full circle. ASK: What happens to the long (minute) hand? (it moves ahead one tick mark)

3. Lynn has 28 marbles. Greg has 22 marbles. How many marbles should Lynn give to Greg so that they have the same number of marbles? Use any tool you think will help. Explain what each step means in the story.

   **Sample solution:** I used tens and ones blocks, 2 tens and 8 ones for Lynn’s marbles on one side of the desk and 2 tens and 2 ones for Greg’s marbles on the other side of the desk. I moved ones blocks from Lynn’s side to Greg’s side until they both had the same number of marbles (25), but I kept the ones that were moved separate. I counted 3 ones blocks that I moved. So Lynn needs to give Greg 3 marbles.

4. Ivan, Karen, and Carl each solve the problem shown below:

   **There are 8 balloons. There are 3 fewer stickers than balloons. How many stickers are there?**

   Ivan says: $8 + 3 = 11$, so there are 11 stickers. Karen says: $8 - 3 = 5$, so there are 5 stickers. Carl says: $8 - 3 = 6$, so there are 6 stickers.

   Who do you agree with? What mistakes did the other people make?
**Answer:** I agree with Karen. You need to subtract because fewer means less than, so the number of stickers should be less than the number of balloons, and $8 - 3$ is 5, not 6. Ivan thought that fewer meant more, and Carl might have started counting back from 8 instead of from 7.
Goals

Students will become familiar with the movement of the hour hand.

PRIOR KNOWLEDGE REQUIRED

Familiar with the numbers on a clock
Knows that clocks have a longer hand and a shorter hand
Knows that one hand on a clock moves faster than the other hand

MATERIALS

analog clock with two hands
BLM Hour Hand (p. M-32)
pencil or ruler
BLM What Are You Doing? (p. M-33)
clocks made in Activity 1 of Lesson MD1-13

The hour hand is shorter. Set an analog clock so the shorter hand is pointing at the 9 and the longer hand is pointing at the 12. ASK: Where is the shorter hand pointing, at the 9 or the 12? (at the 9) Tell students that the short hand is called the hour hand. Show various times on your clock and ask students to identify the hour hand. Point to one of the hands and ASK: Is this the hour hand? Students can signal their answer with thumbs up for yes and thumbs down for no.

Exercises: Complete BLM Hour Hand.

Answers: 1. hand pointing at 6, 2. hand pointing between 3 and 4, 3. hand pointing between 8 and 9, 4. hand pointing at 11

When the hour hand is pointing directly at a number. Draw or show a clock with the hour hand pointing at the 2 and the minute hand pointing at the 12. SAY: The hour hand is pointing at the 2. (Place a pencil or ruler along the hand so students can see this clearly.) Repeat with other examples in which the hour hand is pointing directly at a number and the minute hand is pointing at the 12. For each example, ask the class where the hour hand is pointing. Have volunteers check the answer by extending the hand with a pencil or ruler.

Exercises: What number is the hour hand pointing at?

a) at the ___  b) at the ___  c) at the ___
**Answers:** a) 5, b) 10, c) 1

**Introduce hours.** Tell students that it always takes the same amount of time for the hour hand to move from one number to the next. SAY: The amount of time it takes the hour hand to move from one number on the clock to the next number is called an *hour*. That’s why this hand is called the hour hand—because it moves from one number to the next in one hour. Give students examples of things that take about an hour, such as the time scheduled for lunch at school, a lesson or class outside school (e.g., karate, piano), the time it takes to watch a TV show. If you have any lessons, assemblies, or activity periods that are close to an hour long, you can use one of them as a benchmark (e.g., gym, music, art). You could also use two consecutive half-hour time periods as the benchmark for one hour.

**ACTIVITY 1**

**What are students doing when the hour hand points at ___?** Stop and look at the classroom clock when the hour hand points directly at different numbers throughout the morning (9, 10, 11, and/or 12). **ASK:** What are you doing? Students can record the position of the hour hand and their activities on [BLM What Are You Doing?] or in their notebooks. You could expand the time period from the morning to the whole day. If you will not be with students throughout the day, you can fill in key times as a class. Highlights may include: time to wake up for school, time school starts, lunch time, end of school, and bed time. Make all times approximate. Advance the hands on an analog clock as you discuss each activity.

**An hour later.** Arrange the hands of an analog clock so the hour hand is pointing at the 2. Remind students that in the course of one hour the hour hand moves ahead one number. **ASK:** What number will the hour hand be pointing to an hour from now? (at the 3) Repeat with different examples, such as pointing at the 8 and 6.

Students can signal their answers to the following exercises by moving the hands on the clocks they made in Activity 1 of Lesson MD1-13 and holding up the clocks.

**Exercises:** What number will the hour hand point to one hour later?

a) The hour hand is pointing at the 3.

b) The hour hand is pointing at the 9.

c) The hour hand is pointing at the 7.

**Bonus:** The hour hand is pointing at the 12.

**Answers:** a) 4, b) 10, c) 8, Bonus: 1

**An hour earlier.** Arrange the hands of an analog clock so the hour hand is pointing at the 7. **ASK:** What number was the hour hand pointing to one hour before? (at the 6) Repeat with different examples, such as pointing at the 4 and 2.
Exercises: What number was the hour hand pointing at 1 hour before?

a) The hour hand is pointing at the 5.

b) The hour hand is pointing at the 9.

c) The hour hand is pointing at the 10.

Bonus: The hour hand is pointing at the 1.

Answers: a) 4, b) 8, c) 9, Bonus: 12

When the hour hand is pointing between two numbers. Show students 2 o’clock on an analog clock. ASK: What number is the hour hand pointing at? (2) SAY: The hour hand doesn’t always point exactly at a number, sometimes it is between two numbers. Adjust the clock to read 2:30. ASK: Which numbers is the hour hand between? (2 and 3) As before, use a pencil or ruler to extend the hour hand to show more clearly that it falls between 2 and 3. Do a few more examples, such as 4:30, 11:30, and 7:30. Choose some times that are close to but not exactly half past an hour (e.g., 5:35) so that the hour hand is still distinctly between two numbers. (Be careful with the two-digit numbers, 10, 11 and 12; the position of the hands between those numbers can be hard to discern clearly.)

Exercises: Where is the hour hand pointing?

a) between ___ and ___ 

b) between ___ and ___ 

c) between ___ and ___ 

d) between ___ and ___ 

e) between ___ and ___ 

Answers: a) 10 and 11, b) 12 and 1, c) 6 and 7, d) 4 and 5, e) 7, f) 11
**ACTIVITY 2**

**What are students doing when the hour hand is between two numbers?** When the hour hand is halfway between the 1 and the 2, ASK: Where is the hour hand pointing now? PROMPTS: The hour hand is the short hand. Is it pointing straight at the 1? (no) At the 2? (no) Between the 1 and the 2? (yes) Explain that the hour hand is pointing halfway (right in the middle) between 1 and 2. Repeat with the hour hand halfway between 2 and 3, and finally with it pointing right at the 3. As in Activity 1, students can record the position of the hour hand and their activities on BLM What Are You Doing? or in their notebooks.

**Extensions**

1. Draw a clock face on the board and have a student show you where the hour hand is pointing when school starts. Have another volunteer show where the hour hand is pointing when school finishes. Demonstrate how students can count the number of hours that school lasts each day by counting the number of five-minute skips the hour hand makes, as shown in the margin.

   Repeat the exercise with different start and end positions for the hour hand, such as the length of time until recess or lunch.

   (MP1, MP4)

2. There is a pepperoni pizza and a cheese pizza. Both pizzas have 8 slices. People eat 5 slices of the pepperoni pizza and 6 slices of the cheese pizza. How many slices of pizza are left altogether? Explain.

   **Answer:** 5, sample explanation: I used cubes for the slices:

   **Pepperoni:**
   ![Pepperoni slices](image)

   **Cheese:**
   ![Cheese slices](image)

   I took away 5 of the cubes from the pepperoni pizza and 6 from the cheese pizza. There are 5 cubes left. So there are 5 slices of pizza left altogether.

   Whole-class follow-up: Discuss what made this problem hard. (there was a lot to keep track of) Allow different volunteers to share how they modeled the problem. Some students may have drawn a picture instead of using cubes, others may have added 8 + 8 = 16 to find the number of pieces altogether, and then subtracted 16 − 5 − 6 = 5, or even added 5 + 6 = 11 before subtracting the total number eaten from the total number of pieces to find the number of slices left.
MD1-15  Time to the Hour
Pages 151–153

STANDARDS
1.MD.B.3

GOALS
Students will tell the time to the hour using both digital and analog clocks.

PRIOR KNOWLEDGE REQUIRED
Can identify the hour hand on a clock
Knows that the hour hand takes one hour to move from one number to the next

MATERIALS
analog clock with two hands
digital clock or watch
BLM Time Cards (1) to (2) (pp. M-34–35)
blanks made in Activity 1 of Lesson MD1-13
BLM Clocks (p. M-31), at least 2 copies per student
BLM Time from Now (1) (p. M-38)
Bats Around the Clock by Kathi Appelt

We say “o’clock” when the hour hand points directly at a number.
SAY: If the hour hand is pointing directly at the 9, we say it is 9 o’clock.
Write “9 o’clock” on the board. Show students an analog clock and move the hour hand so that sometimes it points directly at a number and sometimes points between two numbers. Ask students if the clock says “o’clock” or not. You might ask students to show thumbs up for “yes” and thumbs down for “no.” SAY: When we look at a clock and say what o’clock it is, that’s called telling time. Show the hour hand pointing directly at various numbers and ASK: What time does the clock show? What “o’clock” is it?

Introduce the minute hand. Arrange the hands of a clock so that it reads 9 o’clock. ASK: What time does the clock show? (9 o’clock) Where is the longer hand pointing? (at the 12) Advance the clock to 4 o’clock, and repeat. SAY: The long hand is called the minute hand. ASK: If I set the clock to 6 o’clock, where do you think the minute hand will point? (at the 12) Have students predict once or twice more. SAY: When the hour hand is pointing exactly at a number, the minute hand is always pointing at the 12.

Explain to students that the minute hand moves around the clock faster than the hour hand moves around the clock. Each time the minute hand moves, another minute has passed. The minute hand moves five times on its way from one number on the clock to the next number. ASK: How long does it take for the minute hand to move from the 2 to the 3? (5 minutes) How long does it take for the minute hand to move from the 7 to the 8? (5 minutes) How long does it take for the hour hand to move from the 7 to the 8? (one hour) Count the minutes as you point to the minute marks

STANDARDS
1.MD.B.3

VOCABULARY
after
ago
before
clock
hands
hour
hour hand
later
minute
minute hand
next
now
o’clock
telling time

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around the clock. ASK: How many minutes does it take for the minute hand to go around the clock? (60)

Ask students to draw a picture for one minute to develop a sense of how long it takes for a minute to pass. Tell them when to start drawing and when to stop. ASK: What can you do for one hour that you cannot do for one minute? PROMPT: Can you watch a whole TV show in one minute? (no) Can you have a playdate for one minute? (no) Why? (a minute is too short) If you can, ask students to describe where the minute hand is pointing at various “o’clocks” throughout the day. Encourage students to notice that the minute hand is always pointing at the 12 when the hour hand is pointing exactly at a number.

Exercises: Write the time.

a)    b)    c)

Answers: a) 3, b) 6, c) 11

NOTE: Students are not required to learn the terms “digital clock” and “analog clock,” but you might show students each type of clock and explain that an analog clock has a clock face, and a digital clock shows the time as a number for the hour, two dots (a colon), and a number for the minutes past the hour.

Telling time to the hour on digital clocks. Ask students if they have seen clocks or watches that show the time in a different way. Tell students that some watches don’t have hands but show the time using only numbers. Write “9:00” on the board. SAY: They show 9 o’clock like this. Show students a digital clock or watch to illustrate. Summarize the three different ways of showing or writing the same time: 9 o’clock, 9:00, and using a clock with hands (hour hand at 9, minute hand at 12). Show different times to the hour (in sequence) on an analog clock and have students tell the time. For each hour read, ask volunteers to come to the board and write the name in the two forms introduced above (____ o’clock and ____:00).

Exercises: Write the time in two ways.

a)    b)    c)

____:____   ____:____   ____:____
**ACTIVITY**

Play **Picking Pairs** and **Memory** (see unit introduction) with the cards on BLM Time Cards (1) to (2).

**Drawing time to the hour.** Have students use the clocks they made in Activity 1 of Lesson MD1-13 to show 1 o’clock, then 2 o’clock, and continue sequentially until they reach 1 o’clock again. At 12 o’clock, ASK: Is it okay for both hands to point to the same number? (yes) Have students show o’clock times in random order. Ensure that students show the hour hand pointing directly at the hour and the minute hand pointing directly at the 12. Say various times aloud and have students draw them on BLM Clocks. Students can compare their answers with a partner.

Give students another copy of BLM Clocks for Exercise 1 below.

**Exercises**

1. Draw the time.
   a) 5 o’clock  
   b) 8:00  
   c) 9 o’clock

   **Answers**
   a) the hour hand points at 5, the minute hand points at 12  
   b) the hour hand points at 8, the minute hand at 12  
   c) the hour hand points at 9, 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 9 o’clock. The hour hand points to ___. The minute hand points to ___.
   c) It is 12 o’clock. The hour hand points to ___. The minute hand points to ___.

   **Answers:** a) 4, 12; b) 9, 12; c) 12, 12

**Finding the time “in one hour.”** Show various times to the hour and ask students to draw on BLM Clocks or show on the clocks they made the time in one hour. Explain that “in one hour” or “one hour later” or “one hour from now” tells them to move the hour hand to the next number and to leave the minute hand in the same place as before.

**Exercises:** What time will it be 1 hour later?

   a) 4:00  
   b) 7 o’clock  
   c) 10:00  
   **Bonus:** 12:00

   **Answers:** a) 5:00, b) 8 o’clock, c) 11:00, **Bonus:** 1:00
Finding the time “one hour ago.” Show students various times to the hour and ask them to draw or show what time it was one hour before. SAY: Instead of before, sometimes we say one hour ago. Ago means before or in the past. You might mention to students that they have heard this word many times in stories that start with, “A long time ago …” Emphasize the different directions they need to move the clock hand when finding the time “in one hour” or “one hour ago.” “In one hour” (or “an hour later”) tells them to move the hour hand to the next number. “One hour ago” (or “an hour earlier”) tells them to move the hour hand to the number before.

Exercises

1. Complete BLM Time from Now (1).
   Answers: 2. 3 o’clock, 5 o’clock; 3. 6 o’clock, 8 o’clock; 4. 10 o’clock, 12 o’clock

2. Write the time 1 hour before.
   a) 3:00          b) 12 o’clock          c) 9 o’clock
   Answers: a) 2:00, b) 11 o’clock, c) 8 o’clock

Literature Connection: Bats Around the Clock by Kathi Appelt. This book involves a 12-hour dance-a-thon with lively critters and rhyme. It is a fun introduction to time on the hour.

Solving word problems. Write the following word problems on the board, and read and solve them together as a class:

Gym class starts at 10:00. It lasts for one hour. What time does it end?

Roy’s swimming lesson starts at 9:00. The lesson lasts for one hour. What time is practice over?

Write similarly simple word problems on the board for students to solve independently. Underline important phrases, such as “for 1 hour” or “takes 1 hour,” and also any start times. NOTE: Avoid elapsed times that cross the 12. Save problems of this sort for extension questions, or omit them entirely. As a bonus, give problems where the activity lasts for more than one hour. Example: A movie starts at 3:00 and lasts for 2 hours. What time does the movie end? (5:00)

Extensions

1. Find the time.
   a) Bill starts reading at 7:00. He stops 1 hour later. At what time does he stop reading?
   b) Kim has soccer practice at 5 o’clock. It lasts for 1 hour. What time is practice over?
   Answers: a) 8:00, b) 6 o’clock
2. Draw a clock face to match each description.
   a) minute hand at 12, hour hand at 4
   b) minute hand at 12, hour hand at 7
   c) minute hand at 12, hour hand at 11

3. Draw two clocks on the board or have several predrawn clocks ready to attach to the board. Start with one clock showing the hour hand pointing at the 6 and the minute hand at the 12, and the other clock showing the hour hand pointing at the 12 and the minute hand at the 6. SAY: One of these clocks shows an “o’clock” time. ASK: Which one? (the one with the hour hand pointing at the 6) What time does it show? (6 o’clock) SAY: The other clock is broken. ASK: How can you tell? Have students work in pairs to answer the question. (when the hour hand is pointing directly at the 12, it is 12 o’clock) ASK: Where should the minute hand be pointing? (also at the 12) Repeat with other similar pairs of clocks (Example: 7:00 and a clock showing its “reverse.”) Show one clock with both hands pointing at the 12 and another with both hands pointing at the 6 and repeat the exercise. Explain that for o’clock times, when the hour hand is pointing directly at the 6, the minute hand cannot be pointing at the 6—it must be pointing at the 12.

4. Write on the board:
   Anne has 2 teddy bears.
   Rick has 4 more teddy bears than Anne.
   Rick has 3 more toy cars than teddy bears.
   Anne has 1 more toy car than Rick.
   How many toy cars does Anne have?

Have students read the problem silently to themselves, then have a volunteer read it aloud. Have students silently plan how to answer the question, then ASK: What makes this problem hard? (there is a lot to keep track of; there are two types of objects and two different people) How can you make a picture that is clear but easy to draw? Take suggestions, but lead students to the idea that bears have faces and cars don’t, so even just a bear face will help students tell the difference; they don’t need to draw arms and legs or ears) Draw appropriate pictures on the board (a face for a bear and a rectangle for a car). Then have students draw a picture to answer the question, and write the answer as a sentence.

Sample answer
Anne: 🐻 🐻
Rick: 🐻 🐻 🐻 🐻 🐻 🐻 🐻 🐻 
Rick: 🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁🏁 финиш
Anne: 🏁🏁🏁🏁🏁 финиш
Anne has 10 cars.
Redirecting students: If students do not write who the teddy bears or cars belong to, ASK: Whose teddy bears are those? If students don’t remember, emphasize that they could keep track by writing the names beside each picture. If students are unsure how to spell the names, remind students that they can look on the board—the names are written in the problem. When students write their answer as a sentence, you may need to guide them to include all three components: the name of the person, the object, and how many the person has.
MD1-16  Time to the Half Hour

Pages 154–157

STANDARDS
1.MD.B.3

VOCABULARY
ago
between
clock
half past
halfway
hour
hour hand
minute
minute hand
o’clock

Goals
Students will tell the time to the half hour using both digital and analog clocks.

PRIOR KNOWLEDGE REQUIRED
Can tell time to the hour

MATERIALS
a real analog clock
BLM Clocks (p. M-31)
clocks made in Activity 1 of Lesson MD1-13
BLM Time Cards (pp. M-34–37)
BLM Extra Practice: Time (p. M-40)
BLM Time from Now (2) (p. M-39)
Telling Time: How to Tell Time on Digital and Analog Clocks by Jules Older
BLM In Half an Hour (pp. M-41–43, see Extension 5)
BLM Time Word Problems (pp. M-44–46, see Extension 6)

NOTE: Students will learn to tell time to the half hour (recognize, read, and write) but the concept of a “half” as a quantity will be formally introduced in the next unit.

Where is the minute hand pointing when the hour hand is halfway between two numbers? Show 2:30 on an analog clock. ASK: Where is the hour hand? (between 2 and 3) Is it closer to 2 or 3? (the same) Where is the minute hand pointing? (at the 6) Repeat for various “half past” times. SAY: When the hour hand is halfway between two numbers, the minute hand is pointing at the 6. Ask students to describe where the minute hand is pointing at various half past times throughout the day. (Examples: 9:30, 11:30) Encourage students to notice that the minute hand is always pointing at the 6 when the hour hand is pointing exactly halfway between two numbers.

The minute hand moves halfway around the clock when the hour hand moves halfway from one number to the next. Set the time to 2 o’clock on an analog clock. As students watch, adjust the time from 2 o’clock to 3 o’clock. Explain that while the hour hand is moving from 2 to 3, the minute hand is moving all the way around the clock, from the 12 back to the 12. Repeat from 3 to 4 and have students watch the minute hand. Turn the time back to 2 o’clock, and tell students you want to move the hour hand halfway to the 3. Start adjusting the time and have the class stop you when you get halfway. ASK: Where is the minute hand pointing now? (at the 6)
Draw on the board:

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

half past 2

**SAY:** The hour hand is halfway between 2 and 3, and the minute hand has
gone halfway around the clock. We say that the time is *half past* two.

**Telling the time at half past the hour.** Adjust your clock to different half
past times, and have students tell you what time it is. At first, ask students
which two numbers the hour hand is between, before asking the time.

**SAY:** When the minute hand is pointing at the 6, it is always half past the
hour that comes before on a clock. **ASK:** If the hour hand is between 1 and
2, and the minute hand is pointing at the 6, is it half past 1 or half past 2?
(half past 1)

**Exercises:** Write the time.

<table>
<thead>
<tr>
<th>a)</th>
<th>b)</th>
<th>c)</th>
</tr>
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<tbody>
<tr>
<td><img src="#" alt="Clock" /></td>
<td><img src="#" alt="Clock" /></td>
<td><img src="#" alt="Clock" /></td>
</tr>
</tbody>
</table>

**Answers:** a) 1, b) 8, c) 5

**Writing half past the hour in two ways (half past ___ and ___ :30).** Draw a
clock showing half past 1, and ask students what time it shows. Write “half
past 1” under the clock. Remind students that some watches show time
only with numbers. Tell students that the hour hand counts from number
to number but the minute hand counts the very small tick marks between
the numbers. Draw students’ attention to the very small tick marks on the
clock, and have students count with you the number of ticks the minute
hand passes between 12 and 1, 12 and 2, and 12 and 3. You might stress
every fifth number as you count since there are five tick marks in the
space between any two numbers; five small parts in every big part. (This
might lead students to notice that they can just count up by adding 5s as
they learned to do with nickels in the previous unit.) Explain that there are
30 little ticks, or 30 minutes, from the 12 to the 6. So, half past 1 is written
as 1:30 (and said as “half past one” or “one thirty”) because the minute
hand passes 30 minutes. Write “1:30” under the clock.
Set the time on a clock so that the minute hand is pointing at the 6, and ask students to tell you the time in two ways (e.g., half past 2, two thirty). Repeat with different “half past” times. Write the answers on the board for the first 1 or 2 then have volunteers write the answers.

**Exercises:** Write the time in two ways.

a) ![Clock](image1)  b) ![Clock](image2)  c) ![Clock](image3)

**Answers:** a) half past 7, 7:30; b) half past 3, 3:30; c) half past 9, 9:30

**Showing time to the half hour on an analog clock.** Give students **BLM Clocks** and ask them to show half past 12, then half past 1, and continue sequentially until you reach half past 12 again. Repeat with times in random order. Ensure that students show the hour hand pointing halfway between two numbers and the minute hand pointing straight at the 6.

Repeat with a mix of “half past” and “o’clock” times.

For the following exercises, ask students to show the times on the clocks they made in Activity 1 of Lesson MD1-13. Give students another copy of **BLM Clocks**, and ask them to show the same times by drawing the clock hands on the BLM.

**Exercises:** Draw the hands of the clock.

a) 4:30 b) half past 5 c) half past 1 d) 10:30

**Answers**

a) the hour hand is between the 4 and the 5, the minute hand points at the 6
b) the hour hand is between the 5 and the 6, the minute hand points at the 6
c) the hour hand is between the 1 and the 2, the minute hand points at the 6
d) the hour hand is between the 10 and the 11, the minute hand points at the 6

**ACTIVITY 1**

Play **Picking Pairs** and **Memory** (see unit introduction) with cards from **BLM Time Cards**.

**Exercises:** Complete **BLM Extra Practice: Time**.

**Answers:** 2. 4:00, 3. 12:30, 4. 5:30, 5. 1:00, 6. 4:30, 7. 2:00, 8. 11:30, 9. 7:00, 10. 12:00, 11. 6:00, 12. 3:00, 13. 8 :30, 14. 5:00, 15. 9:30, 16. 1:30

**Finding the time in one hour.** **ASK:** If it is 7 o’clock, what time will it be in one hour? (8 o’clock) Set an analog clock to 7 o’clock and, as students watch, advance the time one full hour. **SAY:** In 1 hour, the minute hand goes all the way around the clock and back to where it started. **ASK:** What does
the hour hand do? (it moves ahead to the next hour) Set the time to 7:30. ASK: What does the clock say? (7:30) Where is the minute hand pointing? (at the 6) One hour from now, where will the minute hand be pointing? (at the 6) Where is the hour hand? (between the 7 and the 8) Where do you think the hour hand will be when the minute hand has gone once around the clock and come back to 6? (between 8 and 9) Demonstrate this. ASK: What time is it now? (8:30) So, what is the time 1 hour after half past 7? (half past 8) Show various times on the half hour and have students tell you the time in 1 hour. As a bonus, ask students to tell you the time in 2 hours.

**Exercises:** If this is the time now, what will be the time in 1 hour?

- a) 6:30
- b) half past 11
- c) 5:30

**Bonus:** half past 12

**Answers:** a) 7:30, b) half past 12, c) 6:30, Bonus: half past 1

**Finding the time one hour ago.** Set the time on an analog clock to 3:30. ASK: What time does the clock say? (3:30) What time do you think comes 1 hour before 3:30? (2:30) Demonstrate moving the time back 1 hour. Emphasize that in 1 hour, the minute hand goes all the way around the clock and comes back to where it started. Repeat several times with times on the half hour and have students guess what time it was 1 hour ago.

**Exercises**

1. If this is the time now, what was the time 1 hour ago?

- a) 6:30
- b) half past 11
- c) 5:30

**Answers:** a) 5:30, b) half past 10, c) 4:30, Bonus: half past 12

2. Complete BLM Time from Now (2).

**Answers:** 6. 5:30, 7:30; 7. 11:30, 1:30; 8. 1:30, 3:30

**ACTIVITY 2**

Students can work in small groups to create a collage of pictures of clocks, watches, and other timepieces (but not timers or stopwatches), and write the times shown beneath each one.

**Literature Connection:** *Telling Time: How to Tell Time on Digital and Analog Clocks* by Jules Older.

**Extensions**

1. Draw clocks showing the time.

- a) 3:30
- b) 6:30
- c) 1:30

**Measurement and Data 1-16**
Answers: a) hour hand at 3, minute hand at 6; b) hour hand at 6, minute hand at 6; c) hour hand at 1, minute hand at 6

2. Write simple word problems on the board, and read and solve them together as a class. Include problems where students have to decide if the activity will be done before a given time. Underline important phrases, such as “for half an hour,” and also any start times. Example: Rob starts playing piano at 1:30. He plays for 1 hour. Does he finish before 3:00? (yes, he finishes at 2:30)

(MP6) 3. Draw two clocks on the board or have several predrawn clocks ready to stick to the board. Start with one clock showing the hour hand pointing at the 6 and the minute hand halfway between the 9 and the 10, and the other clock showing the hour hand pointing between the 9 and the 10 and the minute hand pointing at the 6. Tell students that only one clock shows a “half past” time and the other clock is broken. ASK: Can you figure out which clock is which? Have students work in pairs to answer the question. (when the minute hand is pointing directly at the 6, the time is always half past something) ASK: Where should the hour hand be pointing when the minute hand is pointing directly at the 6? (halfway between two numbers) Does one of our clocks do this? (yes, the second one) What is wrong with the other clock? (when the hour hand is pointing directly at a number, it is an “o’clock” time and the minute hand should be pointing directly at the 12) Repeat with other similar pairs of clocks (Example: 3:30 and a clock showing its “reverse.”)

4. What will be the time in 1 hour?
   a)  b)  c)

Answers: a) 2:30, b) 9:30, c) 6:30

NOTE: The following extensions involve the concept of half an hour and not just the ability to tell time to half an hour. You may want to return to these after students complete Unit 5.

5. Students can use the clocks they made to complete BLM In Half an Hour.

Answers: 2. at 9, 3. at 1, 4. at 4, 5. at 12, 6. at 10, 8. between 7 and 8, 9. at 1, 10. between 10 and 11, 11. between 6 and 7, 12. at 2, 14. 9:30, 15. 11:00, 16. 12:00, 17. 5:30, 18. 6:30


Answers: 1. 5:00, 2. 12:30, 3. 9:00, 4. 8:00, 5. 11:30, 6. 6:30, 7. half an hour, 8. 1 hour, 9. half an hour
MD1-17 Area
Page 158

STANDARDS
preparation for 1.G.A.3

VOCABULARY
area
same
size

Goals
Students will compare areas by covering surfaces. Students will estimate, measure, and describe area through investigation using non-standard units.

PRIOR KNOWLEDGE REQUIRED
Knows the concepts of longer, shorter, bigger, and smaller Can measure using non-standard units Can compare quantities Can trace and cut out shapes

MATERIALS
colored and white paper scissors tape paper shapes: two 12 cm × 24 cm blue rectangles, two 18 cm × 18 cm red squares, and one 10 cm × 10 cm yellow square per student BLM Comparing Areas (p. M-47) colored pencils BLM In Order by Area (p. M-48) paper right triangles, four per student (see Extension 1) paper squares and rectangles (see Extension 2) 2 cm connecting cubes (see Extension 2) BLM Estimating and Measuring (p. M-49, see Extension 3)

Are they the same size? Cut colored sheets of 8 1/2 by 11 paper into quarters to make rectangles of the same size. Give each student two rectangles and ASK: Are your rectangles the same size? (yes) How can you tell? (they are exactly the same, they match) Have students compare their rectangles with those of one classmate and then a different classmate. ASK: Are the rectangles the same size? (yes) SAY: (using students’ names): Joy and Lily both compared their rectangles with Ahmad’s and said their rectangles are the same size as Ahmad’s. ASK: Do you think Lily’s rectangles will be the same size as Joy’s? (yes) Why? (they are both the same as Ahmad’s) Have Joy and Lily verify with each other. SAY: Lily compared one of her rectangles with Kyle’s and said they are the same size. ASK: Can Joy and Kyle’s rectangles be different sizes? (no) How do you know? (they are both the same as Lily’s rectangle) Explain that you made sure everyone’s rectangles were the same size.

Introduce area. Fold a rectangle in half and tell students to do the same with one of their rectangles. Them have them cut along the fold; now they have two smaller rectangles. Ask students to rearrange the pieces to make a different rectangle than the one they started with and tape the
new rectangle onto white paper. Tape one of the new rectangles onto the board. ASK: Does anyone have a new rectangle that looks like this one? Does anyone's rectangle look different? Have a volunteer tape a different rectangle on the board. Add a copy of the original rectangle so students can see all three shapes. (The new rectangles will have one of two possible shapes depending on how the original rectangle was cut.)

ASK: Do you think one shape is bigger than the other? (answers may vary) Which one? (students might select the longest or widest rectangles as "bigger") Did one shape use more paper than the other? (no) Did they use the same amount of paper? (yes) Explain that the amount of paper you need to make the shape is the shape's area. ASK: When you cut the rectangle in two and rearranged the pieces, did you change the amount of paper you used? (no) Does your shape have the same shape as the rectangle I gave you? (no) Does it have the same area? (yes) How do you know? (because I used the same amount of paper to make it) Emphasize that shapes can look different but have the same area.

**Compare areas directly.** For each student, cut out these paper shapes: two blue rectangles (12 cm × 24 cm), two red squares (18 cm × 18 cm) and one yellow square (10 cm × 10 cm). Give students one shape of each color. ASK: Which piece of paper is smaller, the blue or the yellow? (yellow) How do you know? (when I place the yellow rectangle on top of the blue one, the blue rectangle is completely covered; when I place the blue rectangle on top of the yellow one, it fits completely and the yellow rectangle “sticks out” on all sides.) Demonstrate how the yellow paper fits onto the blue paper completely. SAY: The yellow paper has a smaller area and the blue paper has a bigger area. Compare the red and yellow pieces in the same way.

**Comparing areas by cutting out the extra parts.** Compare the blue and red pieces. Explain that the blue piece doesn't fit on the red piece and the red piece doesn't fit on the blue piece. ASK: Why does that happen? (the blue piece is longer one way, and the red piece is longer the other way) Ask students to remember how we compare pencil lengths when the colored pencils are lined up so that there is extra blue at one end and extra red at the other (see MD2-1). ASK: How can we compare the lengths of the pencils without lining them up end to end? (check to see if there's more extra red at one end or extra blue at the other) Challenge students to think about how we can use this idea to compare the areas of these two pieces of paper.

Give each student a pair of scissors and have them cut out the parts of each paper shape that are the same, i.e., the parts that overlap. Explain that because we know these parts are the same, we can just compare the leftover parts to see which is bigger. ASK: Does the extra red part fit onto the extra blue part or does the extra blue part fit onto the extra red part? (the extra blue part fits onto the extra red part because there was more extra red than extra blue) SAY: So, the red piece must have been bigger.
Comparing areas by coloring the extra parts. Tell students that you would have liked to compare the pieces without cutting them up. SAY: We know which piece was bigger, but it’s not bigger anymore because we cut it! Give students the second blue and red shapes, and have them color or shade the extra parts instead of cutting them out. Demonstrate how to do so: Place the square on top of the rectangle so that the bottom left corners line up. Color the piece of the rectangle that is not covered, as shown below:

Place the rectangle on top of the square (again, so that the bottom left corners line up), and color the part of the square that is not covered, as shown below:

The shapes will look like this:

Have students compare the parts that they’ve colored by placing them one on top of the other. ASK: Which piece has more “extra”—the red or the blue? (the red)

Have students use this method to compare various pairs of shapes. Have them cut out all of the shapes on BLM Comparing Areas and compare A and B, and C and D. When students are comparing the smaller square (A) and the triangle (B), they should color the parts that stick out, as shown below:

Students then separate the shapes to determine which has the greater colored area. (the triangle)

Repeat with shapes C and D. (D is bigger)
If students need extra practice ordering shapes by area, give them 
**BLM In Order by Area.** (square: middle, top rectangle: smallest, bottom 
rectangle: biggest)

**Tracing, cutting, and comparing.** Before students do Questions 1–3 on 
AP Book 1.2 p. 158, have them predict which shape is bigger or smaller 
in each question. Demonstrate how to place a sheet of paper inside the 
workbook so that it will not move while students trace the shapes. (You can 
use tape or paper clips, too.) Tracing is a good exercise to improve motor 
skills, and all students should attempt it.

**Extensions**

1. Prepare several right triangles by cutting a 10 cm by 10 cm square in 
half diagonally. Give each student four triangles. Have students make 
as many shapes as they can using two, three, or four triangles. The 
triangles must be joined only along lines of the same length. Students 
should trace their shapes onto paper and label them with the number 
of triangles used to make them. When students have made several 
such shapes, SAY: Show me two shapes you made that have the same 
area but a different shape. Show me two shapes you made where 
one of them is bigger. ASK: How do you know it is bigger? (it used 
more paper) SAY: Show me a shape you made with three triangles. 
Now, show me a smaller shape. ASK: How do you know it is smaller? 
SAY: Show me a bigger shape. ASK: How do you know it is bigger? 
Explain that by counting the number of triangles they used to make 
the shape, they can know which shape used more paper and so has 
a bigger area.

2. Give students a 10 cm by 10 cm square and a 10 cm by 8 cm 
rectangle. Have students estimate and measure the number of 2 cm 
connecting cubes required to cover each shape. Students should 
revise their estimates as they place more cubes onto the shapes. 
**Answers:** 25 cubes for the square, 20 cubes for the rectangle

3. Students can complete **BLM Estimating and Measuring** to practice 
estimating and measuring using squares. **(NOTE: Estimating and 
measuring area is a Grade 3 topic.)** 

**Answers:** 2, 7, 9, White; 3. 13, 12, Shaded

4. Write on the board:

- Ross has 5 cats.
- Ross has 2 fewer dogs than cats.
- Mona has 4 more dogs than Ross.
- Mona has 1 fewer cat than dog.
- How many cats does Mona have?

Have students read the problem silently to themselves, then have a 
volunteer read it aloud. Have students silently plan how to answer the
question, then ASK: What makes this problem hard? (there is a lot to keep track of; there are two types of objects and two different people; some are more than and some are fewer than; you have to read the problem really carefully) How can you make a picture that is clear but easy to draw? (sample answers: write C’s for cats and D’s for dogs; draw faces with whiskers for cats and faces without for dogs). Draw appropriate pictures or symbols on the board. Then have students draw a picture to answer the question, and write the answers as a sentence.

Sample solutions
Ross: C C C C C
Ross: D D D
Mona: D D D D D D D
Mona: C C C C C C Mona has 6 cats.

Redirecting students: If students do not write who the cats or dogs belong to, ASK: Whose cats are those? If students don’t remember, emphasize that that’s a good reason to keep track by writing down the names beside each picture. If students are unsure how to spell the names, remind students that they can look on the board—the names are written in the problem. When students write their answer as a sentence, you may need to guide them to include all three components: the name of the person, the type of pet, and how many the person has.
MD1-18  Capacity
Pages 159–160

STANDARDS
K–5 Progressions on Measurement and Data

GOALS
Students will compare capacities directly and indirectly.

PRIOR KNOWLEDGE REQUIRED
Understands the comparatives larger, largest, smaller, smallest
Understands the concepts of length, width, and height
Can compare linear measurements

MATERIALS
Goldilocks and the Three Bears
a cup, bottle of water, pitcher, and funnel
large bowls or tubs (and towels or paper towels in case of spills)
empty containers of various sizes, including 1 pint water bottles and 1 quart milk cartons or jugs
sand and/or dry goods (beans, peas, rice)
water
string
masking tape
markers
BLM Capacity (p. M-50, see Extension 2)

NOTE: Liquid volume, or capacity, is taught formally in Grade 3. The K–5 Progressions on Measurement and Data recommend laying the foundation for understanding volume earlier by using some everyday activities. The activities in this lesson provide some initial development of the concept of volume, which will be beneficial in later grades.

Introduce capacity. Read Goldilocks and the Three Bears with students. Focus on the sizes of the bowls. ASK: Who had the largest bowl? Who had the smallest bowl? What does it mean that one bowl was the largest? Explain to students that capacity means how much of something (e.g., porridge) a container can hold.

NOTE: Ensure all containers have been rinsed clean and are safe (e.g., no sharp edges).

Compare capacities directly—more/less. Hold up an empty small cup and a full bottle of water. SAY: There is more water in the bottle than the cup. But capacity is about how much the bottle and the cup can hold if they are full. Invite a volunteer to pour water from the bottle into the cup. (Work over a large bowl or plastic tub in case of spillage.) ASK: Does all the water in the bottle fit into the cup? (no) Which can hold more: the cup or the bottle? (the bottle) Which holds less? (the cup) Refill the bottle and repeat with a container that has a larger capacity than the bottle, such as a large pitcher. ASK: Which can hold more water? (the pitcher) How do we know
the pitcher can hold more? (there is room for more water in the pitcher after
the bottle has been emptied into it)

Empty the bottle and fill the pitcher with water. SAY: When I pour the water
from the bottle into the pitcher, there is room left in the pitcher. ASK: What
will happen if I fill up the pitcher and pour the water from the pitcher into
the bottle? (the bottle will fill and water will overflow into the bowl) Check the
predictions by pouring the water into the bottle using a funnel.

Which holds the most/least? Order by capacity. Ask students to say
which of the three containers (cup, bottle, or pitcher) can hold the most
water and which can hold the least water. Rephrase the answers using
the terms “largest capacity” and “smallest capacity.” Invite a volunteer
to order the containers from largest (can hold the most) to smallest (can
hold the least).

**ACTIVITY 1**

Create stations at which students can compare capacities directly.
Each station will need a large bowl or tub, four empty containers
different shapes and sizes, and enough sand or dry goods
(beans, peas, or rice) to fill the largest container. At each station,
students should:

- choose two containers, predict which one has the larger
capacity, and check
- choose a third container and order the three containers from
smallest to largest
- determine the capacity of a fourth container relative to the other three

Before letting students work at the stations, discuss with them how
they will perform each task. For example, students can fill the container
they think is larger with beans, then pour the beans into the other
container. PROMPT: If the first container has a larger capacity, will the
beans fit into the second container or will there be beans left over?
(beans left over) As a bonus, add a fifth container.

Can containers of different shapes have the same capacity? Show
students two containers that have the same capacity but a different shape,
such as a 1 pint water bottle and an empty milk carton cut so that it can
contains exactly 1 pint. (To determine where to cut the milk carton, pour
water into the bottle, empty the water into the milk container, and mark the
height the water reaches; cut the milk carton at that height.) ASK: How are
these two containers different? Have students describe the shape of the
containers. ASK: Which one can hold more? Can these two containers have
the same capacity? Compare the capacities directly using water, beans,
sand, or rice.

Comparing capacities indirectly. Show students two containers of
different shapes full of water. ASK: Which container holds more? How can
we check? Students should suggest comparing the capacities directly, as in the first part of this lesson.

Tell students that you do not want to throw out any of the water in order to pour water from one container into the other. Place two identical transparent jars where students can easily see them. SAY: In mathematics, we often use a problem that we have already solved to help us solve new problems. I think comparing capacity is a bit like comparing lengths. Discuss how you compared the lengths of pencils previously (by lining them up) and the capacities of containers earlier (by pouring from one into the other).

SAY: Both these containers are full. ASK: Can we pour from one to the other? (no) SAY: When we compared lengths, there was a time when we could not line up the lengths. ASK: How did we solve that problem? (for example, to compare the lengths of the sides of a book, we used a sheet of paper; we compared both sides of the book to the sheet of paper)

Can we use the same idea here? Invite volunteers to pour the water from each container into one of the identical jars and compare the water levels. ASK: Where is there more water? Which container holds more water?

Tell students that you need to take your desk out of the room, but you are not sure if it will fit through the door. ASK: How could you check? Show students a piece of string and use it to measure the short side of the desk and the width of the door, marking each length on the string with a piece of tape. Point out that the string is longer than both objects you measured. Show students a cup, a can, and a larger plastic bottle. SAY: I would like to find out which has greater capacity, the cup or the can. ASK: Can I use only the bottle to compare capacity the same way as I used the string? Give students time to think through a solution with a partner and then discuss how to do it as a class: fill one container, pour the contents into the bottle, and mark the level; empty the bottle; fill the second container, pour the contents into the bottle, and compare this level with the mark. Discuss how this way of comparing capacities is different from the previous method. (we have only one container instead of two identical ones)

**ACTIVITY 2**

Every student should have an opportunity to compare capacities directly. Each student or pair of students will need three containers, the largest of them transparent; beans, rice, or water; a large bowl or tub to work over; and markers or masking tape. Each student should have the same two smaller containers as at least one other student, so that they can compare their findings. Students with the same smaller containers can have different larger containers and should use different materials. If you choose to do this activity at stations, create three stations with the same smaller containers, different large transparent containers, and different materials.

Have students compare the capacities of the two smaller containers using the third, transparent container. Ask students to predict which
of the smaller containers has a larger capacity. (To help students who need it, have students fill one of the containers with beans, then empty it into the benchmark container and mark the level the beans reach with the marker or a piece of tape. Empty the benchmark container and repeat with the second small container. This time, leave the beans in the benchmark container and compare the level they reach with the mark made for the first container. ASK: What does it mean if the mark is higher than the level? What if it’s lower? Which container holds more?

Extensions

1. After students complete Activity 2, have students with the same containers pair up and discuss their findings. Did they identify the same container as being larger? If the answer is no, discuss what students might have done differently and repeat the experiment. Possible reasons for different answers: filling the container(s) incompletely; holding the container at an angle while marking the level; spilling water, rice, or beans while pouring from the container(s) into the benchmark container. Discuss how else students could check the results. Lead students to the idea of returning to direct comparison. Did people with the same smaller containers but different benchmark containers get the marks at the same level? (most likely not)

2. Have students complete BLM Capacity. (NOTE: Measuring and estimating capacities is a Grade 3 topic.)

   Answers: 1. thermos, 2. pitcher, 3. the middle kettle

3. 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.

4. A bus has 10 rows of seats. Three people can sit in each row. No one wants to sit alone. Show two different ways that 15 people can sit on the bus.

   Bonus: Show a third way.

   Answers: five rows with 3 people in each row; seven rows with 3 people in one row and 2 people in each of the other six rows; six rows, with 3 people in each of three rows and 2 people in each of the other three rows.
Make Your Own Clock
Hour Hand

☐ Circle the hour hand.

1.

2.

3.

4.
What Are You Doing?

[Blank]

[Blank]
Time Cards (2)

12:00
6:00
8:00
10:00
4:00
11:00
3:00
7:00
2:00
9:00
1:00

Blackline Master — Measurement and Data — Teacher Resource for Grade 1

NAME ___________________________ DATE ___________________________
Time Cards (3)

12:30

2:30

3:30

4:30

5:30
Time Cards (4)

1. 6:30
2. 7:30
3. 8:30
4. 9:30
5. 10:30
6. 11:30
7. 12:30
## Time from Now (I)

- Write and show the time 1 hour ago.
- Write and show the time in 1 hour.

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<th>Now</th>
<th>In 1 Hour</th>
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</thead>
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<td>3 o’clock</td>
<td>![Image](4 o’clock)</td>
</tr>
<tr>
<td>![Image](4 o’clock)</td>
<td>7 o’clock</td>
<td>![Image](11 o’clock)</td>
</tr>
<tr>
<td>![Image](11 o’clock)</td>
<td>2 o’clock</td>
<td>![Image](4 o’clock)</td>
</tr>
<tr>
<td>![Image](4 o’clock)</td>
<td>7 o’clock</td>
<td>![Image](11 o’clock)</td>
</tr>
</tbody>
</table>

1. 
2. 
3. 
4.
Time from Now (2)

☐ Write and show the time 1 hour ago.
☐ Write and show the time in 1 hour.

<table>
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<th>Now</th>
<th>In 1 Hour</th>
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<td>3:30</td>
<td>4:30</td>
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<td>6:30</td>
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<td>12:30</td>
<td></td>
<td></td>
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</tbody>
</table>

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2:30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Write the time.

1. 2:30
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 
13. 
14. 
15. 
16.
Where will the **minute hand** be in **half an hour**?

□ Draw the minute hand.

1. **now**  \[\rightsquigarrow\]  **in half an hour**

2. **now**  \[\rightsquigarrow\]  **in half an hour**

3. **now**  \[\rightsquigarrow\]  **in half an hour**

4. **now**  \[\rightsquigarrow\]  **in half an hour**

5. **now**  \[\rightsquigarrow\]  **in half an hour**

6. **now**  \[\rightsquigarrow\]  **in half an hour**
In Half an Hour (2)

Where will the **hour hand** be in **half an hour**?

- Draw the hour hand.

7. **now**  
   In half an hour

8. **now**  
   In half an hour

9. **now**  
   In half an hour

10. **now**  
    In half an hour

11. **now**  
    In half an hour

12. **now**  
    In half an hour
In Half an Hour (3)

You read for **half an hour**.

☐ What time will you finish?

13. **start at**   **finish at**

```
8:00 ___ 8:30 ___
```

14. **start at**   **finish at**

```
9:00 ___
```

15. **start at**   **finish at**

```
10:30 ___
```

16. **start at**   **finish at**

```
11:30 ___
```

17. **start at**   **finish at**

```
5:00 ___
```

18. **start at**   **finish at**

```
6:00 ___
```
Time Word Problems (I)

☐ Write the finish time.
☐ Draw the finish time on the clock.

1.

Lisa plays piano at 4:00.
She plays for 1 hour.

She finishes playing at ___________.

2.

Lunch starts at 12:00.
Lunch lasts for half an hour.

Lunch ends at ___________.

3.

You go walking at 8 o’clock.
You walk for 1 hour.

You finish walking at ___________.

M-44
Time Word Problems (2)

☐ Write the finish time.
☐ Draw the finish time on the clock.

4. I take a bath at 7:30.
   It lasts half an hour.

   The bath ends at ________.

5. Lin starts the race at 10:30.
   Lin finishes the race after 1 hour.

   She finishes at ________.

6. We play checkers at 6:00.
   We play for half an hour.

   We stop at ________.
Time Word Problems (3)

7. Write I hour or half an hour.

The math lesson starts at 1:00. 
It finishes at 1:30.

The math lesson is ________________ long.

8. 

You start reading at 7:30. 
You finish at 8:30.

You read for ________________.

9. 

The music class starts at half past 10. 
The music class ends at 11:00.

The music class is ________________ long.
Comparing Areas

A

B

D

C
In Order by Area

☐ Cut the shapes out and compare the areas.
☐ Write **biggest**, **smallest**, or **middle** on each one.
Estimating and Measuring

Which part is bigger, shaded or white?

1. I estimate: ________ is bigger.
   I measure: shaded ___
   white ___
   _________ is bigger.

2. I estimate: __________ is bigger.
   I measure: shaded _____
   white _____
   ___________ is bigger.

3. I estimate: __________ is bigger.
   I measure: shaded _____
   white _____
   ___________ is bigger.
Capacity

☐ Circle the one that holds more.

1.

☐ Circle the one that holds less.

2.

☐ Circle the one that holds the most.

3.
Unit 5  Geometry: Reasoning with 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). Students focused on attributes such as identifying and quantifying sides and corners (K.G.B.4).

In this unit, students will extend their work from Kindergarten on attributes by distinguishing between defining attributes and non-defining attributes of shapes. They will build and draw shapes (triangles, squares, rectangles, and circles) based on defining attributes (1.G.A.1). This work will be extended in Grade 2 to include quadrilaterals, pentagons, hexagons, and cubes (2.G.A.1). Students in Grade 3 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). Grade 5 students will classify two-dimensional shapes based on a hierarchy of properties (5.G.B.4).

In Kindergarten, students gained flexibility with shapes by composing shapes to form larger shapes and by building shapes from components (K.G.B.5, 6). In this unit, students will compose two- and three-dimensional shapes to create a composite shape and then create new shapes from the composite shapes (1.G.A.2). This is foundational to the study of area where students recognize area as additive and decompose rectilinear shapes into non-overlapping rectangles to find the total area (3.MD.C.7d).

In this unit, students will partition circles and rectangles (both familiar from Kindergarten) into two and four equal shares and describe the shares using the language of fractions (1.G.A.3). Students’ exposure in 1.1 Unit 4 to directly comparing areas will help make this easier. Students will continue using the language of fractions in Grade 2, when they partition circles and rectangles into two, three, or four equal shares. The work in this unit is also extended in Grade 2 to 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) and beyond.

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP.1 to MP.8. Here are some examples of how students can show that they have met a standard.

MP.3: In G1-9 Extension 3, students construct an argument to explain how $20 - 6$ is related to $10 - 6$ and why they are related. Students then have the opportunity to analyze and critique a partner’s reasoning.

MP.6: In G1-4 Question 12 on AP Book 1.2 p. 170, students attend to precision when they explain why a given trapezoid is not a square and not a rectangle, by using the defining attributes of those shapes.
MP.7: In G1-10 Extension 5, students create designs from pattern blocks. They look for and make use of structure when they notice that some blocks have the same side lengths that fit well together and can be used to make neat designs.
Unit 5  Geometry: Reasoning with Shapes

Introduction

In this unit, students will learn to distinguish between defining attributes (e.g., triangles are closed and have three straight sides) and non-defining attributes (e.g., color, orientation). They will build and draw shapes to possess defining attributes. Please note that though students explore these concepts, they do not learn the terms “defining” or “attribute.”

Students will compose two- and three-dimensional shapes using, for example, drawings, tangrams, and pattern blocks. They will use simple shapes (e.g., square, circle) to create composite shapes, and composite shapes to create new shapes.

They will partition circles and rectangles into two and four equal parts or shares, and use words and phrases such as “halves,” “fourths,” “quarters,” “half of,” “quarter of,” or “fourth of” to describe the parts. Students will learn that cutting or dividing a shape into more equal shares creates smaller shares.

Vocabulary. Grade 1 students consider squares and rectangles different shapes. 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. Similarly, Grade 1 students consider cubes and rectangular prisms (which they just call “prisms”) different shapes and do not identify a cube as a prism. Again, identifying a cube as a prism is not a mistake.

Exercises. Many exercises in this unit consist of questions about lines or shapes, e.g., Is this line closed or open? Is the circle cut in quarters? Students can easily signal the answers to such questions by showing thumbs up or down, or holding up the correct number of fingers. To complete these exercises, we recommend drawing the lines or shapes on the board, one at a time, and asking students to signal their answers.

Materials. The shapes from BLM Attribute Blocks (pp. P-16–17) will be reused in several lessons of this unit, as well as in the next unit. Students will count the sides and the vertices, as well as sort different subsets of the shapes in different ways. Cut out a set of the shapes from the BLM for each student and laminate them, if possible.

In Lesson G1-12, students will need a variety of boxes to measure and to build with. You might want to ask students to begin bringing empty boxes from home at the beginning of the unit. You want empty boxes in the shape of rectangular prisms (including cubes), such as empty medication packages, tea or cereal boxes, tissue boxes, small shoeboxes, and so on.
Students will also use pattern blocks. A commercial set of pattern blocks consists of:

- 1 equilateral triangle (green)
- 2 different rhombuses (blue and tan)
- 1 trapezoid (red)
- 1 hexagon (yellow)
- 1 square (color varies)

Pattern blocks are sometimes referred to by their name and color in the lesson plans. If you do not have a commercial set, cut the shapes out of BLM Pattern Blocks (p. P-18) and laminate them, if possible.

Yarn circles are convenient for sorting objects. Cut yarn into pieces about 2.5 feet long and tie each piece into a loop. Students can sort shapes by placing the shapes with a certain property inside the loop, and the shapes that do not have that property outside of the loop.
Goals

Students will identify straight and curved lines and sides, and open and closed lines. Students will identify and count the sides and vertices of shapes.

PRIOR KNOWLEDGE REQUIRED

Knows the words “line” and “shape”
Can write numbers up to 10
Can trace lines

MATERIALS

large paper square and triangle
attribute blocks made from **BLM Attribute Blocks (1)** (p. P-16)
yarn circles
masking tape
cards numbered 1 to 10
**BLM Sides and Vertices** (p. N-63)
yarn or string (see Extension 2)

Curved and straight lines. Draw on the board:

```
\[ \text{straight lines} \]
```

SAY: These are lines. Lines that go directly from one point to another without bending or turning are called **straight** lines. Beside the straight lines, draw on the board:

```
\[ \text{curved lines} \]
```

Tell students that a line that turns or bends and has no pointed corners is called a **curved** line. 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 shape is this? (a square) **If students do not recall the name, SAY:** This shape is a **square**. Run your finger along each of the sides in turn and **SAY:** These are the **sides** of the square. **ASK:** Are the sides of a square straight or curved? (straight)

Show students some shapes with curved and straight sides. **(You can use shapes from **BLM Attribute Blocks (1).**)** Point to each side of the shape in turn and **ASK:** Is this side straight or curved? Draw several shapes on the board and have students say which shapes have only straight sides,
only curved sides, or both. Have volunteers draw shapes for classmates to describe.

**ACTIVITY 1**

**Sorting shapes.** Give each student a set of attribute blocks from BLM Attribute Blocks (1) and a yarn circle. Have students sort the shapes by placing shapes that have only straight sides inside the yarn circle. **NOTE:** Students will use the same shapes later in the lesson.

**Closed and open lines.** Draw on the board:

```
closed path          open path
```

SAY: These are two paths. Pointing to the closed path, ASK: What will happen as this person keeps walking along the path—where will she end up? (back where she started) Pointing to the open path, ASK: Where will this person end up as he walks along the path? Will he end up where he started? (no) Why not? (because the path does not come back)

SAY: A path that comes back to where it started and has no loose ends is called a *closed* path. A path that has two ends is called an *open* path. We also say “closed” and “open” about lines. Draw several more curved lines (without vertices), both closed and open, and for each one ASK: Is this path or line closed or open?

SAY: Some lines can have pointed corners, but pointed corners are not ends. Lines can have straight parts and curved parts. Draw the lines below on the board and explain that they are closed lines because, even after a sharp turn, each path returns to where it started. Trace each shape with a finger to emphasize this.

```
Exercises: Is the line closed or open?

a)  

b)  

c)  

d)  

e)  

f)  
```

**Answers:** a) closed, b) open, c) open, d) open, e) closed, f) closed

**Shapes are closed lines.** Draw three sides of a square on the board. ASK: Is this an open line or a closed line? (open) Add the fourth side to
the square. ASK: What shape is this? (a square) Is a square an open or closed line? (closed) Will people walking along the sides of a square end up where they started? (yes) If necessary, explain that the corners of the square are not ends, and emphasize that people walking along the sides of a square could keep walking around and around the square. SAY: If you draw a closed line on paper and cut along the line, it creates a shape that you can hold.

Draw a shape similar to a square but with one curved side. ASK: Is this a square? (no) How is this shape different from a square? (it has a curved side) PROMPT: One of its sides does not look like a side of a square. Why doesn’t it? (the side is not straight) Trace your finger around the shape and ASK: Does this line make a shape? (yes) Why? (it is a closed line; if you walk along it you will end up where you started)

**Exercises:** Does the line make a shape?

a)  b)  c)  d)

**Answers:** a) no, b) yes, c) yes, d) no

**Drawing closed and open lines.** Divide the board into two parts. Draw on the board:

- **Closed lines:**
  - [Image of closed line]

- **Open lines:**
  - [Image of open line]

Point to each open line and ASK: How is this line different from the closed lines? (it has a break in it; the ends don’t touch)

Have students draw a closed line and an open line in their notebooks. Invite volunteers to draw their lines on the board and explain how they know which line is closed and which is open. Point to each closed shape, one at a time, and ASK: Are all sides of this shape straight? Students can signal the answer with thumbs up for yes and thumbs down for no.

**Introduce vertices.** Show a large paper triangle. Have students find a shape that looks similar to it among the attribute blocks they used in Activity 1. Run your finger along one side of your triangle and SAY: This straight part is a side. Run your finger all the way around your triangle and have students do the same with theirs. ASK: Are there places on the edge of the shape that feel different from the sides? (yes) How do these places feel different? (they are sharper, or pointed) Point to one of the vertices on your paper triangle and SAY: A 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. This shape has three vertices. Trace your triangle on the board, draw a small arrow pointing to each vertex, and write “vertex” and “3 vertices,” as shown in the margin.
ACTIVITIES 2–3

2. **Counting vertices game.** Students use the same attribute blocks as in Activity 1. Player 1 closes his or her eyes. Player 2 places a block in Player 1’s hand. Player 1 counts the number of vertices on the shape by feel, then looks to check the count. Players switch roles.

Students can play this game until they are good at it. Discuss strategies. For example, do not rotate the shape because you might count some vertices twice; use one hand to hold the shape and the other to count; keep a finger on one vertex at all times to know where you started. Point out that the number of vertices of a shape does not change, no matter how the shape is turned.

3. Create a closed shape with straight sides on the floor, using masking tape, and let students guess how many vertices it has. Ask volunteers to stand at the vertices and ask another volunteer to count how many students are standing. **ASK:** Was the guess correct? Repeat with more closed shapes. Examples:

![ Shapes with labeled vertices: 4 vertices, 10 vertices, 8 vertices. ]

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.

**Counting vertices.** Draw a large triangle on the board and number each vertex. **ASK:** How many vertices does the shape have? (3) Write the number of vertices on the board. Repeat with another triangle, this time beginning at a different vertex, as shown below:

![ Triangle with labeled vertices: 2, 1, 3 ]

three vertices

**ASK:** Does it matter which vertex you start counting at? (no) Repeat with a square and a rectangle. Draw a variety of other polygons on the board and have volunteers count the vertices by numbering them. As an added challenge, draw a circle on the board and **ASK:** How many vertices does a circle have? (none)
Exercises: How many vertices?

a)  

b)  

c)  

d)  

Bonus: 

Answers: a) 4, b) 3, c) 5, d) 4, Bonus: 8

Counting sides by labeling each side with a number. SAY: A side of a shape is a line joining two vertices. Draw a rectangle that is not a square on the board. SAY: I want to count the sides of the rectangle. Count the sides going around the rectangle, but continue around the rectangle so that you count six sides. ASK: Am I correct? (no) What did I do wrong? (counted some sides twice) SAY: If I do not want to make this mistake again, it is best to write the numbers of the sides as I count. Count the sides again and write the numbers as you go, as shown below:

\[ \begin{array}{c}
1 \\
2 \\
3 \\
4 \\
\end{array} \]

Repeat with a triangle and a shape with five sides. (Students do not need to know the names of these shapes yet.) Repeat with shapes that have more sides and/or curved sides.

Exercises: How many sides?

a)  

b)  

c)  

d)  

Bonus: 

Answers: a) 4, b) 3, c) 5, d) 4, Bonus: 6

**ACTIVITY 4**

Have students repeat Activity 1 and count the sides and vertices of each shape inside the yarn circle (shapes with straight sides only).

*Variation:* Have students re-sort the shapes by placing those with four or more sides in the yarn circle.

Students who need extra practice counting sides and vertices can do BLM Sides and Vertices. (2. 5; 3. 4, 4; 4. 4, 4; 5. 3, 3; 6. 5, 5; 7. 6, 6; 8. 7, 7; 9. Bonus: 4, 4)
Extensions

1. Have students draw a shape with 3 straight sides and 1 curved side.

Sample answer:

![Shape with 3 straight sides and 1 curved side]

2. In groups of three or four, students use 10 feet of yarn or string to create shapes. As students work, ASK: How many vertices will your shape have? How many sides?

3. Have students make collages or posters showing the different types of lines they learned about in this lesson. Help students to label the lines (curved, straight, etc.).

NOTE: In Extension 4, the facts are not given in the same order that students need to use them.

4. Draw a picture to solve the problem:

Tim and Jen have toy cars.
Some are red and some are blue.
Tim has 4 more blue cars than Jen.
Jen has 2 more red cars than Tim.
Tim has 1 more red car than blue car.
Jen has 3 blue cars.
How many red cars does Jen have?

Sample answer

Jen: 
Tim: 
Tim: 
Jen: 

Jen has 10 red cars.

Redirecting students: Read the first three sentences together. ASK: Can you use that to draw how many blue cars Tim has? Can you use it to draw how many blue cars Jen has? (no) Can you use it to draw any picture that shows how many of something someone has? (no) Continue with the next three sentences, one at a time. Finally, with the last sentence, point out that they can now draw a picture. ASK: What picture can you draw? (Jen’s blue cars) Have students do so. SAY: The next step is to find another sentence that will tell you another picture to draw. Encourage students to persevere in rereading the problem until they have the information they need to solve it.
**Goals**

Students will identify and count sides and vertices of shapes.
Students will sort shapes by number of vertices and draw shapes with a given number of vertices.
Students will determine whether a shape is closed or open, and whether it has straight or curved sides.

**Prior Knowledge Required**

- Knows the word “shape”
- Can identify the sides of a shape
- Can identify open/closed shapes and straight/curved sides
- Can count sides and vertices of a shape

**Materials**

- Yarn circles
- Attribute blocks made from BLM Attribute Blocks (pp. P-16–17)
- BLM 2 cm Dot Paper (p. N-64, see Extension 3)

**Drawing shapes.** Draw three dots on the board and ask a volunteer to connect the dots. ASK: Is this a shape? (yes) Count the sides and the vertices as a class and have volunteers write the numbers for the count. ASK: How many dots did I draw at the beginning? (3) How many vertices does the shape have? (3) Repeat with collections of dots that make a square, a rectangle, and a shape with five sides. To check that students have seen the pattern, ASK: If I want to draw a shape with six vertices, how many dots do I need to draw? (6) What if I want to draw a shape with eight vertices? (8) Students can signal each answer by raising the correct number of fingers.

**Exercises:** Draw a shape with the given number of vertices.

- a) 3 vertices
- b) 5 vertices
- **Bonus:** 9 vertices

**Sample answers**

- a)  
- b)  
- **Bonus:**

Ask students to trade drawings with a partner and to count the sides of each other’s shapes.

**Vertices of open lines.** Draw on the board:
ASK: Are these shapes? (no) What are they? (lines) Are these lines open or closed? (open) How do you know? (sample answers: the line does not return where it started; it has two loose ends) SAY: When two sides meet at a point, they make a vertex. Loose ends are not vertices. Each line on the board has one vertex and two sides.

Draw the open lines shown below, one at a time, and ASK: How many vertices does this open line have? Have students signal the answers.
(a) 1, b) 2, c) 3, d) 4)

Exercises: How many sides does the line have? How many vertices?
 a)
 b)
 c)
 d)

Bonus:

Answers: a) 3 sides, 3 vertices; b) 4 sides, 3 vertices; c) 5 sides, 5 vertices; d) 2 sides, 2 vertices; Bonus: 4 sides, 4 vertices

SAY: If the sides of a line or a shape are straight, every bend is a vertex. When we have curved sides, not every bend is a vertex, only the pointy bends are vertices. 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) Why not, if the line bends here? (because it isn’t pointy)

Describing shapes. Draw a square on the board and write the following phrases below it: “4 sides,” “4 vertices,” “closed.” Point to each phrase and ask students to show thumbs up if the phrase says something that is true of the shape, and thumbs down if it does not. Repeat, using the shapes and phrases in the following exercises.

Exercises: Is this correct?
 a)
 b)
 c)
 d)

☐ 4 vertices  ☐ 4 vertices  ☐ 4 vertices  ☐ 4 vertices
☐ 4 sides  ☐ 4 sides  ☐ 4 sides  ☐ 4 sides
☐ closed  ☐ closed  ☐ closed  ☐ closed
Draw on the board:

SAY: One of these shapes has all sides straight. ASK: Which one? (shape 2) Students can signal the answer by raising the correct number of fingers. ASK: Which shape has all sides curved? (shape 3) SAY: Shape 1 has some curved sides (trace them with a finger) and some straight sides (trace them with a finger as well).

Work through the following exercises in the same way you did the previous exercises.

**Exercises:** Is this correct?

- **a)**
  - all sides curved
  - all sides straight

- **b)**
  - all sides curved
  - all sides straight

- **c)**
  - all sides curved
  - all sides straight

- **d)**
  - all sides curved
  - all sides straight

- **e)**
  - all sides curved
  - all sides straight

- **f)**
  - all sides curved
  - all sides straight

- **g)**
  - all sides curved
  - all sides straight

- **h)**
  - all sides curved
  - all sides straight

**Answers:**
- a) no, no; b) no, yes; c) no, no; d) yes, no; e) yes, yes; f) yes, yes; g) yes, yes; h) no, no
**ACTIVITY**

Give each student a yarn circle and five to eight attribute blocks from **BLM Attribute Blocks**. Each student should have at least one shape with all sides straight, one shape with all sides curved, and one shape with both. Have students put the blocks with all sides straight inside the yarn circle. **ASK:** Where are the blocks with all sides curved: inside or outside the circle? (outside) Have students separate the shapes outside the circle into two piles: shapes with all sides curved and the rest (shapes with some straight sides and some curved sides)

**Variation:** Have students place all shapes with four sides inside the circle.

**Extensions**

1. Draw a shape with the same number of curved and straight sides.
   
   **Sample answer:**

   ![Sample answer](image)

2. Draw a shape with more than 3 sides and less than 5 sides.
   
   **Sample answer:**

   ![Sample answer](image)

3. Give students **BLM 2 cm Dot Paper**. Have students copy each shape below onto the BLM, then count the sides and the vertices.

   ![Shapes](image)

   **Answers:** a) 4 sides, 4 vertices; b) 5 sides, 5 vertices; c) 12 sides, 12 vertices; d) 16 sides, 16 vertices
4. Tessa has 2 teddy bears. Bob has 2 more teddy bears than Tessa. Grace has 3 more teddy bears than Tessa. How many teddy bears does Grace have? Explain.

Answer: Grace has 5 teddy bears.

Redirecting students: Ensure students read all the names carefully. Only the first sentence and the third sentence are actually needed. Ensure students label their pictures clearly. Have students check with a partner that they drew the same pictures. If not, reread the facts.

Whole-class follow-up: ASK: What fact did you not need to use? (how many more teddy bears Bob has than Tessa) Tell students that in real-life problems, they often know a lot of facts that they don’t need to use to answer a question, and to be a problem-solver means to figure out what facts you do need and focus on those.
Goals
Students will identify squares and rectangles by their attributes and draw shapes that possess or lack the defining attributes of squares and rectangles.
Students will compare the length of sides of a shape to determine whether the sides are equal.

PRIOR KNOWLEDGE REQUIRED
Knows the word “shape”
Can identify straight and closed lines
Can identify and count sides and vertices of shapes
Can identify rectangles and squares visually
Can compare lengths directly and indirectly
Can use a ruler to measure
Can fold paper along a line

MATERIALS
large paper square
yarn circles
BLM Attribute Blocks (pp. P-16–17)
BLM Square or Not? (p. N-65)
BLM 2 cm Dot Paper (p. N-64), at least 2 copies per student
paper rectangle, enlarged from BLM Rectangle or Square? (p. N-66)
BLM Rectangle or Square? (p. N-66)
scissors
strips of paper
pattern block squares cut from BLM Pattern Blocks (p. P-18, see Extension 2), 6 per student

Being a square does not depend on size, color, or pattern. Show students a large paper square. ASK: What shape is this? (a square) Divide the board in two. Trace the paper square on one side of the board so that one side is parallel to the ground. ASK: Is this a square? (yes) How do you know? (it is the shape of a square) Draw a smaller square in the same position (i.e., one side parallel to the ground) and ask the same questions. Draw more squares of varying sizes and colors, but again not rotated. Add a pattern (e.g., a dotted pattern) to some squares. ASK: Do the dots change the shape? (no) Is it still a square? (yes) Label the shapes you’ve drawn “squares.”

ACTIVITY 1
Give students yarn circles and attribute blocks from BLM Attribute Blocks (but do not include shapes with curved sides). Ask students to place the squares inside the yarn circle.
Label the second half of the board “not squares.” Have volunteers come to the board and draw one of the shapes they sorted in Activity 1 that is not a square. Encourage other volunteers to draw larger or smaller versions of their shapes, to use different colors, and to add patterns.

**Being a square does not depend on position.** Hold up the paper square used earlier and SAY: This is a square. Turn the square a little and ASK: If I turn it a little, is it still a square? (yes) If I turn it more? (yes) Affix the square to the board in a slightly rotated position, so that no side is parallel to the ground. Trace and remove the paper square. ASK: Is this shape a square? (yes) How do you know? (it is the same square, only turned a little) Repeat several times, increasing the angle of rotation, until a vertex is at the bottom. Emphasize that the shape did not change; you only turned it. The final picture should look similar to this:

![Square shapes](image)

**Exercises:** Is this a square?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>b)</td>
<td>c)</td>
<td>d)</td>
</tr>
<tr>
<td>e)</td>
<td>f)</td>
<td>g)</td>
<td>h)</td>
</tr>
</tbody>
</table>

**Answers:** a) no, b) yes, c) no, d) no, e) yes, f) no, g) yes, h) yes

**ACTIVITY 2**

Have students work through **BLM Square or Not?** Students will add one missing side to various shapes and decide whether the completed shapes are squares. Students should first predict whether each shape is a square. Point out that students can rotate the paper to check visually whether the shape is a square. (1. no, 2. no, 3. no, 4. yes, 5. yes, 6. no) **NOTE:** For Question 3, students might draw two lines to form a rectangle, instead of one line to form a triangle. Either way, the resulting shape is not a square.

**Squares have four sides and four vertices.** Point to one of the non-rotated squares on the board. ASK: How many sides does the square have? (4) Have a volunteer number and count its sides. Repeat for vertices. Repeat for a square of a different size and a square that is rotated. Ask students to pick one of the squares in their collection of attribute blocks and to count the vertices and sides. 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 a shape like a square, but with one side curving inward. 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 all the squares you have on your desk have all straight sides? (yes) SAY: All squares have all straight sides.

**A square is a closed line.** Draw on the board:

![Square diagram]

ASK: Is this a closed line or an open line? (open) Is this a square? (no) Why not? (one side has a break in it) Have a volunteer fix the drawing so that it is a square. ASK: Is a square a closed or an open line? (closed) SAY: All squares are a closed line.

Give students **BLM 2 cm Dot Paper**. Ask them to draw a square. Then ask them to draw a second square that is either larger or smaller than the first square. SAY: Now I want you to draw a shape or a line that is not a square. After students have done so, invite volunteers to show their shape on the board and explain why it is not a square. If students produce pictures that are not closed lines, or have curved sides, or have more/fewer than four sides and vertices, students should refer to these characteristics in their explanation (for example, this shape have a curved side but squares have only straight sides).

**Introduce rectangles.** Introduce rectangles as you did squares:

- Hold up a large paper rectangle and SAY: This is a rectangle.
- Trace the rectangle on one side of the board (with one side parallel to the ground).
- Draw more rectangles on the board (different sizes, colors, patterns) and label them “rectangles.”

Use prompts to help students conclude that rectangles are closed shapes with four straight sides and four vertices. Turn (rotate) a rectangle several times. Emphasize that whether a shape is a rectangle does not depend on pattern, color, size, or position.

**Exercises:** Is this a rectangle?

a) ![Rectangle 1](image1)  
b) ![Rectangle 2](image2)  
c) ![Rectangle 3](image3)  
d) ![Rectangle 4](image4)  
e) ![Rectangle 5](image5)  
f) ![Rectangle 6](image6)  
g) ![Rectangle 7](image7)  
h) ![Rectangle 8](image8)

**Answers:** a) no, b) yes, c) yes, d) no, e) no, f) no, g) yes, h) yes

Have students draw three different rectangles on another copy of **BLM 2 cm Dot Paper**. Have students draw a shape with four sides and four vertices that is not a rectangle.
Length of sides in a square and rectangle. Distribute BLM Rectangle or Square? and have students cut out the rectangle and the square. Hold up your large paper rectangle. Run your finger along one of the shorter sides and ask students how they could check which sides of the rectangle are longer than this side. Point to one of the longer sides. ASK: Is this side longer? (yes) How can we check? (answers may vary) Fold the shorter side down toward the longer side to compare, as shown below:

Have students fold the rectangle they each cut out, to check that it also has two longer sides and two shorter sides. SAY: If you look at each vertex in a rectangle, you see that two sides meet—one long side and one short side.

Point to the top side of the rectangle (it doesn’t matter if it’s a long side or a short side). ASK: Are any other sides the same length as this side? (yes) Which sides? (the bottom side) How can we check? (by folding) Fold the rectangle to show that the bottom and the top sides are the same length.

Unfold the rectangle and repeat the questioning and folding with the adjacent side. Have students do that with their rectangles. The folds should look like this:

SAY: The opposite sides—the sides across from each other in a rectangle—are the same length. The shorter sides are the same length, and the longer sides are the same length.

Repeat the sequence of folds and questions with the square and have students do the same. SAY: All four sides in a square are the same length. We say that these sides are equal. In a square all four sides—the sides that meet at a vertex and the opposite sides—are the same length; they are equal.

Distinguishing between squares and rectangles by comparing lengths of sides. ASK: Do you think all squares have four equal sides? (yes) Have students cut out the Mystery Shapes from BLM Rectangle or Square? Hold up one of the enlarged Mystery Shapes and SAY: I don’t know if this is a square. I can check by folding. If it has opposite sides that are longer than the other sides, it is a rectangle, not a square. If the sides that share a vertex (trace two adjacent sides with a finger) are the same length, it is a square. Have students fold the shapes to check that both are rectangles. You might suggest that students mark “L” for longer and “S” for shorter on the sides as they compare them. This will allow students to recall what they determined when the Mystery Shapes are unfolded.

Ask students to share their findings. Encourage the use of correct terminology, such as “sides,” “equal,” “longer,” “shorter,” and so on.
**Identifying squares by comparing sides indirectly.** Draw several rectangles and squares on the board. (Some should be slightly rotated, to make it harder to see whether they are rectangles or squares.) SAY: I cannot fold these shapes to check if they are squares. Line up the top edge of a strip of paper just below one side of the shape on the board, matching the left corners. Make a mark on the paper, at the right side of the shape, to show the length of the side. Hold the strip against the other sides to see if they are the same length. Ask a volunteer to put a check mark on all of the sides that are the same length.

Have students use strips of paper to check that the squares they drew on dot paper earlier in the lesson have four equal sides.

**Exercises:** Is this true?

- a) [ ] all sides equal  [ ] 4 sides  [ ] 4 vertices  [ ] square
- b) [ ] all sides equal  [ ] 4 sides  [ ] 4 vertices  [ ] square
- c) [ ] all sides equal  [ ] 4 sides  [ ] 4 vertices  [ ] square
- d) [ ] all sides equal  [ ] 4 sides  [ ] 4 vertices  [ ] square

**Answers:** a) yes, yes, yes, yes; b) no, yes, yes, no; c) yes, yes, yes, yes; d) no, yes, yes, yes

**Squares and rectangles in the world.** Point to various objects around the room (doors, windows, books, and so on) and ask if these shapes look like squares or rectangles. Students can compare the faces of 3-D objects in the classroom with the squares and rectangles drawn on the board. Have volunteers identify other objects that involve squares and rectangles.

**Extensions**

1. Students in another class make shapes with straws. They use one straw for each side of each shape. The shapes do not touch.

   a) Mark makes squares. How many pieces of straw does he need to make 2 squares? 3 squares? 4 squares?

   b) Nina makes rectangles. How many pieces of straw does she need to make 2 rectangles? 3 rectangles? 4 rectangles?

   c) Who needs more pieces to make 2 shapes, Mark or Nina? 3 shapes? 4 shapes?
Answers: a) 8, 12, 16; b) 8, 12, 16; c) They both need the same number of pieces for the same number of shapes.

(MP6) 2. Have students create rectangles using up to six pattern block squares. Have them trace their rectangles in their notebooks and tell how the rectangles are different.

Sample answer: This rectangle is 3 squares wide and 2 squares tall. The other one is wider: it is 6 squares wide, but only 1 square tall.

(MP3) 3. Alex solved the given problem. Do you agree with Alex’s thinking? Why or why not?

a) Matt gives away 11 books. He has 8 books left. How many did he have to start with?

Alex says: He has 8 books left, and “left” means subtract, so I should subtract 11 − 8. He started with 3 books.

b) Lily gives away 5 shirts. Then she gives away 3 more shirts. How many shirts did she give away altogether?

Alex says: She gives away 3 shirts, and when you give things away, the number gets smaller, so I should subtract 5 − 3. She has 2 shirts.

Answers: a) no, because the amount left should be added to the amount Matt gives away to get how many he started with—just because most problems with the word “left” are done by subtraction doesn’t mean they all are; b) no, you have to add 5 + 3 to get the amount Lily gave away in total—just because the action is giving away doesn’t mean it’s subtraction

Whole-class follow-up: After taking up the solutions, emphasize the importance of reading all the facts and the question carefully. SAY: You can’t just read a few words and think you know how to do the problem.
G1-4 Square Corners
Pages 169–170

STANDARDS
1.G.A.1

VOCABULARY
closed
equal
longer
open
rectangle
shape
shorter
side
square
square corner
straight
vertex
vertices

Goals
Students will count vertices and identify square corners on a shape.
Students will compare side lengths to see if all sides of a shape are equal.
Students will compare squares and rectangles that are not squares and say how they are similar and different.

PRIOR KNOWLEDGE REQUIRED
Can identify squares and rectangles
Can identify and count sides and vertices of shapes
Can perform direct and indirect comparison of length

MATERIALS
4 toothpicks per student
attribute blocks from BLM Attribute Blocks (2) (pp. P-16–17)
yarn circles
pattern block square for each student cut from BLM Pattern Blocks (p. P-18)

Make different four-sided shapes. The following activity gives students an opportunity to make and see different types of corners, as preparation for learning about a defining attribute of squares and rectangles.

ACTIVITY 1
Make shapes with toothpicks. Give each student four toothpicks of the same length and ask them to create a shape with four sides. Ask them to copy the shape in their notebooks. Then ask students to make a different shape, using the same four toothpicks. Have students copy this shape in their notebooks too. You may need to remind students that shapes are closed, not open. (NOTE: Making a different shape requires changing the corners and “squashing” the square.)

Invite volunteers to draw different shapes they made during Activity 1 on the board. Make sure one of the answers is a square. Ask students to place the toothpicks together and to check that they are all the same length. Remind students that when sides of a shape are the same length, we say the sides are equal. ASK: What is common to all the shapes you made from toothpicks? (they all have four equal sides) Do we have a square on the board? (yes) SAY: Squares have four equal sides, but all the other shapes also have four equal sides. ASK: How can we explain that these shapes are not squares? Record students’ ideas on the board.
**Introduce square corners.** Explain that squares are different from all other shapes on the board because they have special corners. SAY: When two sides meet at a vertex the same way that they meet in a square, we say that they make a *square corner*.

Draw on the board:

1
2
3

ASK: Which picture looks like a corner of a square? (picture 1) Students can signal the answer by raising the correct number of fingers. Show students a square pattern block and ask them to identify the shape. SAY: We can use this square to check if these sides make a square corner. If the square fits the corner exactly, the corner is a square corner. Demonstrate how to place the square, as shown below:

- matches exactly a square corner
- does not match exactly not a square corner
- does not match exactly not a square corner

Emphasize that a vertex of the square is placed directly at the vertex of the shape. SAY: We can draw small squares in square corners to label them. Draw a small square in the first picture above.

**ACTIVITY 2**

**Identifying square corners.** Give each student at least six shapes from *BLM Attribute Blocks (2)*, a yarn circle, and a pattern block square. Make sure each student has either the dotted rhombus or the black triangle, to ensure that at least one of their shapes has all sides the same length. Have students find all shapes that have at least one square corner and place them inside the circle. Students should match the vertices of the shapes and the corners of the pattern block to identify square corners.

**Counting vertices and square corners.** Draw on the board:

Have students count the number of vertices in the shape and signal their answer by raising the correct number of fingers. (4) Have a volunteer number each vertex and write the total number of vertices underneath the shape. ASK: Does this shape have square corners? If students show thumbs up, point to the vertices one at a time and have students signal whether the corner looks like a square corner. If the answer is yes, have a volunteer...
check that the vertex is a square corner using a pattern block square. Have the volunteer count the square corners. (this shape has 2 square corners)

Repeat with the following shapes:

(a) 4 vertices, 4 square corners; b) 3 vertices, 1 square corner; c) 5 vertices, 2 square corners; d) 5 vertices, 0 square corners

**NOTE:** As you talk about identifying rectangles and squares based on side length, some students might realize or know that a square is a rectangle by definition. This is not a mistake. Explain that a square is a special kind of rectangle, just as a Siamese cat is a special kind of cat or a poodle is a special kind of dog. But in this lesson, when you use the word “rectangle,” you will mean a rectangle that is not a square.

**Identifying rectangles and squares based on square corners and side length.** Draw a square on the board. Remind students that they can compare the lengths of the sides by placing a piece of paper along one side and marking the length of the side, then lining up and comparing this length to the other sides. Have a volunteer demonstrate the method. ASK: Does a square have all equal sides? (yes)

Ask students to check the shapes they sorted during Activity 2 and find the shapes that have all equal sides. Instead of using a strip of paper, students can mark the length of a side in their notebook and rotate the shape to check the other sides.

Draw on the board a rectangle that is not a square. ASK: Are all the sides equal? (no) Point to one side of the rectangle and ASK: Is there another side that looks like it is the same length as this one? (yes, the side that is opposite the one you are pointing at) Color the pair of opposite sides with the same color. Point to one of the unmarked sides and ask if the side across from it has the same length. (yes) Color these sides with a different color. Repeat this exercise with several rectangles, rotated in various positions. SAY: In each rectangle, there are two shorter sides and two longer sides. The two shorter sides are always the same length and the two longer sides are always the same length. ASK: Among the shapes you sorted, are there other shapes that have two longer sides the same length and two shorter sides the same length? (sample answers: gray parallelogram, dotted rectangle, and kite)
**Exercises:** Is it true?

a) □ all sides equal
□ all square corners
□ square

b) □ all sides equal
□ all square corners
□ square

c) □ all sides equal
□ all square corners
□ square

d) □ all sides equal
□ all square corners
□ square

e) □ 2 short sides and
□ 2 long sides
□ all square corners
□ rectangle

f) □ 2 short sides and
□ 2 long sides
□ all square corners
□ rectangle

g) □ 2 short sides and
□ 2 long sides
□ all square corners
□ rectangle

h) □ 2 short sides and
□ 2 long sides
□ all square corners
□ rectangle

**Answers:** a) yes, yes, yes; b) yes, no, no; c) no, yes, no; d) no, no, no; e) no, no, no; f) no, no, no; g) yes, yes, yes; h) yes, no, no

Ask students to pick one shape that is not a square in the previous exercises and explain why it is not a square. Have several students share answers, using different shapes. Make sure students mention that the sides are not all equal or that some vertices do not have square corners. Repeat for shapes that are not rectangles. (parts b, d, e, f, h)
Extensions

1. Circle the shape that does not belong. Explain your choice.

a) 

b) 

c) 

d) 

Sample answers
a) square, because the other shapes have 3 sides
b) triangle, because the other shapes have 4 sides; or the shape on the right, because the other shapes have square corners
c) circle, because the other shapes have straight sides or because they have vertices
d) rectangle, because it is the only shape with all square corners

NOTE: Many answers are possible—students just have to identify and describe what makes one shape different from all the others.

2. a) Do all the corners of a square match? How can you fold a paper square to check?

b) Do all the corners of a rectangle match? How can you fold a paper rectangle to check?

Answers: Fold each shape in two twice, so that all the corners fall one on top of the other, as shown below:

3. Find a fast way to subtract 52 – 42.

Answer: 52 is 10 more than 42, so 52 – 42 = 10.

Individual or small-group follow-up: If students do not see the fast way to subtract, encourage them to find the answer using tens and ones blocks. Then ask them to explain why they could have predicted that answer. (they are taking away all of the ones blocks and 4 of the 5 tens blocks, leaving only 1 ten) Encourage students to do similar subtractions (for example, 83 – 73 and 45 – 35) and look for what is the same in each, and then to express that regularity (MP8) by creating more examples that also have answer 10.
Goals

Students will identify triangles by their attributes and draw shapes to possess or lack these attributes.

PRIOR KNOWLEDGE REQUIRED

Knows the word “shape” and what it means
Can identify and count sides and vertices
Can identify open and closed lines

MATERIALS

large paper equilateral triangle
overhead projector
transparency of BLM Triangles and Not Triangles (p. N-67)
yarn circles
BLM Attribute Blocks (pp. P-16–17)
BLM Finding Triangles (p. N-68)
geoboards
BLM 2 cm Dot Paper (p. N-64)

Being a triangle does not depend on size, color, or pattern. Show students a large paper triangle with equal sides (the shape of a pattern block triangle). SAY: This shape is called a triangle. Trace the triangle on the board:

△

Tell students you are going to ask them some questions about triangles and they can signal their answers using thumbs up for yes and thumbs down for no. To start, draw a smaller triangle in the same position (with one side parallel to the ground) and ASK: Is this a triangle? (yes) SAY: Size does not determine whether or not a shape is a triangle. As long as the shape has three straight sides and is closed, it is a triangle. ASK: Does color determine whether a shape is a triangle? (no) Draw a red triangle and ASK: Is it a triangle? (yes) Add dots to the triangle and ASK: Does a pattern affect whether it is a triangle? (no) Is this still a triangle? (yes) Change the pattern to stripes and ASK: Is this still a triangle? (yes)

SAY: Pattern and color do not affect whether a shape is a triangle. As long as the shape has three straight sides and is closed, it is a triangle.

Being a triangle does not depend on position. Hold up the large paper triangle used earlier and SAY: This is a triangle. Rotate the triangle a little, and ASK: Is this still a triangle? (yes) How do you know? (sample answer: the shape is the same, just turned a little) Turn the triangle a bit more and
repeat. Post the triangle on the board in a slightly rotated position. Trace and remove the paper triangle. ASK: Is this shape a triangle? (yes) How do you know? (sample answer: it is the same triangle, just slightly turned) Repeat several times, increasing the angle of rotation (see picture below). Emphasize that the shape did not change; you only turned it. The final picture should look similar to this:

Introduce non-equilateral triangles. Project BLM Triangles and Not Triangles, displaying only the triangles (cover the bottom half of the BLM). Explain to students that all these shapes are called triangles, even though they look different. To explore these differences, ASK: How do the triangles change across each row? (they get taller, fatter, they bend to the right, and so on) Students can also show with their hands or whole bodies how the triangles change.

ACTIVITY 1

Give students a yarn circle and 8 to 10 blocks from BLM Attribute Blocks (use shapes with straight sides only). Ask students to put all the triangles into the yarn circle.

Introduce non-triangles. Project only the bottom half of BLM Triangles and Not Triangles. Explain that these shapes are not triangles. Hold up some paper shapes or attribute blocks, both triangles and not triangles, and ask students which group on the BLM they belong with. Invite volunteers to draw shapes and decide as a class whether the shapes are triangles or not triangles.

Provide students with BLM Finding Triangles. Students will determine which shape in each group is a triangle. (The letters inside the triangles spell the word “coyote.”)

Triangles have three sides and three vertices. ASK: What do we call the point where two sides meet? (a vertex) Ask students to count the vertices on the triangles they have in their collection of shapes from Activity 1. ASK: How many vertices does each triangle have? (3) Do any of your shapes that are not triangles have three vertices? (no) SAY: All triangles have three sides and three vertices.

Why is this not a triangle? Draw on the board:

\[ \sqrt{ } \]

ASK: How many sides does this line have? (3) How many vertices does this line have? (2) Is this a triangle? (no) Why not? (triangles have 3 vertices, triangles are closed)
Repeat with the two lines shown below:

Emphasize again that a triangle has three straight sides and three vertices, and is a closed line. If a shape has a different number of sides or vertices, it cannot be a triangle. A shape with even one curved side is not a triangle.

**Exercises:** Does it have 3 sides? 3 vertices? Is it a triangle?

a) ![Shape](image1)

b) ![Shape](image2)

c) ![Shape](image3)

d) ![Shape](image4)

e) ![Shape](image5)

f) ![Shape](image6)

**Answers:** a) yes, yes, yes; b) yes, no, no; c) no, no, no; d) yes, yes, yes; e) yes, yes, no; f) yes, yes, no

Ask volunteers to pick lines and shapes from the exercises above that are not triangles and explain why they are not triangles. Have students each pick a shape in their collection that is not a triangle and explain to each other why the shape they picked is not a triangle.

**ACTIVITY 2**

Have students create triangles on geoboards. Ask students to move one vertex of the triangle. **ASK:** Is the resulting shape still a triangle? Encourage students to make more changes to their triangles, so that the resulting shapes have sides of different lengths. Ask them to try to create a triangle with a square corner. Have students draw at least three of the triangles they created on dot paper. They can use **BLM 2 cm Dot Paper.** Ask students to draw a shape with three sides that is not a triangle. *(it will be a closed shape, with at least one curved side)*

**Triangles in the world.** After students have completed all the AP Book questions for this lesson, point to various objects around the room and **ASK:** Is this in the shape of a triangle? How do you know?

**Extensions**

1. Students in another class make shapes with straws. They use one straw for each side of each shape. The shapes do not touch each other.

   a) Jayden makes 3 triangles. How many straws does he use?

   b) Sara makes a shape with 5 sides. Ken makes 2 triangles. Who uses more straws?

**Answers:** a) 9, b) Ken
2. Draw a shape with more sides than a triangle but fewer than 5 sides. How many sides does your shape have?

**Answers:** Shapes will vary. They will have 4 sides.

3. Find a fast way to subtract $52 - 42$.

**Answer:** $52$ is 10 more than 42, so $52 - 42 = 10$.

Individual or small-group follow-up: If students do not see the fast way to subtract, encourage them to find the answer using tens and ones blocks. Then ask them to explain why they could have predicted that answer. (they are taking away all of the ones blocks and 4 of the 5 tens blocks, leaving only 1 ten) Encourage students to do similar subtractions (for example, $83 - 73$ and $45 - 35$) and look for what is the same in each, and then to express that regularity (MP8) by creating more examples that also have answer 10.
Goals
Students will divide shapes into smaller shapes by folding or drawing lines.
Students will create polygons from tangram pieces.

PRIOR KNOWLEDGE REQUIRED
Can identify triangles, rectangles, and squares
Can draw a straight line using a ruler
Can fold paper along a line

MATERIALS
paper squares
4 rectangular sheets of paper per student
scissors
magazine pages with pictures
BLM Tangram (p. N-69, see Extension 1)
BLM Tangram Puzzles (pp. N-70–73, see Extension 1)
Grandfather Tang’s Story by Ann Tompert

Making shapes from a given shape. Give each student a paper square. Ask students to fold the paper so that, when they unfold it, they see two triangles. (Students should fold the square along the diagonal.) ASK: Can you make other shapes just by folding the paper a different way? (yes) How many sides and vertices do your shapes have? Have many students share different folds. Examples:

2 rectangles

a triangle and a shape with 5 sides

Exercises: What shapes do you get if you cut along the dotted lines?

a)    b)    c)    

triangle    triangle    triangle
rectangle   rectangle   rectangle
square      square      square

Answers: a) triangle; b) triangle, rectangle; c) triangle, square

Folding rectangles in different ways. Give students four rectangular sheets of paper. Have students fold one sheet in two, so that the opposite sides line up, then unfold it. Recall that there are two ways to do this (see diagrams on the following page).
ASK: What shapes do you see? (rectangles) Did everyone make the same rectangles? (no) Have students share the different rectangles they made. Have students fold the second sheet the other way, so that they have two sheets folded in two different ways. Have students unfold their sheets and compare the rectangles they made.

Ask students to fold another sheet in two (as they just did) and fold it in two again, so that opposite sides line up. Demonstrate the different folding options that produce the unfolded sheets shown below:

Have students unfold their sheets completely and identify the shapes (rectangles). ASK: How many pieces did you make? (4 pieces after 2 folds) Are all the pieces the same shape? (yes) Did everyone get the same pieces? (no) Have several volunteers share the answers.

Repeat with three folds.

**ACTIVITY**

Give each student a (rectangular) magazine page with pictures on it. Show students how they can create triangles by folding a rectangle diagonally and then cutting along the fold. They should continue folding and cutting the resulting triangles to make more triangles. Have students make as many triangles as they can in three minutes and then reassemble the rectangles using the pictures as a guide. **NOTE:** If students find it difficult to fold the magazine page diagonally, they can place a ruler along the diagonal joining the vertices, and then fold the page against the ruler to help make the crease.

**Extensions**

1. **Tangrams.** Give students a copy of **BLM Tangram.** Have students cut out the shapes.
   
a) Have students find the square and create a square using two of the shapes.
   
   **Bonus:** Have students create a square using two small triangles and one medium triangle.
   
b) Have students create a square using four triangles. Hint: One of the large triangles is not needed.
c) Have students find two ways to create the shape below using only two shapes.

\[ \square \]

d) Distribute BLM Tangram Puzzles. Explain that 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.

e) Ask students to create squares using from one to five tangram shapes. ASK: How many different squares can you create? Can you create different rectangles? Other shapes with four sides? Shapes with five or six sides?

f) Have students use tangram shapes to create a picture of their own. Have students trace the border of their shape and have partners re-create the shape.

g) Literature Connection: Grandfather Tang’s Story by Ann Tompert. Grandfather tells a story of a shape-shifting fox. Give students outlines of shapes of animals presented in the book and have them create the shapes from tangram pieces.

Answers

a) Bonus:

\[ \square \]  \[ \triangle \]

b) \[ \square \]  \[ \triangle \]

c) Sample answers

\[ \square \]  \[ \triangle \]

\[ \square \]  \[ \triangle \]

d) 

\[ \square \]  \[ \triangle \]

[diagram]

e) Sample answers

\[ \square \]  \[ \triangle \]

[diagram]

(MP.7) 2. A shape is missing from the square. Which shape is it? Explain.

\[ \square \]

A.  \[ \triangle \]  B.  \[ \triangle \]  C.  \[ \triangle \]  D.  \[ \triangle \]
Answers: A is too tall and D is too short, so only B and C might fit. But in C, the two sides that are not on the bottom are equal—the missing shape has no equal sides, so the answer is B.

3. At a fair, Tina is deciding whether to go to the roller coaster or the bumper cars. She wants to join the line with the fewest people. She counts 17 adults and 28 children in the line for the roller coaster. She counts 14 adults and 36 children in the line for the bumper cars. Which line should she choose? Use any tool you think will help.

Sample solution: I used paper and pencil:

<table>
<thead>
<tr>
<th>Roller coaster</th>
<th>Bumper cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Roller coaster diagram]</td>
<td>![Bumper cars diagram]</td>
</tr>
</tbody>
</table>

4 tens and 5 ones is 45 5 tens and 0 ones is 50

45 < 50, so Tina should line up for the roller coaster.
Goals
Students will compose and decompose 2-D shapes.

PRIOR KNOWLEDGE REQUIRED
Can fold paper along a line
Can identify and count sides and vertices
Can identify triangles, squares, and rectangles
Can compare length directly

MATERIALS
pattern blocks cut from BLM Pattern Blocks (p. P-18), at least 3 of each shape per student
divider (e.g., 1-inch binder) for each pair of students
overhead projector

Create given shapes from simple 2-D shapes. Distribute pattern blocks to students. Explain that they are called pattern blocks because students can put the blocks together to make different patterns or pictures. Explain that some of the blocks have special names. Draw on the board:

triangle  square  rhombus  trapezoid  hexagon

Read the names with students, and keep the pictures of the blocks and the names for reference on the board. NOTE: Students are not expected to use the terms “rhombus,” “trapezoid,” or “hexagon” consistently. Always provide the picture of the block or show the block itself; if you use the name of the block, refer to its color also.

Draw the following patterns on the board and have students make them using their pattern blocks:

ACTIVITY 1
Set a divider (e.g., an upright, open binder) between each pair of students. Each partner chooses two pattern blocks, puts them together to make a shape, and traces the outline of the new shape. Partners trade outlines and try to identify the two blocks used to create the shape by placing different blocks onto the outline. Repeat several times with different designs.

Variation: Ask students to use three blocks.
Decomposing shapes. Put two pattern block triangles side by side on an overhead so that students see the shadow of a rhombus projected on the board. (Don’t let students see the blocks.) ASK: How many sides does this shape have? (4) Have students find a pattern block that has the same shape as the shadow. When students identify the correct shape, display a blue rhombus to show that it does, in fact, produce the same shape. Explain that you used two other shapes to produce the four-sided shape of the shadow. Show students the triangles. Ask them to place two triangles so that they produce the same shape as the shadow—they can use the rhombus pattern block to help them.

Put two different pattern blocks side by side (again, don’t let students see the blocks). Ask students to choose two pattern blocks and to place them so that the shape they create has the same shape as the shadow. When students are comfortable working with two blocks, make shapes with three blocks and four blocks—but do not tell students how many blocks you used. Each time, ask students to say how many sides the shape has and to re-create it. Examples:

Encourage multiple solutions whenever possible. Students with different pattern block combinations can check whether their shapes match by superimposing their arrangements.

ACTIVITY 2

Creating complex 2-D shapes from combinations of other shapes. Students work in groups of four, using pattern blocks. Player 1 makes a design using two blocks. The other players make the same design using their own blocks. The group puts their designs together to make a bigger design. For example, the students might each make a house shape with a square and a triangle and then put their houses together to make a row of houses or an abstract design.

Repeat with different pairs of blocks, so that each student in the group gets a chance to create a design that others must copy and then put together. If time allows, repeat with designs made of three or more blocks.

Extensions

1. Make a hexagon \( \bigcirc \) using 3 pattern blocks. How many different ways can you do it?

   Answers: \( \square \)
2. **Create designs from pattern blocks and describe designs.** Show students the hexagonal shape below created from pattern blocks:

![Hexagon](image1.png)

Ask them to describe the shape. **PROMPTS:** How many blocks are used in this shape? (3) Which shapes are on the top? (the blue block and the green block; the triangle and the blue rhombus) Which shape is on the bottom? (the red block; the trapezoid) Repeat with the designs below:

![Designs](image2.png)

Set a divider (e.g., an upright, open binder) between each pair of students. Player 1 creates a design from pattern blocks and describes the design to her partner, who has to recreate the design according to the description. Players compare their designs and switch roles.

3. Students select some shapes and combine them to compose a bigger shape. Students count the number of sides on their individual shapes and predict how many sides the final shape will have, before they make it. Then they count the number of sides on the final shape and compare the answer to their prediction. Share and discuss results as a class. **Example:** A triangle has three sides and a square has four sides. Many students may predict that the house the two shapes make when put together will have seven sides (because $3 + 4 = 7$). Students will find that it has only five. **ASK:** Why does the final shape have fewer sides than the two shapes together? (some sides are put together and are now on the inside of the shape)

(MP.7)  

---

4. Tony makes this shape using pattern blocks.

![Triangle](image3.png)

a) What shapes did he use?  

b) Make the same shape using only six pattern blocks. Find as many ways as you can.
Sample answers

Individual or small group follow-up: Encourage students to look for shapes with some corners that match those of the given shape. Show students how to check for matching corners by placing the shape on top of the given shape. ASK: Can you fit one corner inside of the other or do they match? After students complete the puzzle, ASK: How did it help to look for matching corners?
Goals

Students will identify circles by their attributes.
Students will identify half circles and quarter circles.

PRIOR KNOWLEDGE REQUIRED

Knows the word shape and what it means
Can identify and count sides and vertices
Can identify closed and open lines
Can identify square corners

MATERIALS

thin strip of paper for demonstration
attribute blocks from BLM Attribute Blocks (1) (p. P-16)
various objects such as string, connecting cubes, pipe cleaners, blocks, popsicle sticks, and toothpicks for each group
paper circles from BLM Circles (p. N-74), 2 per student and for demonstration
scissors
pattern blocks cut from BLM Pattern Blocks (p. P-18), a set for each student

Review straight and curved sides. Draw the shapes below on the board, one at a time. For each shape, ASK: How many sides does this shape have? Point to each side in turn and ASK: Is this side straight or curved? Students can show the letter C with their fingers to signal a curved side, and show their hand flat and straight up to signal a straight side.

Review closed lines. Draw on the board:

SAY: These are two paths. Point at the person on the open path and ASK: What will happen as this person walks along the path? (the person will eventually come to the end of the path) Point at the person on the closed path and ASK: Will this person ever come to the end of the path? (no) Why not? (there are no ends) SAY: A path or a line that has no ends is called closed. Draw several curved lines (without corners), both closed and open, and ask students to signal thumbs up for closed lines and thumbs down for open lines. Remind students that sides can meet at vertices.
Exercises: Is this line closed?

a)  

b)  

c)  

d)  

Answers: a) yes, b) no, c) no, d) yes

For each shape in the previous exercises, ASK: How many sides does this shape have? How many vertices? How many straight sides does this shape have? Have students signal the answers. (a) 4 sides, 4 vertices, 4 straight sides; b) 5 sides, 4 vertices, 5 straight sides; c) 3 sides, 2 vertices, 2 straight sides; d) 2 sides, 2 vertices, 1 straight side)

Introduce circles. Show students a very thin strip of paper and hold it so that it looks like a straight line to the students. ASK: What do we call this in math? (a straight line) Move your hands closer to each other, so that the strip of paper looks like a smile. ASK: What kind of line is it now? (curved) What will happen if I move my hands closer together? What will happen if I join the ends of this line? Join the ends so that the students see a circle. (see diagram below)

Explain that this shape is called a circle. Ask students to make a circle with their thumb and index finger. Give students several shapes from BLM Attribute Blocks (1), but not the “oval” piece of bread. Ask students to find the circle and then shapes that have circles on them. (button, slice of pizza, dotted shapes)

Attributes of a circle. Ask students to feel the edge of a circle. ASK: How many vertices does a circle have? (0) How many sides? (1) Is the side straight or curved? (curved) Does a circle have any straight sides? (no) Ask students to describe a circle. (sample answers: a circle is closed; it has 0 vertices, 0 straight sides, and 1 curved side)

Introduce ovals. Draw a circle on the board. Measure it across the middle with a piece of paper. Demonstrate that the circle measures the same across the middle, no matter in which direction you measure it, as shown below:

Draw on the board:

ASK: How does this shape look different from a circle? (sample answers: a circle is the same width in every direction but this shape is longer across than up and down; it looks like a squished circle and sort of like an egg)
Invite volunteers to measure the width of the oval in different directions. Explain that an oval is a shape that looks somewhat like a circle, but does not measure the same across the middle in all ways. ASK: How many sides does an oval have? (1) Is it straight or curved? (curved) How many vertices does it have? (0)

Exercises: Is this a circle?

a) ![Circle](image)

b) ![Triangle](image)

c) ![Oval](image)

d) ![Octagon](image)

e) ![Oval](image)

f) ![Hexagon](image)

Answers: a) yes, b) no, c) no, d) yes, e) no, f) no

Circles in the world. Discuss with students where they see or use circles (wheels, clocks, coins, and so on). Ask students to identify circular shapes around the room and in photographs or magazines.

ACTIVITY 1

Give small groups of students a variety of objects, such as string, connecting cubes, pipe cleaners, blocks, popsicle sticks, toothpicks, and so on. Ask students to predict which materials can be used to make circles and to test their predictions. Students can either verbally predict and test, or record their predictions and results in a table. If you want students to record their findings, provide the headings for the table (Object, Can Make a Circle) and show students how to use pictures, check marks, and Xs to fill it in.

Introduce half circles. Give each student two paper circles from BLM Circles. Fold a paper circle in two, so the sides line up. Cut along the fold line to make a half circle. Ask students to do the same with one of their circles. ASK: Are the two parts of your circle the same size? (yes) How do you know? (the parts fit onto each other exactly) Tell students that when a circle is cut into two parts that are exactly the same, each part is called a half circle. (NOTE: Students should save their half circles for Activity 2.)

Exercises: Is this a half circle?

a) ![Octagon](image)

b) ![Half Circle](image)

c) ![Hexagon](image)

d) ![Circle](image)

e) ![Half Circle](image)

f) ![Hexagon](image)

Answers: a) no, b) yes, c) no, d) yes, e) yes, f) no
Introduce quarter circles. Fold the second paper circle in two as before, then fold it again to create quarters. Unfold. Have students do the same. ASK: If I cut along the lines, how many pieces will I get? (4) Cut along the lines, and SAY: I cut the circle into four parts. Each part is called a quarter circle. Have students cut their circles to make quarter circles. (NOTE: Students should save their quarter circles for Activity 2.)

Point to the corner of the quarter circle and SAY: I think this vertex is special. Does the way these two sides meet remind you of some shape? What do we call such corners? (square corners) ASK: How can we check if this is a square corner? (match it to a corner of a square or a rectangle) Have students check that the straight sides of quarter circles make a square corner. They can do this using a square or rectangle from among the attribute blocks they used earlier in the lesson, from BLM Attribute Blocks (1).

Exercises: Is this a quarter circle?

a)  b)  c) 

d)  e)  f) 

Answers: a) no, b) no, c) yes, d) no, e) yes, f) no

ASK: Which of the shapes in the previous exercises are half circles? (part d)

**ACTIVITY 2**

Students will need pattern blocks or shapes from BLM Pattern Blocks and the half circles and quarter circles they produced earlier in the lesson. Students work in groups of four. Player 1 makes a design using two or three of their blocks, including a quarter circle or half circle. The other players copy the design and put their designs together to make a bigger design. Repeat the exercise with different groups of shapes, so that each student in the group invents a design. If time allows, repeat with designs made of more shapes.

**Extensions**

1. a) How could you draw a perfect circle?

b) How could you make a perfect circle from play dough?

**Sample answers:** a) trace something circular, like a coin; b) cut it from a flat, round piece of dough using a cup
2. Trace the shape using attribute blocks. If you turn the shape a little bit, will it fit into the outline traced? If you turn the shape more, will it fit into the outline traced?
   a) square   b) circle
   c) rectangle   d) striped polygon
   **Answers:** a) no, yes; b) yes, yes; c) no, yes; d) no, yes

3. Display the picture below:

```
   △
  △△
 △△△
```

Tell students that you made a tree from pattern blocks.

a) What two different pattern block shapes did I use to make this picture?
b) What is the square at the bottom supposed to be?
c) How could I make the top part of the tree taller?
d) How could I make the trunk of the tree taller?

**Answers:**
   a) trapezoids (or red blocks) and squares, b) the tree trunk, c) add another trapezoid (or red block) or a triangle to the top, d) add another square to the bottom

**NOTE:** Students will need pattern blocks for Extension 4.

4. In pairs, copy the rocket, but make your rocket taller. Describe what you did to make it taller.

```
   △      △
   △△△△△
```

**Sample answer:** I added a square under the triangle but above the trapezoid (or red block).

5. Jake has 3 paper squares and 2 paper triangles, as shown below:

```
   □ □ □ △ △
```

Draw a picture to show your answers to the question.

a) How could Jake use three squares and a triangle to make a crayon?
b) How could he use three squares and a triangle to make a lamp?
c) In pairs, explain what you did differently to make the crayon and the lamp and why.

**Sample answers**

a) 

b) 

c) I used the triangle that fits the squares for the crayon because crayons don’t have a part sticking out. I used the larger triangle for the lamp because the lamp shade is usually wider than the rest of the lamp. I made the crayon lying down and the lamp standing up.
Goals

Students will learn to identify halves in shapes.
Students will decompose shapes into halves.

PRIOR KNOWLEDGE REQUIRED

Knows the concepts of more and less
Can identify half circles, rectangles, triangles, and squares
Familiar with pattern blocks

MATERIALS

overhead projector
pattern blocks cut from BLM Pattern Blocks (p. P-18)
8 1/2 inch by 11 inch paper
scissors
paper squares for students to fold
Give Me Half! by Stuart J. Murphy
blank paper (see Extension 2)

NOTE: In this lesson, students will divide shapes into equal parts. Even though, for fractions, equal parts have to be the same size but do not need to be the same shape, students will only work with cases where the parts have the same shape and size. Students will learn about parts that are the same size but have different shape in Grade 2.

Identifying parts of shapes. On an overhead projector, put a pattern block square and a pattern block triangle side by side, so that the shapes share a side. Do not let students see the blocks, only the resulting shadow on the board. Ask students to predict which blocks you used. Invite volunteers to trace or copy the shadow and to draw a line showing where the blocks meet. Ask students to identify the shapes of the blocks in their drawing. Then reveal the blocks on the projector and have students check their predictions. ASK: Was your guess about the block shapes correct? (yes) Repeat with other pairs of blocks, such as a square and hexagon.

Same kind of part, different size. Draw on the board a rectangle that is not a square and divide it into two unequal rectangles, as shown below:

```
<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
```

Invite volunteers to shade or trace each part of the rectangle in a different color. Ask students to identify the shape of each part. (rectangle) Explain that, since the parts are both rectangles, we say that they are the same kind of shape. Are the parts the same size? (no)
Repeat with the shape made from two triangles below:

Folding shapes so that parts match exactly. Fold and cut an 8 1/2 inch by 11 inch piece of paper along a diagonal. Show students one of the resulting right triangles. Fold the diagonal side in half, as shown below. Show students how the two parts do not match exactly—one part is not covered. From one view, the wider part of the triangle covers the narrower part, but when you flip the folded shape over, the narrower part does not cover the wider part.

Give each student a paper square and have one square for yourself, to demonstrate the folding. Ask students to fold the square so that one of the corners matches up with any other corner. (All students don’t have to—and likely won’t—fold the square the same way. Demonstrate folding adjacent corners together and opposite corners together.) ASK: Does the front of your folded square cover the back? (yes) Have students flip the folded square over and ASK: Does the front part now cover the back part? (yes) SAY: Unfold your square. ASK: What shapes do you see? (sample answers: 2 triangles, 2 rectangles) Are the shapes of the same kind? (yes) Are the shapes of the same size? (yes) How do you know? (sample answer: they cover each other exactly, there are no uncovered parts)

ASK: What can you say about the parts of the square? (sample answer: they are the same) SAY: When two parts are exactly the same shape and size, we say that they are equal parts and we say that the parts match exactly. ASK: Did you fold the square so that the parts match exactly? If students did not do this, have them fold the square again, so that the parts match exactly.

Have students fold the square the other way (by matching up the other pair of corners) and ask them if the parts match exactly now.

Equal parts. Ask students to fold the square so that the parts match exactly and, without unfolding, to fold again so that the parts match exactly. ASK: When you unfold the square, how many parts do you see? (4) Are the parts the same size and shape? (yes) Do they match exactly? (yes) Are they equal parts? (yes) Draw on the board:

___ equal parts
SAY: You have made folds to divide a square into equal parts. First, you made one fold that looked like one of these pictures. ASK: How many equal parts did you create with one fold? (2) Write “2” in the blank. Draw on the board:

____ equal parts

SAY: You folded the square again and made more equal parts. Have students count the total number of parts on their squares and write the number on each part as they count. Invite volunteers to do the same on the board. ASK: How many equal parts have you created? (4) Write “4” in the blank.

Exercises: How many equal parts?

a) _______  b) _______  c) _______

d) _______

Bonus: _______

Answers: a) 3, b) 4, c) 2, d) 4, Bonus: 6

Introduce half. Draw a circle on the board. SAY: This is a pizza. I want to cut it so that I can share it with a friend. I want to be fair, so I want the two parts to be the same size, or equal. When something is cut into two equal parts, each part is called a half. We say that I am cutting the pizza in half. Draw a line down the middle of the circle (see first diagram below). ASK: Did I cut the pizza in half? (yes) Draw more circles and divide them as shown in the second, third, and fourth diagrams below. Have students signal thumbs up if you divided the circle in half and thumbs down if not.

SAY: Two equal parts together are called halves. Write “half” and “halves” on the board and have a volunteer circle the parts that sound the same in both words. Read the words together. ASK: How did we use the word “half” in the last lesson? PROMPT: It looked like half of a pizza. (a shape called a half circle) Point out that half circles are actually halves of a circle.

More than half and less than half. Draw on the board:

ASK: Did I divide the pizza in half? (no) Why not? (sample answer: the parts are not the same size) Is the shaded part more than half of the pizza? (yes)
Is the part that is not shaded more than half? (no) Is it less than half? (yes) Can both parts be more than half? (no)

**SAY:** I will divide a pizza in two parts, but they will not be equal. I will shade one part. If the part I shade is more than half, show thumbs up. If it is less than half, show thumbs down. Draw the following pictures on the board one at a time and have students signal their answers.

(a) yes, b) no, c) yes, d) no, e) no, f) yes)

**SAY:** Now my pizza is a square. For each picture you draw (see below), have students again signal whether the shaded part is more or less than half.

(a) yes, b) no, c) no, d) no, e) yes, f) yes)

**Halves of other shapes.** **SAY:** We can draw halves of other shapes, not just circles and squares. The easiest way to divide something in half is to make two parts that are the same shape and size. Draw the shapes below and have students signal whether or not the shaded part is a half.

(a) no, b) yes, c) no, d) no, e) yes, f) no)

Have students explain why the pictures in parts a), c), d), and f) do not show half. Students should mention that the parts are not the same shape or not the same size.

**Literature Connection: Give Me Half! by Stuart J. Murphy.** Various things are divided into halves: pizza, a can of juice, two cakes, and the cleanup job after a fight and reconciliation.
Extensions

1. Point to each shape, and ask students to show thumbs up if the shaded part shows more than half and thumbs down if the shaded part shows less than half.

   a)  
   b)  
   c)  
   d)  
   e)  
   f)  

   Bonus: Have students draw a line to divide each shape in half.

   Answers: a) less, b) more, c) more, d) less, e) more, f) less

   Sample answers: Bonus:

   a)  
   b)  
   c)  
   d)  
   e)  
   f)  

2. Half of a length.

   a) Draw a line on the board and explain that Tessa wants to go from one end of the line to the other:

   Ask students to show where they think Tessa will be when she is halfway along the line. ASK: If Tessa is there, how far did she already come? (half of the way) How far does she have to go? (another half) Are the parts the same length? (yes) How can you tell? (the length on both sides of the halfway point should be the same)

   b) Give students a blank sheet of paper and have them draw a straight line anywhere across the page. Have students guess where the halfway point is and mark it. To check their answer, students can draw dark, big dots at each end of the line and then fold the sheet so that the dots meet. Is the fold close to the mark they made? If not, have students mark the fold, i.e., the actual halfway point. Have students repeat with other lines on the same sheet, first guessing where halfway is and then checking their answer.
3. a) Partner A: Place 6 counters on a ten-frame. What is \(10 - 6\)? How does the ten-frame show that?

Partner B: Start with two new ten-frames. Place 6 counters on one of them. What is \(20 - 6\)? How do the ten-frames show that?

b) In pairs, explain how your answers are related and why that is. Do you agree with each other? Discuss why or why not.

Sample answers
a) Partner A: \(10 - 6 = 4\), because there are 4 empty squares.
Partner B: \(20 - 6 = 14\), because there are 14 empty squares, 10 in one frame and 4 in the other.

b) The answer to \(20 - 4\) is 10 more than the answer to \(10 - 4\). That’s because there is an extra empty ten-frame.
**Goals**

Students will identify quarters in shapes. Students will decompose shapes into halves and quarters, and understand that decomposing into more equal shares creates smaller shares.

**PRIOR KNOWLEDGE REQUIRED**

- Can identify figures that are the same shape and size
- Can identify quarter circles
- Understands that objects can be divided into equal parts

**MATERIALS**

- 2 paper squares for each student and for demonstration
- scissors
- grid paper (see Extension 2)

**Review equal parts.** Remind students that, when you cut something into parts that are the same size and the same shape, you cut them into equal parts. Draw on the board:

```
+---+
|   |
+---+
```

ASK: Did I cut this square into equal parts? (yes) How many equal parts? (4, 2)

**Introduce a quarter of a circle.** SAY: When you divide a piece of paper into four equal parts, you have divided the paper into quarters. ASK: Where have you seen the word “quarter” before? (sample answer: 25 cents is a quarter of a dollar) Point out that just as 4 coins of 25 cents make 100 cents (or one dollar), four quarters of a pizza make one whole pizza, four quarters of a square make one whole square, and so on. Students might also recall that they had shapes called “quarter circles.” SAY: The word whole means all of the object. I am going to draw a whole pizza, and divide it into parts. Draw on the board:

```
  +---+
  |   |
  +---+
```

ASK: What is the shape of each piece? (quarter circle) SAY: There are four parts. All the parts are the same size and shape, so I can say I have four equal parts. Each part is called a quarter of a circle. I am going to divide this pizza in different ways. You have to tell me if the pieces are quarters. You need to check that the pieces are the same size and shape, and that there are four of them. Draw the pictures below one at a time and have students...
signal thumbs up if the picture shows four quarters and thumbs down if it doesn’t. When the picture does not show quarters, have a volunteer explain why not (for example, the pieces are not the same size; there are only two parts, not four; it does not show four quarter circles).

(a) yes, b) no, c) yes, d) no, e) no, f) no)

SAY: I will draw more circles cut in parts and shade some of the parts. You need to decide if the shaded part is one quarter of a circle. I may try to trick you and shade more than one quarter or less than one quarter. Or I may shade more than one part. Draw and write the following on the board:

Are there 4 parts?
Are the parts the same size?
Is one part shaded?
Is the shaded part a quarter?

Read each question and have students signal their answers with thumbs up for yes and thumbs down for no. (yes, yes, yes, yes) Replace the picture with those below, one at a time, and repeat the questions.

(a) yes, no, yes, no; b) yes, yes, no, no; c) yes, yes, yes, yes; d) no, no, no, no; e) yes, no, yes, no)

Emphasize that, for a picture to show one quarter, you need to say “yes” to all of the first three questions. If one of the answers is “no,” the picture does not have one quarter shaded.

Exercises: Is one quarter shaded?

Answers: a) no, b) yes, c) no, d) yes, e) no, f) no

Quarters of other shapes. Give students paper squares and ask them to fold them into quarters, in as many different ways as they can. (see sample answers on the following page) Have many volunteers show different answers.
SAY: I also have a method to cut a square into four parts. Fold a paper square lengthwise to make two rectangles, then fold it along the diagonal of the rectangle. Show students carefully what you are doing and have them repeat the folding with a fresh paper square. Point out that the fold is very special. It is not the regular fold, where the parts match exactly. Have students unfold the paper. The result is shown in the margin.

ASK: What is the shape of each part? (triangle) Do the triangles look the same? Students might not see the triangles as identical. Have students cut the square along the fold lines and place the triangles one on top of the other, to see that they match exactly. SAY: The triangles match exactly, so they are equal. This means that each is a quarter of the square. Have students rearrange the square from the triangles, first in the original way, then by trying to place the triangles differently while still making a square. (see sample answers in the margin)

Have students draw different arrangements on the board and in their notebooks. Emphasize that, since students know that the triangles are equal, these pictures also show a square divided into four quarters.

Show students other shapes divided into four parts, including those in the following exercise, and ask them if they are quarters or not. Ensure all examples are either obviously the same size or obviously not the same size. (For example, do not use a rectangle cut in four along its diagonals.) Emphasize that for one part to be a quarter, it has to be one of four equal parts. Have students signal the answers.

**Exercises:** Is one quarter shaded?

- a)  
- b)  
- c)  
- d)  
- e)  
- f)  

**Answers:** a) no, b) yes, c) yes, d) yes, e) yes, f) no

**Introduce one fourth.** SAY: There is another word for quarter. It is *fourth.* Write “fourth” on the board. ASK: Which number does the word “fourth” remind you of? (4) SAY: We call that part “fourth” because one fourth of a shape is one of four equal parts. Have a volunteer circle “four” inside the word “fourth.”

**Exercises:** Is one fourth shaded?

- a)  
- b)  
- c)  
- d)  
- e)  
- f)  

**Answers:** a) yes, b) no, c) no, d) yes, e) no, f) yes

For each “no” answer in the previous exercises, ask a volunteer to explain how the shaded part is not one fourth.
Identifying halves and quarters. ASK: What words do you know for the parts that a shape can be divided into? (fourth, quarter, half) Write all three words on the board. Draw the shapes below on the board. Point to each shape and ask students to identify the part that is shaded. Write the labels underneath each shape, as shown below:

- one half of a circle
- one quarter of a circle
- one quarter of a rectangle
- one half of a square

Repeat with other shapes showing halves and quarters. Give all students the opportunity to become comfortable identifying and saying the names of the parts.

Cutting shapes into more pieces. Draw a circle on the board. SAY: This is a whole circle. I am going to draw lines to cut it into more parts. Draw another circle of the same size and divide it into two equal parts. ASK: Are the parts equal? (yes) How many parts are there? (2) What is each part called? (a half) What is larger, the whole circle or each of the parts? (whole circle) How many halves make one whole? (2) Draw a copy of the second picture and SAY: I want to cut this circle into fourths or quarters. ASK: How can I do that? Have a volunteer come and draw a line to convert the halves into quarters. ASK: Which piece is larger, a half or a quarter? (half)

ASK: How many quarters make one half? (2) How many quarters make one whole? (4) SAY: The more pieces we make, the smaller the pieces become.

Repeat with a square and a rectangle, each divided with a vertical line, and a square divided with a diagonal. SAY: The more pieces I cut a shape into, the smaller each piece.

Exercises: Kate and Ted each got the same pizza. Kate cut her pizza into halves. Ted cut his pizza into fourths.

a) Who has more pieces?  
b) Who has larger pieces?

Answers: a) Ted, b) Kate

Draw on the board:

SAY: I divided a rectangle into quarters, but some of it got erased. How many quarters or fourths make a whole? (4) How many parts do I have in the picture? (3) How many parts got erased? (1) Have students copy the picture into their notebooks. Ask them to add the erased piece. Repeat with a circle with a missing quarter and a circle with two missing, adjacent quarters.
Extensions

1. Ask students to brainstorm things that are divided into quarters and halves.

   **Sample answers**: hours, sports games, measuring cups, dollars, notes in music, sale prices

2. Draw on the board:

   SAY: This square is divided into quarters, but the quarters are not the same shape. Have students copy the picture onto grid paper, starting with a 4 by 4 square for the outline. Then have students cut it out, and cut along all the lines. Have them color each of the four resulting parts a different color. Challenge students to cut some of the parts and rearrange them to show that the parts are the same size.

   **Answer**: Cut either the rectangles or the squares in half and rearrange the pieces to make the other shape.

3. **Quarter of a length**. Have students draw straight lines and guess where a quarter is on each line. Students check their answers by folding. Draw dark dots at the two ends and fold to find half; fold again so that the halfway mark (now the folded edge of the sheet) meets the dark dot.

4. A family buys 2 small pizzas. One is a cheese pizza and one is a pepperoni pizza.
   a) The cheese pizza is divided in half. Draw the cheese pizza.
   b) The pepperoni pizza is divided into quarters. Draw the pepperoni pizza.
   c) Sally eats 2 pieces of pepperoni pizza. Peter eats 1 piece of cheese pizza. Sally says she ate more pizza because she ate more pieces. Is she correct? Explain.

   **Answers**: a) b)

   c) No, Sally is not correct. 2 pieces of pepperoni pizza is the same amount of pizza as one piece of cheese pizza. Sally and Peter ate the same amount.

(MP.7)

5. Give students several of each kind of pattern block. Have students make designs from pattern blocks.

   Individual or small-group follow-up: If students do not recognize that they can take advantage of matching side lengths to make neat designs, ASK: Which sides of the different pattern blocks match each other? How can you use this to make neat designs?
**Goals**

Students will identify halves and fourths of different shapes, and relate the parts and number of parts to the whole shape.

**PRIOR KNOWLEDGE REQUIRED**

Knows the meaning of halves, fourths, and quarters  
Can identify circles, rectangles, squares, and triangles  
Can identify equal parts of a shape

**MATERIALS**

two index cards for each student

**Review one half and one fourth.** Draw a circle divided into two equal parts. Write on the board:

This circle is cut in ____.

ASK: What word goes in the blank? (half) Write “half” in the blank.

SAY: A few lessons ago, we learned that, when something is cut into two equal parts, each part is called a half.

**Exercises:** Is the shaded part one half?

a)  

b)  

c)  

d)  

e)  

f)  

g)  

h)  

i)  

Answers: a) yes, b) no, c) no, d) yes, e) yes, f) no, g) yes, h) no, i) yes

SAY: If the parts are not equal, they are not halves.

**Exercises:** Is the shaded part one fourth?

a)  

b)  

c)  

d)  

e)  

f)  

Answers: a) no, b) no, c) yes, d) yes, e) yes, f) yes

Give each student two index cards and have them write “half” on one of them and “fourth” on the other, in large letters. Have students raise the card with the correct word to fill in the blanks in the following exercises. Starting with Exercise 2, have students first raise the number of fingers to signal the number that goes in the first blank.
Exercises

1. Finish the sentence with “half” or “fourth.”

a) There are 2 equal parts. Each part is a ________.

b) There are 4 equal parts. Each part is a ________.

c) There are 4 equal parts. Each part is a ________.

d) There are 2 equal parts. Each part is a ________.

Answers: a) half, b) fourth, c) fourth, d) half

2. How many equal parts? Finish the sentence with “half” or “fourth.”

a) There are ___ equal parts. Each part is a ________.

b) There are ___ equal parts. Each part is a ________.

c) There are ___ equal parts. Each part is a ________.

d) There are ___ equal parts. Each part is a ________.

Answers: a) 4, fourth; b) 2, half; c) 4, fourth; d) 4, fourth

For each picture in the previous exercises (except Exercise 1.d), ask volunteers to identify the shape that has been divided and name the part in full. For example, the shape in Exercise 1.a) is a triangle and the part is “half of a triangle.” (1. b) fourth of a rectangle, c) fourth of a triangle; 2. a) fourth of a circle, b) half of a circle, c) fourth of a square, d) fourth of a triangle)

Exercises: How many parts are shaded?

a) _______ of ___ parts

b) _______ of ___ parts

c) _______ of ___ parts

d) _______ of ___ parts
**Answers:** a) 1, 4; b) 1, 2; c) 1, 4; d) 1, 2

**Drawing missing parts.** Draw a half circle on the board. SAY: I have drawn half of a circle. Ask a volunteer to draw a line to make the half circle a whole circle. Draw half of a square on the board and ask for a volunteer to draw the other half of the shape. Repeat with a rectangle and other shapes.

**Extensions**

1. Draw on the board:

   ![Images of half circles](image1)

   As you point at each picture, ASK: How many fourths are shaded? (1 fourth, 3 fourths, 2 fourths, 2 fourths) Write the answer underneath each picture as you go.

   Have students write the number of shaded parts and the name of the part.

   ![Images of shaded parts](image2)

   **Answers:** a) 2 fourths, b) 2 fourths, c) 2 fourths, d) 4 fourths, e) 2 halves, f) 3 fourths

2. The picture shows two fourths. Draw the missing parts to make a whole.

   ![Images of fourths](image3)

   **Sample answers**

   ![Images of shaded parts](image4)

3. The picture shows one fourth. Draw the missing parts to make a whole.

   ![Images of fourths](image5)

   **Sample answers**

   ![Images of shaded parts](image6)
4. Give each student the following pattern block shapes: three triangles and a hexagon.

a) Use all the shapes to create a larger triangle.

b) What is the same about the triangle and hexagon that helps them fit together so well?

**Answers**

a) 

b) all the sides are the same length
Goals

Students will identify 3-D shapes in drawings, models, and real-life objects. Students will compose 3-D shapes to create a composite shape and compose new shapes from that shape.

PRIOR KNOWLEDGE REQUIRED

Can measure distances using a ruler
Can identify and describe rectangles, squares, and triangles

MATERIALS

large paper rectangle and square
large cube
cube for each student (in different sizes, if possible)
rulers
boxes in the shape of rectangular prisms brought in by students
cutout picture of a quarter
several real or play money quarters
paper rectangles and squares of different proportions, tape, tracing paper, and scissors per student
real-life objects shaped like a cylinder or cone
paper rectangles and squares of various proportions
tape
scissors
cutouts from BLM Cones (pp. N-75–76)
towel or large box

NOTE: Students need to bring a variety of boxes in the shape of rectangular prisms to measure and to build with.

Introduce cubes. Hold up a large paper rectangle and square. Ask students to identify the shapes. ASK: How are these shapes different? (the rectangle has two longer sides and two shorter sides and the square has four equal sides) Show students a large cube. Explain that the shape is called a cube. Write “cube” on the board and read it with students.

ACTIVITY 1

Give each student a different-sized cube and a ruler. Have students measure the cubes from side to side, front to back, and top to bottom. Demonstrate what you mean on your large cube. Record the results of several measurements on the board. ASK: What do you notice? (the measurements for each cube are the same) Is a cube more like a square or more like a rectangle? (square) How is a cube different from a square? (sample answer: squares are flat, cubes are thick)
Introduce prisms. Show students a box that is not a cube. ASK: Is this shape more like a square or more like a rectangle? (rectangle) SAY: This shape is like a cube, but it has some longer sides and some shorter sides. We call such shapes prisms. Write “prism” on the board and read it together with students. Hold up several objects (boxes, a toilet paper roll, a cone, a ball, etc.), one at a time, and ask students to show thumbs up if the object is a prism and thumbs down if it is not a prism.

Explain that shapes that can be drawn on paper, such as squares, rectangles, circles, and triangles, are called flat shapes. Shapes like cubes and prisms that are not flat are called three-dimensional or 3-D shapes. (Students may recognize the word “3-D” from the context of 3-D movies.)

Point out that pictures on paper are flat, so we can’t draw a cube on paper, we can only draw what a cube would look like. Draw the following pictures and have students show thumbs up if the picture shows a cube and thumbs down if it does not. For each picture that students identify as “not cube,” ask if the picture shows a prism.

(a) cube; b) not cube, prism; c) not cube, not prism; d) not cube, prism; e) cube; f) not cube, not prism)

Cubes and rectangular prisms in the world. Ask students to think about where they have seen cubes or shapes that are almost cubes. ASK: How are the “almost cubes” different from cubes? (examples: some dice have rounded corners or edges; some tissue boxes; connecting cubes have little holes in their sides and the linking part stick out; some beads are cubes, but have a hole in the center; ones blocks have one side missing and a linking part sticking out on the opposite side) Repeat with prisms and “almost prisms.” (examples: board game boxes; paperback books; juice boxes may have a straw attached and rounded edges; a block of cheese has rounded edges; a filing cabinet has handles that stick out)

Introduce cylinders. Show students a cutout picture of a quarter (you could photocopy a quarter and cut it out). ASK: What shape is this? (a circle) Show them a real quarter and ask them to identify the shape again. ASK: How are they different? (the coin is thicker) Have students look at both from the side. Explain that the coin has thickness; it is a 3-D shape. To make thickness more visible, place several real or play money quarters in a stack. SAY: A shape that looks like a stack of coins is called a cylinder. It is like a circle, but it is not flat. When you look at a cylinder from the top or bottom, you see a circle. But if you look at a cylinder from the side, it looks more like a rectangle or a square. Hold up a cylinder and have students look at it from the side and from the top or bottom. Write “cylinder” on the board and read it with students. Point out that both “cylinder” and “circle”
start with the same letter, “c,” and the same sound, “ssss.” You might also point out that the second letter in circle is “i,” while the second letter in cylinder is “y.”

**ACTIVITY 2**

Give students paper rectangles and squares of various proportions, and show them how to make cylinders:

- Roll the rectangle into a cylindrical shape (so there is no paper sticking out at either end).
- Tape the roll together.
- Trace the ends of the roll, cut out the resulting circles, and tape them over the ends of the roll. Emphasize that a cylinder is closed at the ends.

**Cylinders in the world.** Ask students to think of objects that have the shape of a cylinder and to describe how some objects are like cylinders. Display some examples, such as cans of non-perishable food; new, round pencils; hockey pucks; pillar candles; paper-towel rolls (almost cylinders—open on both sides); straws (again, open at the ends); and so on.

**Exercises:** Is this a cylinder?

a)  b)  c)  d)  e)  f)

**Answers:** a) yes, b) no, c) yes, d) no, e) no, f) yes

**Introduce cones.** Give each student a cutout from BLM Cones. Show students how to roll the shape into a cone. Ask students to place their cone on a sheet of paper, opening face down, and trace the circle at the end. Students should cut out the circle and tape it to the cone. Explain that the shape is called a **cone**. Write “cone” on the board and read it aloud with students.

**Cones in the world.** Ask: What shapes in the world are called “cones”? (sample answers: a pine cone, an ice cream cone) How are they the same as a cone and how are they different? (answers may vary) Ask students to think of shapes that are cones or almost cones. Display some examples, such as paper cups, party hats, and ice cream cones. Say: These are all almost cones because they are open at the end and should be covered by a circle, or open slightly at the other end and so lacking the vertex.
Exercises: Is this a cone?

a) [cylinder]    b) [cube]    c) [cone]

d) [triangle]    e) [rectangle]    f) [triangle]

Answers: a) no, b) no, c) yes, d) yes, e) no, f) yes

Have students compare cones to cylinders, using the following PROMPTS:
If you look at the shape from the side, what do you see? If you turn the shape sideways, what do you see? Can you turn the shape so that you see a circle? Does the shape have a sharp point? Does the shape roll? Can you stack several such shapes?

Identifying 3-D shapes. Show students examples of cubes, cones, cylinders, and prisms, and allow students to practice identifying the shapes and saying their names. You can write the words “cube,” “cone,” “prism,” and “cylinder” on the board in four different locations and have students point toward the correct word for each object you hold up.

Identify shapes in structures built from separate shapes. Make a structure using cubes, prisms, cones, and cylinders, and ask students to identify how many of each shape is in your structure. Students can signal the answer by raising the correct number of fingers.

ACTIVITIES 3–5

3. Ask students to use the paper shapes they created during the lesson, the cubes they measured, and the boxes they brought from home to create free-standing towers. If possible, add some rectangular boxes as well. Ask them to predict how tall their towers will be compared to other objects in the classroom. Let them build their towers and check their predictions using indirect measurement (that is, by using a third object, such as the meter sticks students made in Lesson MD1-6). Have students work in pairs to identify the 3-D shapes in the towers of a partner. Have students create a different tower or other structure by combining the shapes.

4. Students work in groups of four. Player 1 makes a design using two or three of the shapes used in Activity 3. The other players copy the design. The group puts their designs together to make a bigger design. For example, students can make a tower from a box, a cylinder, and a cone, and combine them into a castle of four towers. Repeat the exercise with different groups of shapes, so that each student in the group invents a design. If time allows, repeat with designs made of more shapes.
5. Place several familiar objects (e.g., ball, pencil) on a table. Have students view the objects for a limited time, then cover them up with a towel or a large box. Can students recall the shapes or objects?

Variation: Remove one object while students are not looking. Can students identify the missing object? This game can also be played in pairs.

Extensions

(MP.6) 1. a) Build a city using cones, cylinders, prisms, and pyramids. Include tall buildings and short buildings.


Selected sample answers: b)

• I used cylinders. I put a cone on top for the roof. Cylinders have two flat sides, so they are easy to stack.

• I used prisms. I put a pyramid on top for the roof. Prisms have flat sides, so they are easy to stack.

2. Students can use a table (with the 3-D shapes as column headings) to tally all the objects in the classroom that resemble 3-D shapes.

3. Copy the pictures. Use your pictures to color a half and a fourth of the same shape.

\[
\begin{array}{cc}
\text{a)} & \text{b)} \\
\text{c)} & \text{d)} \\
\end{array}
\]

(MP.6, MP.8) 4. Look at your answers to Extension 3. What is more, a half or a fourth? Explain.

Answer: A half is always more than a fourth, because a fourth is part of a half, so it is smaller.
Sides and Vertices

☐ Count the sides.
☐ Count the vertices.

1. 4 sides
   4 vertices

2. 5 sides
   _____ vertices

3. _____ sides
   _____ vertices

4. _____ sides
   _____ vertices

5. _____ sides
   _____ vertices

6. _____ sides
   _____ vertices

7. _____ sides
   _____ vertices

8. _____ sides
   _____ vertices

9. BONUS
   _____ sides
   _____ vertices
2 cm Dot Paper

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• • • • • • • • • •
Square or Not?

One side is missing.

☐ Will it be a square? Guess.

☐ Finish the shape. Is it a square?

1. [Diagram of a shape with one side missing]
   
   Guess _____
   
   Check _____

2. [Diagram of a shape with one side missing]
   
   Guess _____
   
   Check _____

3. [Diagram of a shape with one side missing]
   
   Guess _____
   
   Check _____

4. [Diagram of a shape with one side missing]
   
   Guess _____
   
   Check _____

5. [Diagram of a shape with one side missing]
   
   Guess _____
   
   Check _____

6. [Diagram of a shape with one side missing]
   
   Guess _____
   
   Check _____
Rectangle or Square?

Mystery Shape

Mystery Shape

Mystery Shape

NAME ___________________________ DATE ___________

Rectangle or Square?

Mystery Shape

Mystery Shape

Mystery Shape
Triangles and Not Triangles

triangles

not triangles
Finding Triangles

☐ Circle the triangle.
☐ Copy the letter of the triangle.

What is the animal?  c ___________
Tangram
Tangram Puzzles (I)

☐ Make a bunny.
Tangram Puzzles (2)

☐ Make a person.
Make a boat.
What is it?

[Image of a tangram puzzle]
Circles
Cones (I)
Cones (2)
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). In this unit, students will sort data into categories and represent the data on a chart or picture graph (1.MD.C.4). 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 all the way through Grade 4 (4.G.A.2) and Grade 5 (5.G.B.3, 4).

Students’ work in Kindergarten and in 1.1 Units 1 and 2 and 1.2 Unit 3 on counting and comparing numbers allowed students to answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another (1.MD.C.4). In this unit, students will read the answers to those questions off of a chart or picture graph.

This work continues in Grade 2 where students will represent data using picture graphs, bar graphs, and line plots (2.MD.D.9, 10). Students will also generate their own data to create line plots. Both line plots and bar graphs introduce students to scales. In Grade 3, this concept extends to scales where each square in a bar graph or picture in a picture graph might represent more than one object (3.MD.B.3). From Grades 3 to 5, this concept of scale is mainly extended through changes to the horizontal scale on a line plot: the horizontal scale on a line plot in Grade 3 may be marked off using whole numbers, halves, or fourths (3.MD.B.4); in Grades 4 and 5 they may be marked off using whole numbers, halves, fourths, or eighths.

This work on data management in Kindergarten through Grade 5 prepares students for the study of statistics in Grade 6 through to high school.

Mathematical Practices in This Unit

In this unit, you will have the opportunity to assess MP.2, MP.3, and MP.5 to MP.7. Here are some examples of how students can show that they have met a standard.

MP.2: In MD1-22 Extension 4, students reason abstractly and quantitatively by making a graph to show the number of people who chose each answer as the type of ice cream they prefer and then use the graph to determine which flavor the class should buy.

MP.3: In MD1-21 Extension 3, students construct an argument to explain why 20 – 7 is 10 more than 10 – 7. Students also have the opportunity to analyze and critique a partner’s argument.
Unit 6 Measurement and Data: Representing and Interpreting Data

Introduction

In this unit, students will organize, interpret, and represent data with up to three categories using a variety of tools, including sorting circles, concrete graphs, and picture graphs. Students will ask and answer questions about the total number of data points, the number in each category, and how many more or fewer are in one category than in another. Students will learn how to tally numbers and will count by fives to find the total.

In lessons MD1-22 and MD1-24, students create, analyze, and ask questions about picture graphs. The Common Core State Standards require students to organize, represent, and interpret data, but they do not specify doing so using picture graphs. We have used picture graphs in this unit because the K–5 Progressions suggest using them as a data organizer in Grade 1.

Materials. Yarn circles are convenient for sorting objects. Cut yarn into pieces about 2.5 feet long, and tie each piece into a circle. Students can sort shapes by placing those with a certain property inside the circle, and those that do not have that property outside the circle.

In addition to the BLMs provided at the end of this unit, the following Generic BLMs, found in section P, are used in Unit 6:

- BLM Attribute Blocks (pp. P-16–17)
- BLM Pattern Blocks (p. P-18)
- BLM 2 cm Grid Paper (p. P-20)
Goals
Students will sort objects according to different attributes using sorting circles.

Prior Knowledge Required
Can identify sides and vertices in shapes
Can identify triangles, rectangles, squares, circles, and ovals

Materials
4 sheets of paper
masking tape or string
cards from BLM Animals (pp. O-34–35) or pictures of animals
1 box or envelope per student
cards from BLM Blank Cards (p. O-36) labeled with numbers, letters, symbols, or shapes, 5 per student
shapes from BLM Attribute Blocks (pp. P-16–17) or BLM Pattern Blocks (p. P-18), at least 8 per student
yarn circles
cards or sticky notes

NOTE: You will need to display a variety of geometric shapes on the board. All shapes that appear in the lesson are on BLM Attribute Blocks and BLM Pattern Blocks. You can post the shapes or, if you prefer, you can draw them. If you draw the shapes, use a ruler to draw any straight sides.

Introduce sorting. Introduce the concept by having students sort themselves. Write the following descriptions on separate sheets of paper: "straight hair," "curly hair," "wearing red," "wearing blue." Create a large circle on the floor using masking tape or string. Put the paper that has "straight hair" written on it inside the circle, and ask all the students with straight hair to stand inside the circle. ASK: Who is left outside the circle? (people with curly or wavy hair) Repeat with the other descriptions.

Using a rule to sort data. Post the cat, dog, tiger, and bear cards from BLM Animal Cards on the board and draw a line beneath them. If you have pictures of real animals, you can use them rather than the cards on the BLM. Draw a sorting circle and write "pets" inside it, as shown below:

C D T B

pets
Ask volunteers to come to the board and move a picture inside the circle if the animal is a pet or outside the circle if the animal is not a pet. When students have finished sorting the animals, the sorting circle should look like this:

```
  T  C  D  B
```

Point to the word “pets” and SAY: This word helped us decide where to put each animal, the same way the words in the circle on the floor helped us decide who should stand in the circle and who should stand outside it. These words give us a rule. The rule tells us what to do. To follow this rule, we put only animals that are pets in the circle. All of the animals in the circle have something in common—they are pets.

Move all the animals back above the line and change “pets” to “wild animals.” SAY: Now the rule tells us that we can put only wild animals in the circle. Ask a volunteer to re-sort the cards according to this new rule.

Now change the animals and the rule. Post the bee, cow, cat, bird, bear, and spider cards from BLM Animal Cards on the board, and write “can fly” in the sorting circle. Point to each animal, and ask students to signal thumbs up if the animal belongs in the circle. Repeat with other rules (for example, has fur, has 4 legs, eats meat) and an increasing number of pictures.

Challenge students to determine the rule from the pictures: Put a fish and an octopus inside the sorting circle and put a cow, cat, and spider outside. Ask students to guess the sorting rule. (sample answer: lives in water)

**ACTIVITY**

Cut out cards from BLM Blank Cards. On each card, draw one of the following:

- a number
- a letter (uppercase or lowercase)
- a symbol (e.g., equal sign, check mark)
- a shape (e.g., circle, star)

Give each student a box or envelope and five game cards. Students should each get at least one number, one letter, and one symbol or shape. Ask students to place all cards that have letters on them in their boxes or envelopes. Ask students to empty their boxes or envelopes and repeat with different rules, such as cards that have numbers on them, cards with 2-digit numbers, cards that don’t have a letter, and so on.

**Variations:** Place all the capital (uppercase) letters in the box. Place all the cards with either a letter or a number in the box.
**Introduce vocabulary: groups, sorting, data.** Draw a sorting circle, write “pets” in it, and post the first four animal cards used earlier (cat, dog, bear, and tiger) above it. Ask a volunteer to use the rule to move the animals. While the volunteer is working, describe what they are doing using key vocabulary. For example, SAY: Zara is putting the animals into two groups. As you point to each group, SAY: One group of animals is inside the circle and one group is outside. When Zara puts the animals in groups using a rule, she is sorting the animals. The things you sort, like animals or numbers or letters, are called data. You sort data into groups using a rule. The rule is also the name of the group. It tells us how all of the things in a group are the same in some way. For example, all the animals in the circle are pets.

Draw on the board:

<table>
<thead>
<tr>
<th>5</th>
<th>8</th>
<th>!</th>
<th>T</th>
<th>k</th>
<th>4</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

letters

Ask students to identify the data and the two groups. (data: 5, 8, !, T, k, 4, m; groups: letters and not letters) Ask volunteers to write the letters inside the circle and the other data outside the circle. Repeat the exercise using the same symbols and a sorting circle labeled “numbers.”

For each of the following exercises, ask students to draw the sorting circle and write the rule on a sheet of paper. Students should copy data that belong in the sorting circle into their circle and the rest outside their circle. Make sure that students have sorted all the data. Have them count the symbols in their pictures—there should be 7 in each.

**Exercises:** Sort the data.

**a)**

<table>
<thead>
<tr>
<th>5</th>
<th>?</th>
<th>7</th>
<th>H</th>
<th>2</th>
<th>m</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

numbers

**b)**

<table>
<thead>
<tr>
<th>3</th>
<th>F</th>
<th>&gt;</th>
<th>p</th>
<th>W</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

letters

**Answers**

**a)**

<table>
<thead>
<tr>
<th>m</th>
<th>7</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

numbers

**b)**

<table>
<thead>
<tr>
<th>&gt;</th>
<th>letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>F</td>
</tr>
<tr>
<td>p</td>
<td>W</td>
</tr>
</tbody>
</table>

"
Review attributes of shapes. Post (or draw) a triangle, square, rectangle, pentagon, and hexagon on the board and have volunteers count the number of sides and vertices in each shape. Draw a shape with at least one curved side, and ask students to identify the curved and straight sides. Draw or post several shapes with square corners and ask students to identify the square corners.

Sorting geometric shapes using one rule. Give each student the same 8 shapes from BLM Pattern Blocks and BLM Attribute Blocks—2 or 3 squares, 1 rectangle, 1 circle, 2 triangles, and 1 oval—and a box or envelope. Ask students to place the squares in their boxes or envelopes. SAY: The shapes outside the box could be called “not squares.” Repeat with triangles and then shapes with straight sides. After the last round of sorting, ASK: What is left outside? (a circle and an oval) Why? (they do not have straight sides) What kind of sides do they have? (curved)

Sorting and tracing. Give each student a yarn circle and a card or sticky note to use as a label. Have them label the sorting circle “4 sides.” Ask students to sort their shapes using this rule. Show students any four-sided shape, and ASK: Does this go inside or outside the sorting circle? (inside) Why? (because it has 4 sides) Repeat with a pentagon and a four-sided shape that has some curved sides. Give each student a different shape to place inside or outside their circles. Have students form pairs and check each other’s work.

Draw a sorting circle with the label “4 vertices” on the board. Post or draw the following shapes above the circle:

Point to each shape and ask a volunteer to say if the shape belongs in the circle. If it does, move the shape into the circle. If it does not, move the shape to a region outside of the circle. Repeat with the rule “no square corners.” (see answers below)

For each of the following exercises, post (or draw) the shapes on the board along with the sorting circle. Point at each shape and ask students to signal (thumbs up or down) whether the shape belongs in the circle or not. If the shape belongs in the circle, draw a line from the shape into the circle. Otherwise, draw a line from the shape to the area outside the circle, but inside the rectangle.
Exercises: Sort the data.

a) [Diagram of shapes with 3 vertices]

b) [Diagram of shapes with 1 or more square corners]

Answers

a) [Diagram with letters A, B, C, D, E, F, G]

b) [Diagram with letters A, E, B, D, F, C, G]

Extension

Post or draw the following shapes (from BLM Attribute Blocks) on the board. Write a letter under each shape.

A B C D
 E F G

Have students sort the shapes using these rules:

a) 4 sides and 4 square corners

b) 1 square corner and fewer than 4 sides

For each rule, students should draw a sorting circle and write the letters of the shapes that match the rule inside the circle. They should write the letters of shapes that do not match the rule outside the circle.

Answers

a) [Diagram with letters A, B, C, D, E, F, G]

b) [Diagram with letters A, E, B, D, F, C, G]
Goals

Students will sort objects into two or three categories using sorting circles.

PRIOR KNOWLEDGE REQUIRED

- Can identify sides, vertices, and square corners in shapes
- Can identify triangles, rectangles, squares, circles, and ovals
- Knows the meaning of fewer than and more than

MATERIALS

- 2 crayons (red and blue)
- 2 colored pencils (red and blue)
- Yellow marker or piece of chalk
- Masking tape or string
- Boxes
- Cards
- Markers, crayons, and pencils in four or more colors
- Small objects (e.g., blocks, beads, small toys)
- Shapes from BLM Attribute Blocks (pp. P-16–17) and/or BLM Pattern Blocks (p. P-18)
- Grocery store flyers
- Scissors

Sorting (Math Counts) by Henry Pluckrose

Sorting into many groups. Show students a set consisting of two crayons (red and blue) and two colored pencils (also red and blue). ASK: How could we sort these objects? (answers will vary) Draw a large circle on the board and label it “red.” Sort the pencils and crayons according to this rule. Use masking tape to affix them to the board.

ASK: What color is the crayon that isn’t red? (blue) Where is the blue crayon? (outside the circle) Draw a second circle and label it “blue.” SAY: Sometimes we sort into more than one group. Place the blue crayon in the new circle. Hold up the blue pencil, and ASK: Where does this go now? (in the blue circle) Show a yellow marker or piece of chalk, and ASK: Which group does this belong to? (none) Explain that sometimes objects don’t fit into any group and are placed outside the circles.

Change the labels in the circles to “pencil” and “crayon” and repeat the sorting exercise.
ACTIVITIES 1–2

1. Create two large circles on the floor using masking tape or string. Have students sort themselves according to rules that don’t encompass everyone such as “blue eyes” and “brown eyes.” Ensure that at least two students are left outside the groups.

ASK: Suppose I label the circles “straight hair” and “curly hair.” How is this sorting different? (no students are left outside the circles)

NOTE: If straight hair and curly hair don’t encompass everyone in your class, use “freckles” and “no freckles.”

2. Sorting stations. Create stations with objects for students to sort according to different rules. Start with two stations. At each one, put three boxes and any number of markers, crayons, and pencils in four or more colors (green, red, blue, and others). Write the sorting rule or label for each box on a card and put it in the box.

• Rules for station 1: markers, crayons, pencils
• Rules for station 2: green, red, blue

Students visit each station in groups of two or three and work together to sort the objects into the boxes. When students are done, ASK: Did all the items fit into the boxes? (yes at station 1, no at station 2)

Create more stations with different objects and new rules. Objects that can be sorted include attribute blocks, beads, and small toys. Write rules in such a way that sometimes all the objects belong to a group and sometimes some objects are left outside the groups.

Sorting geometric shapes. Select a set of triangles and four-sided shapes from BLM Attribute Blocks and/or BLM Pattern Blocks and post them on the board. Draw two sorting circles labeled “3 vertices” and “4 vertices,” and ask volunteers to help you sort the shapes. Show a circle and a pentagon and ask students where these shapes should go. (they do not have 3 or 4 vertices, so they go outside the sorting circles) Draw a third sorting circle on the board with the label “circles.” ASK: Which shape outside the groups now goes inside one of the groups? (the circle)

Clear the board and draw a new sorting circle labeled “more than 3 vertices.” Show a rectangle, and ASK: How many vertices does this shape have? (4) Is 4 more than 3? (yes) Where does this shape go? (inside the sorting circle) Repeat with a pentagon and a circle. (Remind students that circles don’t have any vertices.) Show students a triangle, and ASK: How many vertices does this shape have? (3) Is 3 more than 3? (no) Where does this shape go? (outside of the circle) Draw a second sorting circle labeled “triangles,” and ask for volunteers to help you sort the same four shapes into the two circles. ASK: Which shape doesn’t go in any of the sorting circles? (the circle)
Clear the board and draw two sorting circles with the labels “fewer than 3 sides” and “4 sides.” ASK: Where does the triangle go? (outside both groups) Ask volunteers to sort the rectangle, pentagon, and circle.

Ask students to sort the same four shapes (rectangle, pentagon, circle, and triangle) into three circles with the labels “fewer than 3 sides,” “3 sides,” and “4 sides.” Show a hexagon and a crescent moon shape. ASK: Where does a hexagon go? (outside all the circles) The moon? (in “fewer than 3 sides”)

Draw the sorting circles shown below on the board and post the following shapes above the circles:

```
1 or more square corners

no square corners
```

Ask the class to help you sort the shapes. Point to each shape one at a time. If students think the shape belongs in the left-hand circle they should point their thumb to the left. If students think the shape belongs in the right-hand circle they should their thumb to the right. If they think it doesn’t belong in either circle they should point their thumb down. (see answers below)

```
1 or more square corners

no square corners
```

Repeat with the following exercise.

**Exercise:** Sort the data.

```
triangles

squares
```
Answer

Describing how objects are sorted. Draw or post on the board:

ASK: What is the same about all of the shapes inside the sorting circle? (sample answers: they have 3 sides; they have 3 vertices; they are all triangles) Write "shapes with 3 sides," "shapes with 3 vertices," and "shapes that are triangles" beside the diagram. Point to each phrase, and SAY: Each of these could be a sorting rule for the picture.

Replace one of the triangles with a three-sided shape that has one curved side. Point to the rules again, and ASK: Which of these 3 rules is not a sorting rule for the new picture? PROMPT: Does each shape in the circle have 3 sides? (yes, so "shapes with 3 sides" is a rule) Does each shape have 3 vertices? (yes, so "shapes with 3 vertices" is a rule) Is each shape a triangle? (no, triangles have all straight sides, so one shape is not a triangle; "shapes that are triangles" is not a rule for the picture)

Exercises: What rule was used to sort the objects?

a) 

b) 

Bonus: Give a rule for each circle.
Sample answers: a) shapes with 4 sides (or 4 vertices); b) shapes with all straight sides (or no curved sides); Bonus: first circle: shapes with 5 sides (or 5 vertices), second circle: shapes with 3 sides (or 3 vertices)

ACTIVITY 3
Distribute grocery store flyers and have students cut out and sort foods into the food groups: meat, dairy, vegetables, fruits, and grains.

Literature Connection: Sorting (Math Counts) by Henry Pluckrose. Various objects are sorted in this book. Potentially complex concepts are made accessible to students.

Extensions

(MP6, MP7) 1. Which shape does not belong? Why?
   a) □ △ □ □
   b) ○ △ ○ ○
   c) △ □ □ □

Sample answers:
   a) The triangle does not belong. The other shapes all have 4 sides.
   b) The triangle does not belong. The other shapes all have some curved sides.
   c) The third shape does not belong. The other shapes all have a square corner.

NOTE: Other possible answers exist. For example:
   a) The parallelogram because it has corners “bigger” than square corners.
   b) The circle because it has no straight sides.
   c) The fourth shape because it has more than 4 sides, or because it has a corner that points in.

NOTE: For Extensions 2 and 3, you will need a tall cylinder, a cone, a sphere, and a cube. You will also need the following large paper shapes: a rectangle, an isosceles triangle, a square, and a circle. Sort the shapes according to the groups in each extension before having students answer the question. Place all the shapes so that they are standing along a shelf or blackboard ledge. The rectangle should be standing on its short side.

(MP6, MP7) 2. a) How did I sort these shapes?
   Group A: cylinder, cone, sphere, cube
   Group B: rectangle, triangle, square, circle
   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

Selected answer: a) all the 3-D shapes are in Group A and all the flat shapes are in Group B
Redirecting students: ASK: What is the same about all of these shapes (point to Group A) that is different about all of these shapes (point to Group B)? (they are thicker; they are 3-D, but those other ones are flat)

(MP6, MP7) 3. a) How did I sort these shapes?
   - Group A: cylinder, cube, rectangle, square
   - Group B: cone, triangle

b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

Selected sample answer: a) the shapes in Group B get narrower as you go from bottom to top, but the shapes in Group A have the same width the whole way up

Redirecting students: ASK: What stays the same in this group (point to Group A) that changes in this group (point to Group B)? (the width stays the same from top to bottom; the top and bottom of the shapes are the same)
Goals

Students will sort and represent data as a concrete graph.

PRIOR KNOWLEDGE REQUIRED

- Can sort data according to one, two, or three attributes
- Can determine how many more or how many less
- Understands the comparatives largest, smallest, longest, shortest, most, least
- Can identify and sort triangles, circles, squares, rectangles
- Can identify the number of vertices, sides, and square corners in a shape

MATERIALS

- 20 large connecting cubes of three different colors per student or small group
- 3 strips of paper divided into squares (optional)
- BLM 2 cm Grid Paper (p. P-20)
- 5 to 10 small connecting cubes per student or small group
- sticky tack
- 4 triangles and 3 four-sided shapes from BLM Attribute Blocks (pp. P-16–17) or BLM Pattern Blocks (p. P-18) per student
- glue or tape
- BLM Graph Templates (1) (p. O-37)
- cards labeled “Winter,” “Spring,” “Summer,” and “Fall”

NOTE: You will need to partially fill in and then photocopy BLM Graph Templates (1) for the exercises on p. O-16.

Creating a concrete graph. Give each student or small group of students about 20 large connecting cubes of three different colors. Ask them to sort the cubes into groups by color.

SAY: I want to see which color you have the most of. ASK: How can you show me that quickly? Ask students to link the cubes into chains of the same color so that you can easily compare their lengths. Ask students to place the chains side by side, so that the longest chain is easy to find.

SAY: A graph is a way of arranging data that makes it easy to learn about and compare. You have created a concrete graph. A concrete graph is made using things that you can touch and move around.

The need for a common starting line. Show three connecting cube chains side by side without a common starting line, as shown on the following page (you could also use strips of paper divided into squares).
Compare each color to another color. Using whatever colors your students have, ASK: Is it easy to see that there are more light gray cubes than white cubes? (yes) What about dark gray cubes and white cubes—can you compare them easily? (no, they are not lined up properly) How should the chains be arranged so that we can easily tell which one is longest or shortest? (the ends of the chains should line up on one side) Invite a volunteer to rearrange your cube chains so that they line up on the left side. Have students rearrange their own cube chains if necessary.

When all students have created their concrete graphs, prompt them to “read” their graphs. For example, ASK: Which color do you have the most of? How many more red cubes do you have than green cubes? How do you know?

The need for a common starting point. Give each student or small group of students BLM 2 cm Grid Paper, 5 to 10 small connecting cubes, and about 5 large connecting cubes. Have students sort their cubes by size and create two new chains.

Hold up two cube chains side by side, one made of 4 large cubes and the other made of 6 small cubes, and SAY: I think I have more large cubes than small cubes because this chain is longer. Am I correct? Have students identify your mistake. ASK: How could we draw these two chains on grid paper so that we can see which chain has more cubes? PROMPTS: Think of reading buddies. The older students are larger. How do we know if there are the same number of older students and younger students? Buddies work in pairs. Can cubes go in pairs too? How can you put the cubes on grid paper so that we see the pairs?

Invite students to make a concrete graph on 2 cm grid paper. Guide them to do so by lining up the blocks: the first 4 small blocks should line up with the big blocks and the last 2 small blocks should extend past the big blocks. Show an example on the board, using sticky tack to affix the large connecting cubes in one row and the small connecting cubes in another below it. Include the labels “Big” and “Small” to the left of each row. The graph should look like this:

```
Big
[ ] [ ] [ ] [ ]

Small
[ ] [ ] [ ] [ ] [ ] [ ]
```

SAY: I have made a graph with the cubes. It is easy to see from my graph which size of cube I have more of.

Explain that graphs can be created by arranging data sideways or up and down. Point to the corresponding part of the graph on the board as you
SAY: We put all the large connecting cubes in one row and all the small connecting cubes in another. We could also put the cubes in a column. Have students rearrange their concrete graphs on grid paper so that the large cubes are in one column and the small cubes are in another next to it. The cubes should again be paired: each small cube should line up with a large cube. The columns need to line up at the bottom just as the rows lined up at the left. Rearrange your graph on the board so that it is vertical. Point out how the labels change position: the name of each group (or label) is written next to each row but below each column.

**ACTIVITY 1**

Give each student 4 triangles and 3 four-sided shapes from BLM Attribute Blocks or BLM Pattern Blocks. Ask them to put the shapes with 3 sides in one group and the shapes with 4 sides in another. Ask students to create a concrete graph by gluing or taping the shapes onto a piece of paper. Students should place the shapes in columns and try to line them up in pairs so it is easy to see which column has more shapes. They should also write “3 sides” and “4 sides” under the correct columns.

Draw on the board:

| 4 | L | 2 | 7 | D | A | r | 9 | 3 |

SAY: I want to sort these symbols into letters and numbers. So I will write the words “letters” and “numbers” in the circles. After you write these, ask volunteers to copy each symbol into the correct circle. Students should cross out the symbols as they sort them. After students sort the symbols, SAY: I want to make a graph of my letters and numbers. ASK: What name should I give to my rows? (letters and numbers) SAY: My rows will have the same names as my circles—letters and numbers. Write the names in the rows. SAY: I'm going to write all the letters in this row (indicate the top row of the table), one letter in each box. Copy the letters one at a time. SAY: You can cross them out as you go, if you'd like. Have a volunteer copy the numbers into the second row. The final picture should look like this:

<table>
<thead>
<tr>
<th>A</th>
<th>L</th>
<th>D</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letters</td>
<td>L</td>
<td>D</td>
<td>A</td>
</tr>
<tr>
<td>Numbers</td>
<td>4</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>
ASK: How many letters did we sort? (4) How many numbers? (5) How many more numbers did we sort than letters? (1 more) How many things did we sort altogether? (9)

Write the data for each exercise below in the appropriate space on BLM Graph Templates (1). Make copies and give one to each student. Look at the first exercise together. ASK: How could we sort the data—into which groups? (into letters and numbers) What names should we write in the sorting circles? (letters, numbers) Have students sort the data, and then copy the data into the rows of the graph. Take up the answers on the board step by step as students complete them. Prompt students to think about how to sort the data in the second exercise, and help them to write the correct labels in the sorting circles (2 letters, 3 letters). Have them sort the data and create the graph independently.

Exercises: Sort the data. Copy the sorted data into the rows of the graph.
a) T b m 7 W 3 4 L r  
b) at bed on it hat me top

Answers

a) Letters

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>b</th>
<th>m</th>
<th>W</th>
<th>L</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) 2 Letters

<table>
<thead>
<tr>
<th></th>
<th>at</th>
<th>on</th>
<th>it</th>
<th>me</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Letters</td>
<td>hat</td>
<td>top</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Copy the answers for exercise b) above onto the board. ASK: How many words with 2 letters did you sort? (4) How many words with 3 letters did you sort? (3) How many words did you sort altogether? (7) How many more words with 2 letters did you sort than words with 3 letters? (1 more)

ACTIVITY 2

Make a concrete graph with people. Prepare cards or sheets of paper with the words “Winter,” “Spring,” “Summer,” and “Fall” and attach them to the board. Invite students to stand in a line under their favorite season. ASK: Which season is liked by most people in the class? How does the concrete graph you just created make it easier to find the answer? (the longest line has the most number of people) Which season is liked by the smallest number of people? How does our concrete graph make it easier to find this answer? (the shortest line has the least number of people) How many people like summer? (have students count off) How many people prefer spring? How many more people chose summer than spring?
Extensions

1. Have students create a set of data to sort and then graph. First, direct them to create the data. For example, ask them to write five 2-letter words and four 3-letter words or draw three shapes with no curved sides and four shapes with no straight sides. Then prompt them to draw and label the sorting circles, sort the data, and copy the sorted data into a graph.

Students can use BLM Graph Templates (1). If the template isn’t large enough for the type of data you want students to use, have them draw their own sorting circles on blank paper and create a graph on grid paper.

2. a) If you keep the bottom of a cylinder the same but stretch it taller, is it still a cylinder?
   b) In pairs, explain your answers to part a). Do you agree with each other? Discuss why or why not.

Sample answers: a) yes; b) the circle on the bottom is still a circle and it stays the same width all the way up when you stretch the cylinder taller.

Whole-class follow-up: Repeat for a rectangle, a square, a cube, a triangle, and a cone. Have students sort the shapes into “Yes” (cylinder, rectangle, triangle, cone) and “No” (square and cube) groups.

3. a) If you know $10 - 7 = 3$, how can you find $20 - 7$ without subtracting? 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) 20 is 10 more than 10, so $20 - 7$ is 10 more than $10 - 7$. Since $10 - 7 = 3$, then $20 - 7 = 13$.

4. Jenny has 20 stamps. She uses 6 of them to mail a letter. How many stamps does she have now?

Answer: 14
MD1-22  Picture Graphs
Pages 200–202

STANDARDS
1.MD.C.4

VOCABULARY
column
concrete graph
data
fewer than
graph
more than
picture graph
row
same
symbol

Goals
Students will create and analyze picture graphs.

PRIOR KNOWLEDGE REQUIRED
Can sort objects according to up to three attributes
Can compare and order numbers
Can tell how many more or how many less
Can create concrete graphs
Can write a subtraction sentence

MATERIALS
BLM Graph Templates (2) (p. O-38)

Introduce picture graphs. Remind students that in the last lesson they made concrete graphs using blocks, shapes, and even students. SAY: It would be hard to take some of these graphs home or keep them (especially the graph made of students!). I will show you a way to put data into a graph that you can keep or take home. Write “picture graph” on the board and have a volunteer circle the word that tells you it is a graph. (graph) Point to the word picture. SAY: A picture graph uses very simple pictures of objects instead of the real objects. These simple pictures are called symbols and they should be easy to draw. For example, a symbol for a person might be a stick person. Ask students to think about a simple shape they might use to represent a book (a square or rectangle) or a set of coins of different types (circles). SAY: Sometimes people use the same symbol in all the rows of the graph and sometimes they use different symbols.

Write on the board:

Money: 1¢

Fruit:

SAY: The symbols in a picture graph don’t have to look like the data at all. You could use check marks or circles or squares to show the data, even if the data do not have that shape.

Review the need to align symbols and use a common starting point in graphs. Draw on the board:

After-School Classes

<table>
<thead>
<tr>
<th>Art</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Music</td>
<td>🎶🎶🎶🎶</td>
</tr>
<tr>
<td>Soccer</td>
<td>🎾🏀〇〇</td>
</tr>
</tbody>
</table>
SAY: This graph shows how many after-school classes there are in one week. I used a paintbrush to show an art class, a musical note for a music class, and a ball for a soccer class. Pointing to the graph, SAY: The line of paintbrushes is longer than the line of notes. I think there are more art classes during the week than music classes. ASK: Is that correct? (no) Why not? (there are only 2 symbols for art and 4 symbols for music, so there are more music classes) SAY: I think there are more soccer classes than music classes. Have students explain your mistake.

Discuss with students why you might be making mistakes. (the paintbrushes are longer than the other symbols; the soccer balls do not start at the same place as the other symbols) ASK: How could we redraw the picture graph to make it easier to read? (make the symbols the same size or width; line up the symbols in one row with the symbols in the others; use the same symbol in every row, e.g., stick people) Invite three volunteers to redraw the picture graph using one of the suggestions. ASK: What activity has the greatest number of classes in a week? (music)

Translating a concrete graph into a picture graph and analyzing it.
Select approximately 10 students who are wearing either white, red, or green shirts. Write the words "White," "Red," and "Green" on the board. Have students line up in front of the words according to the color of their shirt. Pick two adjacent colors, such as white and red, and ASK: On this concrete graph, can we easily see if we have more red shirts or more white shirts today? (sample answer: yes) How can we see that? (sample answer: the red line is longer) Ask the students in the red column to pair up with the students in the white column by holding hands. ASK: How many people are not holding anyone’s hand? Which column are they in? What does this mean? (more people are wearing ___ than ___) How many more people are wearing ___ than ___?

Ask the students in the concrete graph to stay where they are while you draw the template for a picture graph on the board. Label each row with a shirt color, as shown below:

<table>
<thead>
<tr>
<th>White</th>
<th>Red</th>
<th>Green</th>
</tr>
</thead>
</table>

Have the students in the concrete graph draw a smiley face for themselves in the appropriate row. Ask students to say how they know the graph was drawn correctly. PROMPTS: Where do the pictures in each row start? (they start at the left side) Do any rows have gaps between pictures? (no) Is each picture lined up with the picture above or below? (yes) Let students count both the people and the symbols for each color. ASK: Do we have the same number of people and symbols? (yes) On this graph, can we easily see if we have more red shirts or more white shirts today? (yes) How can we see that? (compare the lengths of the rows of symbols) Emphasize the significance of lining up the symbols correctly. Repeat with a different group
of students and different colors. In at least one graph, arrange the symbols in columns instead of rows.

Add a title to one of the graphs on the board (e.g., Color of Shirts) and explain to students that a title tells us what a graph is about.

**How many more?** Draw on the board:

<table>
<thead>
<tr>
<th>Color of Shirts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
</tr>
<tr>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
</tr>
</tbody>
</table>

ASK: How many people are wearing a red shirt in the graph? (4) A blue shirt? (6) How many more people are wearing a blue shirt than a red shirt? (2) How could you find out? (use subtraction) How does the graph show that there are 2 more people in blue shirts than in red shirts? (the blue row is longer by 2 symbols) How many more people are wearing blue shirts than green shirts? (4) How many fewer people are wearing green shirts than red shirts? (2)

**There should be no “breaks” in the data.** Draw on the board:

<table>
<thead>
<tr>
<th>Students’ Birthplaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in the US</td>
</tr>
<tr>
<td>Born outside the US</td>
</tr>
</tbody>
</table>

Explain that the graph shows the number of students in a class who were born in the US and outside the US. SAY: I think more students were born in the US than outside the US because the circles start at the same place, but the ones in the top row go past the ones in the bottom row. ASK: Is that correct? Have students explain your mistake and redraw the table correctly. (there should be no empty spaces (cells) within the graph) Remind students that the symbols must line up at the start.

**Creating picture graphs of numerical data.** Start with two pieces of data, such as the number of people who like to play soccer and the number of people who don’t like to play soccer (note that the numbers cannot exceed 12). Present your class with hypothetical numbers or collect the data from some of your students by asking them how they feel about soccer. Brainstorm possible symbols for a picture graph. (see examples below)

Like to play soccer: ☻

Don’t like to play soccer: ☹

Have students create a picture graph using the numbers that you wrote on the board and **BLM Graph Templates (2)**. Write the title and labels for the rows on the board for students to copy.
Repeat with more numerical data collected from the class. You can give students two or three choices—the BLM includes templates for both.

SAY: A teacher asks her class about their favorite fruits. Here are the numbers of students that chose each fruit. Write on the board:

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>5</td>
</tr>
<tr>
<td>Bananas</td>
<td>4</td>
</tr>
<tr>
<td>Oranges</td>
<td>6</td>
</tr>
</tbody>
</table>

Ask students to use the graph template to make a picture graph with the title “Favorite Fruit.” The completed graph should look like this:

```
Title: Favorite Fruit

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>😊😊😊😊</td>
</tr>
<tr>
<td>Bananas</td>
<td>😊😊😊</td>
</tr>
<tr>
<td>Oranges</td>
<td>😊😊😊😊</td>
</tr>
</tbody>
</table>
```

ASK: How many students chose apples? (5) How many more students chose oranges than apples? (1) How many more students chose oranges than bananas? (2) How many fewer students chose bananas than apples? (1)

**Exercises:** Use the picture graph to answer the questions.

**Mittens or Gloves**

<table>
<thead>
<tr>
<th>Mittens</th>
<th>Gloves</th>
</tr>
</thead>
<tbody>
<tr>
<td>😊😊😊😊</td>
<td></td>
</tr>
<tr>
<td>😊😊😊</td>
<td></td>
</tr>
</tbody>
</table>

a) How many students wear gloves?
b) How many students wear mittens?
c) Do more students wear mittens or gloves?
d) How many more wear mittens?
e) Write a subtraction sentence to show how many more wear mittens.

**Answers:** a) 3, b) 5, c) mittens, d) 2, e) 5 – 3 = 2

**Extensions**

1. **Creating graphs from numerical data and clues.** Ask students to pick their favorite of three sports: basketball, soccer, or swimming. Give students BLM Graph Templates (2) and have them label the rows. Present the numerical data in the form of clues and short statements written on the board. (Example: 5 students chose soccer. The same number chose basketball. 2 more students chose swimming than basketball) Create the corresponding picture graph together, using a circle for each piece of data. If students need a hint to get started, ASK: Which sport do you know the number for right away, without adding or subtracting? (soccer)
For this example, the final graph should look like this:

**Title: Favorite Sport**

<table>
<thead>
<tr>
<th></th>
<th>Soccer</th>
<th>Basketball</th>
<th>Swimming</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O O O O O</td>
<td>O O O O O</td>
<td>O O O O O</td>
</tr>
</tbody>
</table>

Have students draw a picture graph with the same title for the following data:

- 5 students chose swimming.
- 3 more students chose basketball than swimming.
- 2 fewer students chose soccer than swimming.

**Answer**

**Title: Favorite Sport**

<table>
<thead>
<tr>
<th></th>
<th>Swimming</th>
<th>Basketball</th>
<th>Soccer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O O O O O</td>
<td>O O O O O</td>
<td>O O O</td>
</tr>
</tbody>
</table>

2. Write three questions about the graph and answer them.

**Flowers in Tom’s Garden**

<table>
<thead>
<tr>
<th></th>
<th>Roses</th>
<th>Tulips</th>
<th>Daisies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O O O O O</td>
<td>O O O O</td>
<td>O O O O O</td>
</tr>
</tbody>
</table>

**Sample answer:** How many tulips are in Tom’s garden? (2) How many more daisies than tulips are in the garden? (5) How many fewer roses than daisies are there? (2)

3. Pam asked 10 students whether they like apples or oranges best. She forgot to fill in the row for oranges. How many students like oranges best?

**Apples or Oranges?**

<table>
<thead>
<tr>
<th></th>
<th>Apples</th>
<th>Oranges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O O O O O</td>
<td></td>
</tr>
</tbody>
</table>

**Answer:** 4 (she asked 10 students in total and 6 prefer apples)

4. In advance, prepare three containers labeled “vanilla,” “chocolate,” and “strawberry.” SAY: When we ask people questions about their choices and ideas and then record and display the answers, we are taking a survey. Write on the board:

What kind of ice cream do you like the most?

vanilla  chocolate  strawberry
Give each student a craft stick (or if not available, a connecting cube) and tell students to put their craft sticks in the container for the kind of ice cream they like the most—if students do not like any of the three kinds, they can pass. When all students have made their choice, place the craft sticks in groups of 5.

a) Count the number of people who picked each kind of ice cream. Find a fast way to count.

b) Make a graph using BLM Graph Templates (2). Remember to write the title and labels.

c) I want to buy one kind of ice cream for the class. From the graph, which kind should I buy? Why?

d) Did anyone not answer the survey question? If so, how many people? How do you know?

e) Make up another question you can ask about the graph. Have a partner answer your question.

Selected sample answers

c) the one that has the most people choosing it, because the most people will like that kind

d) I counted the number of students in the class and I found the total number of people who did the survey by adding together the number of craft sticks in each bucket. I subtracted the number of craft sticks from the number of students in the class to find how many did not answer the survey question.

Redirecting students: For part a), ASK: How can you use the groups of five to count easily? Do you know how many are in two groups of five without counting? (yes, 10) For part c), if some students say that you should buy the kind of ice cream that they like rather than the most popular choice, explain that you want them to look at the graph to decide, because you want to buy the kind of ice cream that the most people like. For part d), ASK: What makes this problem hard? (it’s hard to know how to start) What numbers should you compare to know if there are people who didn’t answer the question? (the number of people in the class and the number of people who answered the question) Do you know how many people are in the class today? (no) How can you find out? (count them—you may need to remind some students to include themselves) Do you know how many people answered the question? (no) How can you find out? (look at the graph and count them)

Whole-class follow-up: How does having the labels on the graph help you to know which ice cream the teacher should buy? (I can see how many people picked each kind of ice cream; if I didn’t label it, I wouldn’t remember which row means strawberry, chocolate, or vanilla)
MD1-23  Tally Charts  
Pages 203–205

STANDARDS
1.MD.C.4, 1.OA.A.1, 1.OA.C.6

VOCABULARY
common
data  
fewer  
least  
more  
most  
picture graph  
popular  
tally  
tally chart  
symbol

Goals
Students will create picture graphs from data given in tally charts.  
Students will solve one-step word problems from data in tally charts.

PRIOR KNOWLEDGE REQUIRED
Can read and create picture graphs  
Can answer simple questions about picture graphs including questions about how many more or fewer

MATERIALS
coin  
12 pipe cleaners  
blue, red, and green chalk or markers (optional)  
BLM Graph Templates (2) (p. O-38, optional)  
BLM Tallies (pp. O-39–40)  
BLM Survey (p. O-41, see Extension 2)

Most popular and least popular. Write the names of several team sports on the board (for example, baseball, basketball, soccer, football) Ask students to vote for their favorite sport listed and write the numbers on the board. ASK: Which sport got the most votes? (answers will vary) SAY: [Sport] is the most popular in our class. It is the first choice of the most people. Suppose I have to decide which after-school program we need at school. I can choose only one sport. ASK: Which one should I pick? (the most popular one) Does it make sense to start a _____ team? (name one of the less popular sports in your class) (no) Why does it make more sense to start a _____ team? (because lots of people like it) Which do you think will attract more people? Why?

Most common and least common. Select 10 students and conduct a quick survey for something that is not based on choice, such as the students’ eye colors. Count the number of students who have blue, green, or brown eyes. Display the results in a picture graph. SAY: We cannot look for the most popular eye color in this graph. We use the word popular for things that people choose. ASK: Can we say that four students chose green eyes? (no) What could we say instead? (four students have green eyes, four students were born with green eyes) SAY: We use the word common to talk about things that people have. ASK: What is the most common eye color? What is the least common eye color?

Introduce tallies. Ask students to raise their hand if they have a sister. Count the number of raised hands and draw a tally mark on the board for each hand counted. (Don’t bundle the tallies in groups of 5. This is taught later in the lesson.) SAY: I am drawing lines to keep track of the number of hands. This way of keeping track of a total is called a tally, and the lines
I am drawing are called tally marks. When you are counting something, such as the number of birds you see on a walk, you can use tally marks to help you keep track of how many you counted. Ask the class several more questions and ask volunteers to write tallies for the number of hands raised. Students could put their hands down as the person marking the tally records them.

Exercises: Write a tally for the number.

a) 5   b) 2   c) 7

Answers: a) \[\boxed{\mid\mid\mid}\], b) \[\boxed{\mid}\], c) \[\boxed{\mid\mid\mid\mid\mid}\]

Drawing a tally chart. SAY: We use tallies to keep track of things 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>
<th>Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tails</td>
<td></td>
<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 rows, one for each possibility (heads or tails). Select 10 volunteers. SAY: Each one of you is going to toss a coin, and we are going to keep a tally of which side lands up. At the end, we will count to see how many we got of each. Show students the coin. Tell students which side of the coin is heads and which side is tails. Have each student toss the coin. Mark down their toss in the Tally column. Ask students to pass the coin to the next person. At some point, you may wish to have volunteers mark the tally for you. When you are done, ask the class to tell you how many heads and tails were tossed and write the answers in the Total column.

Answering questions using a tally chart. Review the results of your tally chart. ASK: Which came up most often: heads or tails? (answer will vary) SAY: The thing that is counted most often is also called the most common. Write: “Which was the most common: heads or tails?” and the answer on the board.

Exercises: Find the answer from the tally chart.

a) Which was the least common: heads or tails?

b) Did tails come up more or fewer times than heads?

c) How many more or fewer times did tails come up than heads?

d) How many times was the coin tossed altogether?

Answers: Answers will vary.
Making picture graphs from tally charts. SAY: Tally charts work very well for answering questions, but sometimes it is nicer to have a picture graph, especially when we want to show other people what we found. Suppose a class is choosing colors for a new school T-shirt. Imagine that the students vote for the color they like best. Here is a tally chart of the results. Draw on the board:

<table>
<thead>
<tr>
<th>Color</th>
<th>Number of Times Chosen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Green</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

SAY: We can make a picture graph from our results. We would need the same number of rows as in the tally chart. We would use the same words too. ASK: Which color was the most popular? (blue) How many people chose blue? (4) SAY: We need to make the graph wide enough for 4 people to vote for blue. Draw the following picture graph next to the tally chart:

<table>
<thead>
<tr>
<th>Color</th>
<th>Number of Times Chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td></td>
</tr>
</tbody>
</table>

SAY: We draw one happy face for each person’s choice. Fill in the blue row. If you have colored markers or chalk, draw the happy faces in the corresponding colors. Have volunteers fill in the rest of the picture graph from the tally chart data, as shown below:

<table>
<thead>
<tr>
<th>Color</th>
<th>Number of Times Chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>😊😊😊😊</td>
</tr>
<tr>
<td>Red</td>
<td>😊😊😊</td>
</tr>
<tr>
<td>Green</td>
<td>😊</td>
</tr>
</tbody>
</table>

SAY: Each happy face stands for one student. Write under the picture graph: “Each 😊 stands for one student.”

ASK: Which color is the most popular? (blue) SAY: Remember: we say popular, not common, because this graph shows peoples’ choices. If we had counted things that people have, we would say common.

Exercises: Answer the questions using the picture graph or the tally chart.

a) Which is the least popular color?
b) How many more people chose blue than red?
c) How many more people chose red than green?

Bonus: How many students are in the class?
Answers: a) green, b) 1, c) 2, Bonus: 8

Tallies with groups of 5. Remind students that when they learned about money, they added the number 5 three or four times by keeping a running total. Write on the board:

\[
5 + 5 + 5 + 5 = 20
\]

\[
\begin{array}{ccc}
10 & 15 & 20
\end{array}
\]

Show students a pile of 12 pipe cleaners and explain that you want to count them. Draw 12 vertical lines on the board. ASK: Is it easier to count the pipe cleaners or the marks on the board? (it is the same) Circle two consecutive groups of 5 marks and ASK: Is it easier to count the tallies now? (yes, we can add the groups of 5 and then count on by ones) 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 with the rest of the pipe cleaners.

SAY: We can keep track of our tally on the board the same way, by grouping them in 5s. Draw 4 vertical lines, counting as you go. SAY: When we get to 5, we draw it across the group like this. Draw on the board:

NOTE: The slash can go diagonally in either direction, or horizontally; all should be shown over the course of the lesson.

SAY: We keep counting and grouping as we go. Count up to 12 while drawing the tally, as shown below:

\[
\begin{array}{c}
\text{\textbackslash longdashes} \\
\text{\textbackslash longdashes} \\
\text{\textbackslash longdashes} \\
\text{\textbackslash longdashes} \\
\end{array}
\]

SAY: It does not matter how we draw the line across. 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 vertical lines, no grouping)

Exercises: Draw a tally to show the number.

a) 3 \hspace{1cm} b) 9 \hspace{1cm} c) 16

Answers: a) \text{\textbackslash longdashes} \hspace{1cm} b) \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \hspace{1cm} c) \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \\

Converting tallies to numbers. Draw on the board:

\[
\begin{array}{c}
\text{\textbackslash longdashes} \\
\text{\textbackslash longdashes} \\
\text{\textbackslash longdashes} \\
\end{array}
\]

ASK: How do we find what number this tally shows? (add 5 three times)

What number does it show? (15)

Exercises: What number does the tally show?

a) \text{\textbackslash longdashes} \hspace{1cm} b) \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \hspace{1cm} \text{\textbackslash longdashes} \\

Answers: a) 10, b) 20
Draw on the board:

\[ \text{\begin{tally}{5} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \end{tally}} \]

SAY: This tally has some groups of 5 and some extra 1s. ASK: How do we find the number this tally shows? (add 5 two times then add 1 three times)

What number does this tally show? (13) Count this out for the class while pointing: 5, 10, 11, 12, 13.

**Exercises:** What number does the tally show?

a) \[ \boxempty{5} \]  

b) \[ \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \]

C) \[ \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \boxed{5} \]

**Answers:** a) 6, b) 14, c) 21

Students can use **BLM Graph Templates (2)** to draw the picture graph in the next exercise.

**Exercises:** Answer the questions using the tally chart.

<table>
<thead>
<tr>
<th>Favorite Snack</th>
<th>Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \end{tally}} ]</td>
<td></td>
</tr>
<tr>
<td>Carrots</td>
<td>[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} ]</td>
<td></td>
</tr>
<tr>
<td>Muffins</td>
<td>[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} ]</td>
<td></td>
</tr>
</tbody>
</table>

a) Write the total for each snack.

b) Draw a picture graph for the data.

**Answers:** a) 6, 7, 4; b) Apples \( \times \times \times \times \times \)
Carrots \( \times \times \times \times \times \times \)
Muffins \( \times \times \times \times \)

For extra practice with tallies, you can assign **BLM Tallies**. (5. 3, 6. ||||| 7. 7, 8. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 9. 5, 10. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 11. 9, 12. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 13. 10, 14. 9, 15. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 16. 13, 17. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 18. 19, 19. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 20. 21. 18, 22. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 23. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 24. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 25. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 26. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 27. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \] 28. \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \]

**Extensions**

1. Make a tally for these numbers.

a) 30  

b) 32  

c) 41

**Answers:** a) \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \]  

b) \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \]

c) \[\begin{tally}{3} \text{\begin{tally}{1} \text{2} \text{3} \text{4} \text{5} \text{6} \text{7} \text{8} \text{9} \text{10}} \end{tally}} \]
2. Tell students that when we ask people questions about their choices and ideas and then record and display the answers, we are taking a survey. Give students **BLM Survey** and have them ask their classmates whether they prefer apples, bananas, or grapes. Students can record their answers with tallies and make a picture graph from the results.

3. Jack made a tally chart of his classmates’ favorite kinds of movies.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>sci-fi</td>
<td></td>
</tr>
<tr>
<td>comedy</td>
<td></td>
</tr>
<tr>
<td>action</td>
<td></td>
</tr>
</tbody>
</table>

He asked four questions about the tally chart and got these answers:

a) 6  

b) 10  

c) action  

d) 3

Write a question for each answer.

**Sample answers:** a) How many people picked comedy?, b) How many people picked action?, c) What kind of movie was picked the most? d) How many more people picked sci-fi than comedy?

4. Jack’s class (see Extension 3) is going to watch a movie today. Looking at the tally chart, which kind of movie should they watch? Write your answer as a full sentence. Explain your choice.

**Sample answer:** Jack’s class should watch an action movie, because more people like action than sci-fi or comedy.
STANDARDS
1.MD.C.4, 1.OA.A.1, 1.OA.C.6

VOCABULARY
column
common
data
fewer
graph
more
picture graph
popular
row
symbol
table

Goals
Students will ask questions about data that are presented in various ways.
Students will answer questions about picture graphs.

PRIOR KNOWLEDGE REQUIRED
Can read and create concrete graphs, picture graphs, and tally charts
Can tell how many more or fewer

MATERIALS
BLM Graph Templates (2) (p. O-38)
BLM Bar Graphs (pp. O-42–43, see Extension 2)

Analyzing graphs and asking questions. SAY: Imagine that you asked some students what they ate for breakfast and wrote down their answers in a picture graph. Draw on the board:

Our Breakfast Today

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal</td>
<td></td>
</tr>
<tr>
<td>Waffles</td>
<td></td>
</tr>
<tr>
<td>Muffins</td>
<td></td>
</tr>
</tbody>
</table>

SAY: We are going to practice asking questions about graphs. ASK: What can I tell from this graph? (sample answer: three people ate muffins) What question can I ask to get this answer? (How many people ate muffins for breakfast?) Write the key phrase in this sentence—“how many”—on the board. Invite more questions and different kinds of questions. If students are asking only “how many” questions, challenge them to think of a question that does not use these words. Prompt them to make comparisons (how many more, how many less, the same number of ___ and ___) and evaluations (the most popular). Record the key phrases for different questions on the board. Encourage students to ask complex questions about the graphs. (for example: How many more students ate cereal than muffins? How many students did the teacher ask in total?)

Repeat the same steps (ask questions and make comparisons) for the graphs on the following page.
Weather (Over 2 Weeks)

| Rainy | Sunny | Cloudy |

Favorite Season

<table>
<thead>
<tr>
<th>Season</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
</tr>
</tbody>
</table>

Introduce tables of values. Draw on the board:

**Favorite Pets**

<table>
<thead>
<tr>
<th>Pets</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cats</td>
<td></td>
</tr>
<tr>
<td>Dogs</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td></td>
</tr>
</tbody>
</table>

SAY: A teacher asked her students to pick their favorite pet. The picture graph shows the results. ASK: How many students chose cats? (8) How many more students chose cats than fish? (6) How many fewer students chose dogs than cats? (4) How many students are in the class altogether? (14) SAY: Some picture graphs have a lot of pictures. Instead of counting the pictures in picture graphs to compare numbers, it is easier to show the data in a different form, called a **table**. A table shows the total number of each type of data. Draw a table beside the picture graph with the title “Favorite Pets” and these labels for the types of data: Cats, Dogs, Fish. Ask students to help you count the pictures and fill in the table. The completed table should look like this:

**Favorite Pets**

<table>
<thead>
<tr>
<th>Pets</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cats</td>
<td>8</td>
</tr>
<tr>
<td>Dogs</td>
<td>4</td>
</tr>
<tr>
<td>Fish</td>
<td>2</td>
</tr>
</tbody>
</table>

Give each student **BLM Graph Templates (2)** for the following exercises.
Exercises: A teacher asks her students to name their favorite vegetable. She writes the number of students who pick each vegetable in a table.

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Student Picks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peas</td>
<td>6</td>
</tr>
<tr>
<td>Carrots</td>
<td>4</td>
</tr>
<tr>
<td>Broccoli</td>
<td>7</td>
</tr>
</tbody>
</table>

a) Make a picture graph of the data.
b) How many more students chose broccoli than carrots?
c) How many children are in the class?

Answers: a) Peas ✓ ✓ ✓ ✓ ✓ ✓ ✓, b) 3, c) 17

Extensions

1. Who found fewer leaves than Bill and more leaves than Yu?

Leaves We Found

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill</td>
<td>●●●●●●●●●</td>
</tr>
<tr>
<td>Milly</td>
<td>●●●●●●●●●</td>
</tr>
<tr>
<td>Raj</td>
<td>●●●●</td>
</tr>
<tr>
<td>Yu</td>
<td>●●●●</td>
</tr>
</tbody>
</table>

Answer: Milly

NOTE: Extensions 2–6 should be done in order. Students will work in groups of three to create a survey.

2. What are some things you would like to know about your classmates? Finish the question in different ways: What _____ do you like the most?

Sample answers: song, color, season, subject, food, farm animal

3. In groups of 3, decide with your group what question you want to ask. Pick three answers for your classmates to choose from.

Sample answer: Question: What animal do you like the most?
Answers: dogs, cats, horses

(MP3) ✶ 4. a) Why is it important to make sure everyone answers the question only once?

b) In the same group of 3, explain your answers to part a). Do you agree with each other? Discuss why or why not.
NOTE: In part b), encourage partners to ask questions to understand and challenge each other’s thinking (MP3)—see p. A-43 for sample sentence and question stems.

Whole-class follow-up: Tell students you want to know what their favorite subject is, math, science, or language. Have several volunteers tell you their favorite choice and record it in a tally chart. Be sure to ask some volunteers twice. If no one notices, ask the same volunteer every second time. Observe if anyone is objecting. ASK: Is this a good way to find out what subject is liked by the most people? (no) Why not? (you keep going back to the same person—that person’s opinion will count more than others) SAY: I want everyone’s opinion to count once.

(MP5)

5. a) Decide how you will do the survey to make sure you ask everyone only once.

b) Prepare the materials that you will need to do the survey.

Sample answers
• Ask everyone to stand in a line behind the choice they like the most.
• Give everyone a craft stick and have them put it in a can labeled with the choice they like the most.
• Make a tally chart. Ask the question to each classmate one at a time and record their answers on the tally chart

Redirecting students: If students struggle with making a decision, encourage them to discuss in groups which way will be faster and easier.

NOTE: For Extension 6, assign a number from 1 to 3 to each student in each group of 3. Ask students to find the other students with the same number. This will allow students to survey fewer people than the whole class.

(MP2)

6. a) Ask your question to the people who have the same number as you. Record the answers.

b) Graph the results on BLM Graph Templates (2).

c) Return to your original group of three. Add the data your group members found to your graph.

d) Ask and answer questions about your surveys. Include questions about “how many more.”

NOTE: If some students don’t want to answer the question because their favorite (song, animal, etc.) is not one of the choices, point out that it would take too much time to list all the choices that exist, so they have to decide which of these they like the most. If students really dislike all of the choices, they are allowed to pass.
Animals (I)

1. **Cat**
2. **Dog**
3. **Cow**
4. **Fish**
5. **Penguin**
6. **Frog**
7. **Octopus**
8. **Tiger**
Animals (2)

- Spider
- Grasshopper
- Bee
- Polar Bear
- Bird
- Horse
- Mouse
- Fish
Blank Cards
Graph Templates (2)

Title: ________________________________

Title: ________________________________

Title: ________________________________

Title: ________________________________
Tallies (I)

□ Write the number or draw the tally.

1. \( / \) 2. \(/ /\) 3. \(\begin{array}{c}4\end{array}\) 4. \(\begin{array}{c}5\end{array}\)

5. \(\begin{array}{c}6\end{array}\) 6. \(\begin{array}{c}7\end{array}\) 7. \(\begin{array}{c}8\end{array}\) 8. \(\begin{array}{c}9\end{array}\)

9. \(\begin{array}{c}10\end{array}\) 10. \(\begin{array}{c}11\end{array}\) 11. \(\begin{array}{c}12\end{array}\) 12. \(\begin{array}{c}13\end{array}\)

13. \(\begin{array}{c}14\end{array}\) 14. \(\begin{array}{c}15\end{array}\) 15. \(\begin{array}{c}16\end{array}\) 16. \(\begin{array}{c}17\end{array}\)

17. \(\begin{array}{c}18\end{array}\) 18. \(\begin{array}{c}19\end{array}\) 19. \(\begin{array}{c}20\end{array}\) 20. \(\begin{array}{c}21\end{array}\)
Tallies (2)

□ Tally the number of objects.
□ Cross out the objects as you count.

22. [Diagram of apples with tally marks]
23. [Diagram of bananas with tally marks]
24. [Diagram of ants with tally marks]
25. [Diagram of dots with tally marks]
26. [Diagram of hearts with tally marks]
27. [Diagram of squares with tally marks]
28. [Diagram of various shapes with tally marks]
Survey

☐ Ask students in your class:
   Which fruit do you like best?
☐ Tally your results.

1. 

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td></td>
<td></td>
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<tr>
<td>Bananas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grapes</td>
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</tbody>
</table>

☐ Make a picture graph. Use 😊.

2. 

<p>| | | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Apples</td>
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<tr>
<td>Bananas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td></td>
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</tbody>
</table>

☐ Write 2 questions about your data, and answer them.

3. 

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Bar Graphs (I)

1. How many?

The bar for cats is **4** long.
We own **4** cats.

The bar for dogs is **long**.
We own **dogs**.

The bar for fish is **long**.
We own **fish**.

2. Flowers in Ethan’s Garden

Ethan has:

____ lilies
____ roses
____ tulips
Bar Graphs (2)

☐ Use the bar graph to answer the questions.

3. Use the bar graph to answer the questions.

Which color is most popular? ______________________
Which color is least popular? ____________________

4. How many more quarters than dimes are in Ella’s pocket? _____
How many coins are in Ella’s pocket altogether? _____
Ten-Frames

[Blank ten-frame diagrams]
Hundreds Chart

<table>
<thead>
<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<td>97</td>
<td>98</td>
<td>99</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
Number Cards 1 to 100 (I)
Number Cards 1 to 100 (2)

13 14 15
16 17 18
19 20 21
22 23 24
Number Cards 1 to 100 (3)

25  26  27

28  29  30

31  32  33

34  35  36
Number Cards 1 to 100 (4)

37  38  39
40  41  42
43  44  45
46  47  48
Number Cards 1 to 100 (5)

49  50  51

52  53  54

55  56  57

58  59  60
Number Cards 1 to 100 (7)

73 74 75
76 77 78
79 80 81
82 83 84
### Number Cards 1 to 100 (8)

<table>
<thead>
<tr>
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<th>86</th>
<th>87</th>
</tr>
</thead>
<tbody>
<tr>
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<td>91</td>
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<td>93</td>
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<tr>
<td>94</td>
<td>95</td>
<td>96</td>
</tr>
</tbody>
</table>
Number Cards 1 to 100 (9)

<table>
<thead>
<tr>
<th>97</th>
<th>98</th>
<th>99</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>&gt;</td>
<td>&lt;</td>
</tr>
<tr>
<td>=</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Hundreds Chart for Base Ten Blocks

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

<p>| | | | | | | | | | | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>4</td>
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<td>7</td>
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<td>46</td>
<td>47</td>
<td>48</td>
<td>49</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>
Base Ten Materials

[Diagram of Base Ten Materials]

NAME ___________________________ DATE ____________
I Have _____, Who Has _____? Game Cards

<table>
<thead>
<tr>
<th>I have</th>
<th>I have</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who has</td>
<td>Who has</td>
</tr>
<tr>
<td>I have</td>
<td>I have</td>
</tr>
<tr>
<td>Who has</td>
<td>Who has</td>
</tr>
</tbody>
</table>
Attribute Blocks (I)
Attribute Blocks (2)
Pattern Blocks

---

[Diagram of various geometric shapes including triangles, squares, parallelograms, trapezoids, and hexagons]
1 cm Grid Paper
2 cm Grid Paper
3. Draw more circles.
   Write the addition sentence.
   a) 2 more than 4
      \[\begin{array}{c}
      \bullet \\
      \bullet
      \end{array}\]
      \[4 \quad + \quad \Box \quad = \quad \Box\]
   b) 3 more than 5
      \[\begin{array}{c}
      \bullet \\
      \bullet
      \end{array}\]
      \[5 \quad + \quad \Box \quad = \quad \Box\]

4. Find the missing number by counting on.
   a) 5 + \[\Box\] = 8
   b) \[\Box\] + 6 = 9
   c) 4 + \[\Box\] = 6
   d) 3 + \[\Box\] = 8

**BONUS:** 17 + \[\Box\] = 20
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 54 to 57)

1. a) \[
\begin{array}{cccccc}
& & & & & \\
& & & & & \\
& & & & & \\
& & & & & \\
& & & & & \\
\end{array}
\]
   5
b) \[
\begin{array}{c}
& \\
\end{array}
\]
   1, 4

2. a) \[
\begin{array}{c}
& \\
\end{array}
\]
   1
b) \[
\begin{array}{cccccc}
& & & & & \\
& & & & & \\
& & & & & \\
& & & & & \\
& & & & & \\
\end{array}
\]
   6

3. a) \[
\begin{array}{cccc}
& & & \\
& & & \\
\end{array}
\]
   2, 6
b) \[
\begin{array}{cccc}
& & & \\
& & & \\
\end{array}
\]
   3, 8

4. a) 3
b) 3
c) 2
d) 5

BONUS
   3
1. Subtract by counting on from the smaller number.
   a) 8 − 5 = □
   b) 18 − 3 = □

2. Find the missing number by adding or counting on.
   a) 8 + 4 = □
   b) 3 + □ = 7

3. Is the number sentence true or false?
   a) 7 + 1 = 9
   b) 3 + 5 = 8
   true    false    true    false

4. There are 4 empty mugs.
   There are 3 full mugs.
   There are _______ in total.

5. Make a problem for the picture. Use the words big and small.
   There are _______ frogs.
   There are _______ frogs.
   There are ______ frogs altogether.
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 58 to 61)

6. Draw a picture to find the answer.

Use ● for red. Use ○ for green.

a) There are 5 apples.
   3 are red.
   How many green apples are there?
   _____ green apples

b) There are 4 apples.
   1 is red.
   How many green apples are there?
   _____ green apples

c) There are 2 red apples and 4 green apples.
   How many apples are there in total?
   _____ apples in total

d) There are 2 red apples and 2 green apples.
   How many apples are there in total?
   _____ apples in total

BONUS: Is the number sentence true or false?

17 – 3 = 14
true    false
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 58 to 61)

1. a) 3  
   b) 15

2. a) 12  
   b) 4

3. a) false  
   b) true

4. 7 mugs

5. 2 big  
   4 small  
   6

6. a) 2  
   b) 3  
   c) 6  
   d) 4  

   BONUS  
   true
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 62 to 65)

1. Draw circles for the apples.
   a) 6 apples
      | 2 red | 4 green |
   b) 4 apples
      | 1 red | 3 green |

2. Find the missing number.
   a) total
      | 7     |
      | 3     | part
   b) total
      | 4     | 5     | part
      | part  |

3. Write an addition sentence for the picture.
   Draw □ for the missing number.
   a) 6
      | 3     |
   b) 2     3
4. Fill in the picture.

Find the answer.

a) Ron has 4 red fish and 3 yellow fish. How many fish does he have in total? 
   ____ fish

b) Ron has 5 pencils. 2 are green. The rest are red. How many are red? 
   ____ red pencils
ADVANCED

5. Write a number sentence.

Find the answer.

Ed sees 4 ducks on a pond.
Then 3 more land on the pond.
How many ducks does Ed see now?

______________________

_____ ducks
1. a)
   \[ \begin{array}{cc}
   \text{a)} & \text{b)} \\
   \hline
   \text{a)} & \text{b)} \\
   \end{array} \]

2. a) 4
   b) 9

3. a) \[ 3 + \square = 6 \]
   b) \[ 2 + 3 = \square \]

4. a)
   \[ \begin{array}{c}
   \text{7} \\
   \text{4} \\
   \text{3} \\
   \hline
   \text{7} \\
   \end{array} \]

   b)
   \[ \begin{array}{cc}
   \text{5} \\
   \text{2} \\
   \text{3} \\
   \hline
   \end{array} \]

   3

ADVANCED

5. \[ 4 + 3 = 7 \]

   7
1. Draw the hidden balls.

Write the number of balls that are hidden.

a) \[ \begin{array}{ccc} & & \bigcirc \bigcirc \bigcirc + & \bigcirc & = 7 \end{array} \]

\[ \begin{array}{ccc} 3 + & \bigcirc & = 7 \end{array} \]

b) \[ \begin{array}{ccc} & \bigcirc \bigcirc & + & \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc = \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc 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5. Draw a picture to find the answer.
   Use ◯ for red. Use ○ for green.
   There are 8 apples.
   3 are red. The rest are green.
   How many are green?

   ____ green apples

6. Find the missing number.

   a) total
      __________ 7
      part 4
      part

   b) total
      __________ 8
      part 2
      part

7. Fill in the picture. Find the answer.
   Ron has 5 pencils.
   2 are green. The rest are red.
   How many are red?

   ____ red pencils
ADVANCED

8. Write a number sentence. Find the answer.

Kim sees 8 frogs on a lily pad.

2 frogs jump off.

How many frogs are on the lily pad now?

___________________________________

____ frogs
Unit 3: Operations and Algebraic Thinking

Test (Lessons 54 to 65)

1. a) 4
   b) 5
2. a) 4
   b) 3
   c) 6
3. a) 5
   b) 11
4. a) false
   b) true
5. 5
6. a) 3
   b) 6
7. 3
   2 3
   5
ADVANCED
8 − 2 = 6
6
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 66 to 69)

Name: ____________________
Date: ______________

1. Draw circles to find the missing number.
   a) 〇 〇 〇 〇 〇  b) 〇 〇 〇 〇 〇
   6 is ____ more than 4.  7 is ____ more than 3.

2. Draw 〇 to show how many. Fill in the answer.

   Anne has 4 stickers.
   Jane has 3 more stickers than Anne.

   Jane has ____ stickers.

3. Draw 〇 to show how many.
   Draw × to show how many fewer.

   Pam has 6 apples.
   Ted has 4 fewer apples.

   Ted has ____ apples.
4. Write the subtraction sentence.
   a) Bill has 7 stickers. John has 4 stickers.
      How many more stickers does Bill have?
      _______________________
   b) Alex has 8 beads. Ted has 5 beads.
      How many more beads does Alex have?
      _______________________

5. Show how you find the answer.
   Tina buys 4 pencils.
   Then she buys 3 more.
   How many pencils does she have altogether?
   _____ ○ _____

**BONUS:** Fill in the number sentence.
   Tim has 6 leaves. He finds 1 more. Then he gives 3 to a friend. How many leaves does Tim have now?
   _____ ○ _____ ○ _____ = _____
ADVANCED

6. Fill in the missing numbers.

\[8 + \underline{+} + 10 \rightarrow 13\]

\[8 + \underline{+} = 13\]
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 66 to 69)

1. a) 2
   b) 4

2. Anne    
   Jane    
   7

3. Pam     
   Ted     
   2

4. a) 7 − 4 = 3
     b) 8 − 5 = 3

5. 4 + 3

BONUS
  6 + 1  3 = 4

ADVANCED
6. 2, 3
   5
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 70 to 73)

Name: ____________________

Date: ______________

1. Circle the coin that is worth the most.

![Coins Image]

2. How much money?

![Nickels Image]

____ ¢

3. Add the nickels.

![Nickels Image]

____ ¢   ____ ¢   ____ ¢   ____ ¢
4. Draw the coins you need to pay.

5. Find the answer.
   
a) Ron has 9 cherries.
   Alice has 5 cherries.
   How many more cherries does Ron have than Alice?

   ____________________ ________________________

b) Paul has 4 fish, 2 mice, and 3 cats.
   How many pets does he have?

   ____________________ ________________________
Unit 3: Operations and Algebraic Thinking

Quiz (Lessons 70 to 73)

1. Teacher to check that the quarter is circled.
2. 6
3. 5, 10, 15, 20
4. Teacher to check that student has drawn 1 nickel and 3 pennies.
5. a) $9 - 5 = 4$
b) $4 + 2 + 3 = 9$
1. Draw ○ to show how many.
   Draw × to show how many fewer.

   Raj has 7 apples.
   Ali has 3 fewer apples.

<table>
<thead>
<tr>
<th>Raj</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali</td>
<td></td>
<td></td>
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</table>

   Ali has ____ apples.

2. Write the subtraction sentence.
   Pam has 9 books. Ed has 7 books.
   How many more books does Pam have?

   __________________________

3. Add the nickels.

   5¢  5¢  5¢

   ____ ¢  ____ ¢  ____ ¢

4. Draw the coins you need to pay.

   ○ 14¢  5¢
5. Fill in the missing numbers.

\[
7 + \boxed{} + 10 = 14
\]
Unit 3: Operations and Algebraic Thinking

Test (Lessons 66 to 73)

1. \[
\begin{array}{c}
\text{Raj} \\
\text{Ali}
\end{array}
\]

\[
\begin{array}{cccccc}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & X & X & X
\end{array}
\]

4

2. \(9 - 7 = 2\)

3. \(5, 10, 15\)

4. Teacher to check that student has drawn 1 nickel and 4 pennies.

ADVANCED

3, 4

7
Unit 4: Measurement and Data
Quiz (Lessons 13 to 16)

1. Fill in the missing numbers.

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

2. Where is the hour hand pointing?

a) between ___ and ___

b) at the ___

c) at the ___

d) between ___ and ___
3. Write the time two ways.
   a)  
   b)  
   ____ o’clock
   ____ o’clock
   ____ : 00
   ____ : 00

4. Write the time two ways.
   a)  
   b)  
   half past ____
   half past ____
   ____ : 30
   ____ : 30
   c)  
   d)  
   half past ____
   half past ____
   ____ : 30
   ____ : 30
**BONUS:** Jim’s basketball game starts at 5:00.

It ends 1 hour later.

What time does the game end?
Unit 4: Measurement and Data

Quiz (Lessons 13 to 16)

1. 2, 3, 5, 6, 7, 8, 10
2. a) 5, 6
   b) 8
   c) 4
   d) 9, 10
3. a) 4
   b) 11
4. a) 3
   b) 8
   c) 11
   d) 4
BONUS
   6:00
1. Where is the hour hand pointing?
   
   a)  
   
   between
   ____ and ____
   
   b)  
   
   at the ____

2. Write the time two ways.
   
   a)  
   ____ o’clock
   ____ : 00

   b)  
   ____ o’clock
   ____ : 00

   c)  
   BONUS:
   ____ o’clock
   ____ : 00
3. Write the time two ways.
   a) half past ____  
      ____ : 30
   b) half past ____  
      ____ : 30

4. Draw the hands on the clock.
   a) 10:30
      ![Clock](image1)
   b) 2:00
      ![Clock](image2)
   c) 3:30
      ![Clock](image3)
   d) 10:00
      ![Clock](image4)
BONUS: Pam started running at 4:00.
    She stopped running 1 hour later.
    What time did she stop running?
Unit 4: Measurement and Data

Test (Lessons 13 to 16)

1. a) 8, 9
   b) 7

2. a) 10
   b) 6
   c) 3

BONUS
   12

3. a) 5
   b) 7

4. a) [Clock with hands indicating 10:00]
   b) [Clock with hands indicating 11:00]
   c) [Clock with hands indicating 12:00]
   d) [Clock with hands indicating 4:00]

BONUS
   5:00
1. Count the sides.
   a) 
   ____ sides
   b) 
   ____ sides

2. Write ✓ if true.
   Write × if not true.
   a) 
   4 vertices
   3 sides
   all sides straight
   b) 
   3 sides
   3 vertices
   open

3. Write ✓ under the rectangles.
4. Draw a small square in the square corners.
   How many vertices?
   How many square corners?

   a)   b)

   _____ vertices  _____ vertices
   _____ square corners  _____ square corners

5. Write ✓ if true. Write ✗ if not true.

   all square corners
   2 short sides, 2 long sides
   rectangle

**BONUS:** Is the shape a square? ______
How do you know?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
Unit 5: Geometry

Quiz (Lessons 1 to 4)

1. a) 3
   b) 4
2. a) ✔
   ✔
   ✔
   b) ✔
   ✔
   ✔
3. shapes 1, 4, and 5
4. a) 

   5  
   2
   b)

   4  
   2
5. ☒
   ☒
   ☒

BONUS

Yes
All the sides are the same
length. All the corners are
square.
Unit 5: Geometry

Quiz (Lessons 5 to 8)

1. Write ✓ if true.
   Write × if not true.
   a)
   b)

   □ 3 sides
   □ 3 vertices
   □ triangle

2. What shapes do you get if you cut along both dotted lines?

   □ triangles
   □ squares
   □ rectangles
3. Circle the pattern blocks used to make the shape.

![Pattern blocks image]

3 △ □ □ △

4. Write how many straight sides and vertices.

___ straight sides
___ vertices

**BONUS:** Write ✓ if true. Write ✗ if not true.

4 vertices 1 curved side
3 sides 2 long sides and 2 short sides
closed all straight sides
Unit 5: Geometry
Quiz (Lessons 5 to 8)

1. a) ✅ ✅ ✅
   b) ✅ ✅

2. ✅ ✅

3. △ □ △ △

4. 0
   BONUS
   ✅ ✅
   ✅ ✅
   ✅ ✅
1. How many equal parts?
   a) [Diagram of 2 equal parts]
   ____ equal parts
   b) [Diagram of 4 equal parts]
   ____ equal parts

2. Circle the pictures that have one quarter shaded.
   [Diagrams of 4 circles, one shaded]

3. A whole shape has been cut into quarters.
   Draw the missing piece.
   [Diagram of a rectangle cut into 4 sections, one section shaded]
4. Write **half** or **fourth**.
   
   a)  
   [Diagram of a circle divided into four equal parts]
   
   Each part is a ________.  
   
   b)  
   [Diagram of a rectangle split into two equal parts]
   
   Each part is a ________.

5. Circle the shapes used to make the shaded shape.

   ![Shapes]

**BONUS:** How many halves of a pizza do you need to make a whole pizza? ____
Unit 5: Geometry

Quiz (Lessons 9 to 12)

1. a) 2
   b) 4

2. circle the 3rd picture

3. 

4. a) fourth
   b) half

5. 

BONUS

2
1. Count the vertices.
   a) ![pentagon]
   ___ vertices
   b) ![trapezoid]
   ___ vertices

2. Write ✓ if true.
   Write × if not true.
   a) ![triangle]
   - [ ] 3 vertices
   - [ ] closed
   - [ ] all sides straight
   b) ![rectangle]
   - [ ] 3 vertices
   - [ ] closed
   - [ ] 4 sides

3. Write ✓ under the squares.
Unit 5: Geometry
Test (Lessons 1 to 12)

4. Write ✓ if true.
   Write × if not true.

   a) ________________________
      □ all square corners
      □ 2 short sides, 2 long sides
      □ rectangle

   b) ________________________
      □ 4 sides
      □ all square corners
      □ square

5. Draw a shape with 3 straight sides.

   ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ 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________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ________ ______

Sample Unit Quizzes and Tests for AP Book 1.2 Q-77
6. Draw × on the half circles.

7. Write **half** or **fourth**.
   a)  
   b)  

   Each part is a _______.  Each part is a _______.

**BONUS:** Write how many parts are shaded.

   _____ of ____ parts.
Unit 5: Geometry

Test (Lessons 1 to 12)

1. a) 5
   b) 4

2. a) ✓
    ✓
    ✓
   b) ✓
    ✓
    ✓

3. shapes 3 and 5

4. a) ✓
    ✓
    ✓
   b) ✓
    ✓
    ✓

5. Shapes will vary.
   Teacher to check.
   yes

6. cross out the 3rd, 4th, and 6th shapes

7. a) fourth
   b) half

BONUS
   3, 7
Unit 6: Measurement and Data

Quiz (Lessons 19 to 21)

1. Sort the data.

![Shapes with 3 vertices and 4 vertices]

2. Sort the data.

![Shapes with 3 vertices and 4 vertices]
3. Sort the data.

Copy the sorted data into the rows.

<table>
<thead>
<tr>
<th>T</th>
<th>8</th>
<th>a</th>
<th>5</th>
<th>7</th>
<th>b</th>
<th>2</th>
<th>d</th>
</tr>
</thead>
</table>

Letters

Numbers

**BONUS:**

a) How many letters did you sort in Question 3? ____

b) How many letters and numbers did you sort altogether? ____
Unit 6: Measurement and Data

Quiz (Lessons 19 to 21)

1. [Diagram of squares]

2. [Diagram of shapes with 3 and 4 vertices]

3. [Table of letters and numbers]

<table>
<thead>
<tr>
<th>Letters</th>
<th>T</th>
<th>a</th>
<th>b</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

BONUS

a) 4

b) 8
Unit 6: Measurement and Data
Quiz (Lessons 22 to 24)

1. Draw ⬜️ to show the data.
   How many more?

   Sports We Play
   |       |       |       |       |
   | Baseball | ⬜️ | ⬜️ | ⬜️ | ⬜️ | ⬜️ | 5 play baseball
   | Soccer   |     |     |     |     |     | 3 play soccer

   ___ more students play _________ than ____________.

2. Find the totals. Draw a picture graph from the tally chart.

   Favorite Color
   |       |       |
   | Tally | Total |
   | Blue  |   |     |
   | Red   |   |   |
   | Green |   |   |

   Favorite Color
   |       |       |
   | Blue  |       |
   | Red   |       |
   | Green |       |

   ○ means 1
3. Use the picture graph to answer the question.

**Kim’s Garden**

<table>
<thead>
<tr>
<th>Tulips</th>
<th>Roses</th>
<th>Daisies</th>
</tr>
</thead>
</table>

a) Does Kim have more tulips or daisies? ___________

b) How many fewer tulips does Kim have than roses? ____

**BONUS:** How many plants are in Kim’s garden altogether? ____
1. Teacher to check picture graph.
   2. baseball, soccer

2. |   | Total |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>1</td>
</tr>
<tr>
<td>Red</td>
<td>3</td>
</tr>
<tr>
<td>Green</td>
<td>4</td>
</tr>
</tbody>
</table>

3. a) tulips
   b) 1

**BONUS**
6
1. Sort the data.

Sort the data.

Copy the sorted data into the rows.

2. Sort the data.

Copy the sorted data into the rows.
3. Use the picture graph to answer the question.

**Drinks at Lunch**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Juice</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How many more people drink water than juice? ____

4. Use the picture graph to answer the question.

**Favorite Season**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Spring</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

How many more people voted for summer than for spring? ____

**BONUS:** Two fewer people voted for winter than for fall. How many people voted for winter? ____
1. 

1. 

2. 

2. 

3. 3

4. 2

BONUS

2
### Scoring Guides for Sample Unit Quizzes and Tests

#### Unit 3: Operations and Algebraic Thinking

**Quiz (Lessons 54 to 57), p. Q-35**

<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) Draws correct number of balls</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws correct number of balls</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>1, 4</td>
<td></td>
<td>/4</td>
</tr>
<tr>
<td>2</td>
<td>a) Draws correct number of balls</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws correct number of balls</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>6</td>
<td></td>
<td>/4</td>
</tr>
<tr>
<td>3</td>
<td>a) Draws correct number of circles</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>2, 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws correct number of circles</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>3, 8</td>
<td></td>
<td>/4</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>3</td>
<td>yes / no</td>
<td>/4</td>
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</tbody>
</table>

**Total Points** /16
Scoring Guides for Sample Unit Quizzes and Tests
Unit 3: Operations and Algebraic Thinking

(continued)

<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</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>4</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Circles correct answer</td>
<td>false</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Circles correct answer</td>
<td>true</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Gives correct number</td>
<td>7</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>Gives correct word</td>
<td>mugs</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Uses big correctly</td>
<td>2 big</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uses small correctly</td>
<td>4 small</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>6</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td>6</td>
<td>a) Draws a correct picture</td>
<td>● ● ●●</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>●</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws a correct picture</td>
<td>● ○ ○ ○</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>●</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Draws a correct picture</td>
<td>● ● ●●●</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>●</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Draws a correct picture</td>
<td>● ● ○ ○</td>
<td>1</td>
<td>/8</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>●</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>Circles correct answer</td>
<td>true</td>
<td>yes / no</td>
<td>/19</td>
</tr>
</tbody>
</table>

Total Points

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### Scoring Guides for Sample Unit Quizzes and Tests

**Unit 3: Operations and Algebraic Thinking**

**Quiz (Lessons 62 to 65), p. Q-41**

Common Core State Standards Emphasized: 1.OA.A.1, 1.OA.D.8

<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) Draws correct number of circles for the total Draws correct number of circles for the parts</td>
<td>☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>b) Draws correct number of circles for the total Draws correct number of circles for the parts</td>
<td>☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total Points</td>
<td>/4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>9</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>3 + □ = 6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>2 + 3 = □</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct number for the total Gives correct number for the parts</td>
<td>7 4 5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct number for the total Gives correct number for the parts</td>
<td>5 2 3</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer</td>
<td>3</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td>Advanced</td>
<td>Gives correct number sentence</td>
<td>4 + 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gives correct answer</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points** /12
## Scoring Guides for Sample Unit Quizzes and Tests
### Unit 3: Operations and Algebraic Thinking

(continued)

**Test (Lessons 54 to 65), p. Q-45**

| Common Core State Standards Emphasized: 1.OA.A.1, 1.OA.C.5, 1.OA.D.7, 1.OA.D.8 |
|---|---|---|---|
| Question | How to Score | Answer | Number of Points | Total Points |
| 1 | a) Draws correct number of balls
   Gives correct answer | 4 | 1 | 1 |
|  | b) Draws correct number of balls
   Gives correct answer | 5 | 1 | 1 |
|  | | | 4/4 |  |
| 2 | a) Gives correct answer | 4 | 1 | 1 |
|  | b) Gives correct answer | 3 | 1 | 1 |
|  | c) Gives correct answer | 6 | 1 | 1 |
|  | | | 3/3 |  |
| 3 | a) Gives correct answer | 5 | 1 | 1 |
|  | b) Gives correct answer | 11 | 1 | 1 |
|  | c) Gives correct answer | 1 | 1 | 2 |
| 4 | a) Circles correct answer | false | 1 | 1 |
|  | b) Circles correct answer | true | 1 | 2 |
| 5 | Draws a correct picture
   Gives correct answer | ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | 1 | 1 |
|  | | 5 | 1 | 2 |
| 6 | a) Gives correct answer | 3 | 1 | 2 |
|  | b) Gives correct answer | 6 | 1 | 2 |
| 7 | Gives correct number for the total
   Gives correct number for the parts
   Gives correct answer | 5  2  3 | 0.5 0.5 | 1 1 |
|  | | | 2/2 |  |
| Advanced | Gives correct number sentence
   Gives correct answer | 8 – 2 | 1 | 1 |
|  | | 6 | 1 | 1 |
| | Total Points | | | 17 |

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# Rubric for Unit 3: Operations and Algebraic Thinking

**Test 1 (Lessons 54 to 65), p. Q-45**

<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>1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td>
<td>5, 6</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>1.OA.C.5 Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).</td>
<td>2, 3</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>1.OA.D.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? $6 = 6$, $7 = 8 - 1$, $5 + 2 = 2 + 5$, $4 + 1 = 5 + 2$.</td>
<td>4</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>1.OA.D.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = __ - 3$, $6 + 6 = __$.</td>
<td>1, 7, 8 (Advanced)</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>
</tbody>
</table>

**Comments**
## Scoring Guides for Sample Unit Quizzes and Tests

### Unit 3: Operations and Algebraic Thinking

#### Quiz (Lessons 66 to 69), p. Q-49

**Common Core State Standards Emphasized:** 1.OA.A.1, 1.OA.A.2, 1.OA.B.4, 1.OA.C.5, 1.OA.D.8

<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) Draws correct number of circles&lt;br&gt; Gives correct answer</td>
<td>2, 2</td>
<td>0.5</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Draws correct number of circles&lt;br&gt; Gives correct answer</td>
<td>4, 4</td>
<td>0.5</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>Draws correct number of circles for Anne&lt;br&gt; Draws correct number of circles for Jane&lt;br&gt; Gives correct answer</td>
<td>4, 4, 7</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>3</td>
<td>Gives a correct drawing for Pam&lt;br&gt; Gives a correct drawing for Ted&lt;br&gt; Gives correct answer</td>
<td>6 circles, 2 circles, 4 x’s, 2</td>
<td>1</td>
<td>/3</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct subtraction sentence&lt;br&gt; Gives correct answer</td>
<td>7 − 4, 3</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct subtraction sentence&lt;br&gt; Gives correct answer</td>
<td>8 − 5, 3</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td>5</td>
<td>Gives correct numbers&lt;br&gt; Gives correct symbol</td>
<td>4, 3, +</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct number sentence</td>
<td>6 + 1 − 3 = 4</td>
<td>yes / no</td>
<td>/2</td>
</tr>
<tr>
<td>Advanced</td>
<td>Fills in missing numbers correctly&lt;br&gt; Gives correct answer</td>
<td>2, 3, 5</td>
<td>1</td>
<td>/3</td>
</tr>
</tbody>
</table>

**Total Points** /13

#### Quiz (Lessons 70 to 73), p. Q-53

**Common Core State Standards Emphasized:** 1.OA.A.1, 1.OA.A.2, 1.OA.B.4, 1.OA.C.5, 1.OA.C.6, 1.OA.D.8, 1.NBT.C.4

<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>Circles correct answer</td>
<td>quarter</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>2</td>
<td>Gives correct answer</td>
<td>6</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>3</td>
<td>Gives correct answer</td>
<td>5, 10, 15, 20</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>4</td>
<td>Draws correct number of coins</td>
<td>1 more nickel, 3 pennies</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>a) Writes correct number sentence&lt;br&gt; Gives correct answer</td>
<td>9 − 5, 4</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td></td>
<td>b) Writes correct number sentence&lt;br&gt; Gives correct answer</td>
<td>4 + 2 + 3, 9</td>
<td>1</td>
<td>/4</td>
</tr>
</tbody>
</table>

**Total Points** /9
## Scoring Guides for Sample Unit Quizzes and Tests

### Unit 3: Operations and Algebraic Thinking

(continued)

Test (Lessons 66 to 73), p. Q-56

Common Core State Standards Emphasized: 1.OA.A.1, 1.OA.A.2, 1.OA.B.4, 1.OA.C.5, 1.OA.C.6, 1.OA.D.8, 1.NBT.C.4

<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>
</table>
| 1        | Gives a correct drawing for Raj  
          | Gives a correct drawing for Ali  
          | Gives correct answer | 7 circles  
          | 4 circles, 3 x’s  
          | 4 | 1  
          | 1  
          | 1 /3 |
| 2        | Gives correct subtraction sentence  
          | Gives correct answer | 9 – 7  
          | 2 | 1  
          | 1 /2 |
| 3        | Gives correct answer | 5, 10, 15 | 1 | 1 /1 |
| 4        | Draws correct number of coins | 1 more nickel  
          | 4 pennies | 1  
          | 1 | 1 /2 |
| Advanced  | Fills in missing numbers correctly  
          | Gives correct answer | 3, 4  
          | 7 | 1  
          | 1 |

**Total Points** 1 /8
## Rubric for Unit 3: Operations and Algebraic Thinking

**Test 2 (Lessons 66 to 73), p. Q-56**

<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>1.OA.A.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td>
<td>1, 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.OA.A.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td>
<td>3, 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.OA.D.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = __ - 3$, $6 + 6 = __$.</td>
<td>5 (Advanced)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments**
## Scoring Guides for Sample Unit Quizzes and Tests
### Unit 4: Measurement and Data

#### Quiz (Lessons 13 to 16), p. Q-59

<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 6 or 7 correct answers</td>
<td>2, 3, 5, 6, 7, 8, 10</td>
<td>3</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>Gives 4 or 5 correct answers</td>
<td></td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives 2 or 3 correct answers</td>
<td></td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>5, 6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>9, 10</td>
<td>1</td>
<td></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>11, 11</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer</td>
<td>3, 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>8, 8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>11, 11</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Gives correct answer</td>
<td>4, 4</td>
<td>1</td>
<td>/4</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>6:00</td>
<td>yes / no</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Points</td>
<td>/13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Test (Lessons 13 to 16), p. Q-63

<table>
<thead>
<tr>
<th>Question</th>
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<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>8, 9</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>2</td>
<td>a) Gives correct answer</td>
<td>10, 10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>6, 6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Gives correct answer</td>
<td>3, 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td>12, 12</td>
<td>yes / no</td>
<td>/3</td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>5, 5</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>7, 7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>a) Draws the correct minute hand</td>
<td>at 6 between 10 and 11</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draws the correct hour hand</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws the correct minute hand</td>
<td>at 12 at 2</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draws the correct hour hand</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Draws the correct minute hand</td>
<td>at 6 between 3 and 4</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draws the correct hour hand</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Draws the correct minute hand</td>
<td>at 12 at 10</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draws the correct hour hand</td>
<td></td>
<td>0.5</td>
<td>/4</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>5:00</td>
<td>yes / no</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Points</td>
<td>/11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Rubric for Unit 4: Measurement and Data

**Test (Lessons 13 to 16), p. Q-63**

**Common Core State Standard** | **Assessed by Question(s) ...** | **Level 1** | **Level 2** | **Level 3** | **Level 4**
--- | --- | --- | --- | --- | ---
1.MD.B.3  
*Tell and write time in hours and half-hours using analog and digital clocks.* | 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.

**Comments**
## Scoring Guides for Sample Unit Quizzes and Tests
### Unit 5: Geometry

**Quiz (Lessons 1 to 4), p. Q-67**

**Common Core State Standards Emphasized:** 1.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>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>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>✓</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✓</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>0.5</td>
<td>/3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Correctly identifies rectangles with a ✓</td>
<td>shape 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>shape 4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>shape 5</td>
<td>1</td>
<td>/3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>a) Draws squares in square corners</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for vertices</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for square corners</td>
<td>2</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Draws squares in square corners</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for vertices</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for square corners</td>
<td>4</td>
<td>0.5</td>
<td>/4</td>
</tr>
<tr>
<td>5</td>
<td>Gives correct answer</td>
<td>×</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>1</td>
<td>/3</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives correct explanation</td>
<td>yes / no</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All the sides are the same length. All the corners are square.</td>
<td>yes / no</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Points** /15
Scoring Guides for Sample Unit Quizzes and Tests
Unit 5: Geometry

(continued)

<table>
<thead>
<tr>
<th>Question</th>
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<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>✓</td>
<td>0.5</td>
<td>✓ ✓ ✓ /3</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>×</td>
<td>0.5</td>
<td>✓ × × /3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gives correct answer</td>
<td>triangles</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>3</td>
<td>Circles correct answer</td>
<td>shapes 1, 2, and 4</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>4</td>
<td>Gives correct answer for straight sides</td>
<td>0</td>
<td>0.5</td>
<td>✓ /2</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer for vertices</td>
<td>0</td>
<td>0.5</td>
<td>✓ /2</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>✓, ×</td>
<td>yes / no</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>x, ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓, ✓</td>
<td></td>
<td></td>
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Total Points: /6

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<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>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>4</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>2</td>
<td>Circles correct answer</td>
<td>shape 3</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>3</td>
<td>Correctly draws the missing piece</td>
<td></td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer</td>
<td>fourth</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>half</td>
<td>1</td>
<td>/2</td>
</tr>
<tr>
<td>5</td>
<td>Circles correct answer</td>
<td>shapes 2 and 3</td>
<td>1</td>
<td>/1</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>2</td>
<td>yes / no</td>
<td></td>
</tr>
</tbody>
</table>

Total Points: /7
## Scoring Guides for Sample Unit Quizzes and Tests

### Unit 5: Geometry

**Test (Lessons 1 to 12), p. Q-76**

**Common Core State Standards Emphasized:** 1.G.A.1, 1.G.A.2, 1.G.A.3

<table>
<thead>
<tr>
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<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>✔ ✔ ✔</td>
<td>0.5 0.5 0.5</td>
<td>1/2</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✔ ✔ ✔</td>
<td>0.5 0.5 0.5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>a) Gives correct answer</td>
<td>✔ ✔ ×</td>
<td>0.5 0.5 0.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✔ ✔ ✔</td>
<td>0.5 0.5 0.5</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Correctly identifies squares with a ✔ shape</td>
<td>shape 3 shape 5</td>
<td>1 1</td>
<td>1/2</td>
</tr>
<tr>
<td>4</td>
<td>a) Gives correct answer</td>
<td>✔ ✔ ✔</td>
<td>0.5 0.5 0.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>✔ ✔ ✔</td>
<td>0.5 0.5 0.5</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Draws a shape with 3 straight sides, gives correct answer</td>
<td>yes</td>
<td>1</td>
<td>1/2</td>
</tr>
<tr>
<td>6</td>
<td>Draws × on the half circles</td>
<td>shape 3 shape 4 shape 6</td>
<td>1 1 1</td>
<td>1/3</td>
</tr>
<tr>
<td>7</td>
<td>a) Gives correct answer</td>
<td>fourth</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td>half</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td>3, 7 yes / no</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Points:** 1/7
### Rubric for Unit 5: Geometry

**Test (Lessons 1 to 12), p. Q-76**

<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>1.G.A.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.</em></td>
<td>1, 2, 3, 4, 5, 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.G.A.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.</em></td>
<td>7, Bonus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Comments

Name: ____________________
### Quiz (Lessons 19 to 21), p. Q-80

**Common Core State Standards Emphasized:** 1.MD.C.4, 1.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 sorts 6 or 7 shapes</td>
<td><img src="image" alt="Shapes" /></td>
<td>3</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 4 or 5 shapes</td>
<td></td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 1, 2 or 3 shapes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Correctly sorts 5 or 6 shapes</td>
<td><img src="image" alt="Shapes" /></td>
<td>3</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 3 or 4 shapes</td>
<td></td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 1 or 2 shapes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Correctly sorts 7 or 8 numbers/letters</td>
<td><img src="image" alt="Letters" /></td>
<td>3</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 4, 5, or 6 numbers/letters</td>
<td></td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 1, 2, or 3 numbers/letters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly copies the letters into a row</td>
<td>T, a, b, d</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly copies the numbers into a row</td>
<td>8, 5, 7, 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bonus</td>
<td>a) Gives correct answer</td>
<td></td>
<td>4</td>
<td>yes / no</td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td></td>
<td>8</td>
<td>yes / no</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td></td>
<td></td>
<td></td>
<td>/11</td>
</tr>
</tbody>
</table>

### Quiz (Lessons 22 to 24), p. Q-83

**Common Core State Standards Emphasized:** 1.MD.C.4, 1.OA.A.1, 1.OA.C.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>Draws correct number of circles for soccer</td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gives correct number</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives sports in correct order</td>
<td>baseball, soccer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Finds the totals</td>
<td></td>
<td>1, 3, 4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Draws the correct number of circles for 3 colors</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draws the correct number of circles for 1 or 2 colors</td>
<td></td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>a) Gives correct answer</td>
<td>tulips</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Gives correct answer</td>
<td></td>
<td>1</td>
<td>yes / no</td>
</tr>
<tr>
<td>Bonus</td>
<td>Gives correct answer</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td></td>
<td></td>
<td></td>
<td>/8</td>
</tr>
</tbody>
</table>
**Scoring Guides for Sample Unit Quizzes and Tests**

**Unit 6: Measurement and Data**

(continued)

<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 sorts 6 or 7 shapes</td>
<td>![Image of shapes]</td>
<td>(3)</td>
<td>/3</td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 4 or 5 shapes</td>
<td>![Image of shapes]</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 1, 2, or 3 shapes</td>
<td>![Image of shapes]</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Correctly sorts 6 or 7 shapes</td>
<td>![Image of shapes]</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 4 or 5 shapes</td>
<td>![Image of shapes]</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly sorts 1, 2 or 3 shapes</td>
<td>![Image of shapes]</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly copies words with 3 letters into a row</td>
<td>top, bed, men, cat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correctly copies words with 2 letters into a row</td>
<td>to, an, as</td>
<td></td>
<td>/5</td>
</tr>
<tr>
<td>3</td>
<td>Gives correct answer</td>
<td></td>
<td>3</td>
<td>/1</td>
</tr>
<tr>
<td>4</td>
<td>Gives correct answer</td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Bonus: Gives correct answer</td>
<td></td>
<td>2</td>
<td>/1</td>
</tr>
</tbody>
</table>

**Total Points** /10
## Rubric for Unit 6: Measurement and Data

**Test (Lessons 19 to 24), p. Q-86**

Name: ____________________

<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><strong>1.MD.C.4</strong></td>
<td>Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
<td>2, 3, 4, Bonus</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>
</tr>
<tr>
<td><strong>1.G.A.1</strong></td>
<td>Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Comments

Name: ____________________

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### Grade 1 Common Core State Standards Curriculum Correlations

**NOTE:** The *italicized gray* JUMP Math lessons contain prerequisite material for the Common Core standards.

<table>
<thead>
<tr>
<th><strong>Domain</strong></th>
<th><strong>Cluster</strong></th>
<th><strong>1.OA</strong> <strong>Operations and Algebraic Thinking</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>OA</td>
<td>OA.A</td>
<td><strong>Represent and solve problems involving addition and subtraction.</strong></td>
</tr>
</tbody>
</table>

#### 1.OA.A
**Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, 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>OA1-4, 8, OA1-9</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>OA1-27, 30</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>OA1-39, 41</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>OA1-50 to 53</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-58 to 62, 64, 65, 67 to 73</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>MD1-23, 24</td>
</tr>
</tbody>
</table>

#### 1.OA.A.2
**Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, 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>3</td>
<td>OA1-24, 26, 29</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>OA1-49</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-69, 72, 73</td>
</tr>
</tbody>
</table>

#### 1.OA.B
**Understand and apply properties of operations and the relationship between addition and subtraction.**

#### 1.OA.B.3
**Apply properties of operations as strategies to add and subtract. Examples: If \(8 + 3 = 11\) is known, then \(3 + 8 = 11\) is also known. (Commutative property of addition.) To add \(2 + 6 + 4\), the second two numbers can be added to make a ten, so \(2 + 6 + 4 = 2 + 10 = 12\). (Associative property of addition.)**

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA1-5</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>OA1-14, 18, 23 to 29</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>OA1-40</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>OA1-42 to 44, 47, 49</td>
</tr>
</tbody>
</table>
### 1.OA.B.4
Understand subtraction as an unknown-addend problem.
*For example, subtract $10 - 8$ by finding the number that makes 10 when added to 8.*

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>OA1-37 to 39</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>OA1-48</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-66 to 70, 73</td>
</tr>
</tbody>
</table>

### 1.OA.C
Add and subtract within 20.

#### 1.OA.C.5
Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).

#### 1.OA.C.6
Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$); decomposing a number leading to a ten (e.g., $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$); using the relationship between addition and subtraction (e.g., knowing that $8 + 4 = 12$, one knows $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$).

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA1-1 to 3, 6 OA1-5, 9</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>OA1-15 to 22</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>OA1-32 to 36</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>OA1-45, 47</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-57, 58, 66, 70, 72</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>MD1-23, 24</td>
</tr>
</tbody>
</table>

### 1.OA.D
Work with addition and subtraction equations.

#### 1.OA.D.7
Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false?
$6 = 6$, $7 = 8 - 1$, $5 + 2 = 2 + 5$, $4 + 1 = 5 + 2$.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA1-4, 7, 8 OA1-10, 11</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-59</td>
</tr>
</tbody>
</table>

#### 1.OA.D.8
Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = __ - 3$, $6 + 6 = __$.*

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>OA1-4</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-54 to 57, 59, 62 to 65, 69, 73</td>
</tr>
</tbody>
</table>
## 1.NBT  Number and Operations in Base Ten

### 1.NBT.A  Extend the counting sequence.

**1.NBT.A.1** Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>NBT1-1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>NBT1-11, 12, 25 to 27</td>
</tr>
</tbody>
</table>

### 1.NBT.B  Understand place value.

**1.NBT.B.2** Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

1. **10 can be thought of as a bundle of ten ones—called a “ten.”**
   - Part 1: Unit 2, Lessons NBT1-3, 4
   - Part 2: Unit 1, Lessons NBT1-11, 13, 14

2. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
   - Part 1: Unit 2, Lessons NBT1-1, 2, NBT1-3, 4
   - Part 2: Unit 1, Lessons NBT1-13, 14

3. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).
   - Part 1: Unit 2
   - Part 2: Unit 1, Lessons NBT1-17 to 24, 27

**1.NBT.B.3** Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>NBT1-1, 2 NBT1-3, 4</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>NBT1-17 to 24, 27</td>
</tr>
</tbody>
</table>

### 1.NBT.C  Use place value understanding and properties of operations to add and subtract.

**1.NBT.C.4** Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, 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 and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>NBT1-28, 34 to 43</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>OA1-72</td>
</tr>
<tr>
<td>1.NBT.C.5</td>
<td>Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.</td>
<td>Part</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1.NBT.C.6</td>
<td>Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90 (positive or zero differences), 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 and explain the reasoning used.</td>
<td>2</td>
</tr>
</tbody>
</table>
### Grade 1 Common Core State Standards Curriculum Correlations

#### 1.MD  **Measurement and Data**

<table>
<thead>
<tr>
<th>1.MD.A</th>
<th>Measure lengths indirectly and by iterating length units.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.MD.A.1</td>
<td>Order three objects by length; compare the lengths of two objects indirectly by using a third object.</td>
</tr>
<tr>
<td>JUMP Math Grade 1 Lessons</td>
<td></td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

<p>| 1.MD.A.2 | Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. <strong>Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.</strong> |
| JUMP Math Grade 1 Lessons |</p>
<table>
<thead>
<tr>
<th>Part</th>
<th>Unit</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>MD1-6, 8 to 12</td>
</tr>
</tbody>
</table>

#### 1.MD  **Measurement and Data**

<table>
<thead>
<tr>
<th>1.MD.B</th>
<th>Tell and write time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.MD.B.3</td>
<td>Tell and write time in hours and half-hours using analog and digital clocks.</td>
</tr>
<tr>
<td>JUMP Math Grade 1 Lessons</td>
<td></td>
</tr>
<tr>
<td>Part</td>
<td>Unit</td>
</tr>
<tr>
<td>------</td>
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</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

#### 1.MD  **Measurement and Data**

<table>
<thead>
<tr>
<th>1.MD.C</th>
<th>Represent and interpret data.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.MD.C.4</td>
<td>Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
</tr>
<tr>
<td>JUMP Math Grade 1 Lessons</td>
<td></td>
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<tr>
<td>Part</td>
<td>Unit</td>
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<tr>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>
### 1.G. Geometry

<table>
<thead>
<tr>
<th>1.G.A</th>
<th>Reason with shapes and their attributes.</th>
<th>JUMP Math Grade 1 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.G.A.1</td>
<td>Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.</td>
<td><strong>Part</strong></td>
</tr>
<tr>
<td>1.G.A.2</td>
<td>Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.</td>
<td><strong>Part</strong></td>
</tr>
<tr>
<td>1.G.A.3</td>
<td>Partition circles and rectangles into two and four equal shares, describe the shares using the words <em>halves</em>, <em>fourths</em>, and <em>quarters</em>, and use the phrases <em>half of</em>, <em>fourth of</em>, and <em>quarter of</em>. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.</td>
<td><strong>Part</strong></td>
</tr>
</tbody>
</table>