OA3-22 Patterns in Multiplication of Even Numbers

Pages 88–89

Standards: 3.OA.D.9

Goals:
Students will find patterns in the multiplication of even numbers and practice multiplication facts for even numbers, particularly for 2, 4, and 6.
Students will gain practice multiplying numbers that appear in a column or are stacked.

Prior Knowledge Required:
Can skip count by 2, 4, and 6
Can write multiplication sentences
Can model multiplication using equal groups
Can identify digits in the ones place and tens place, and knows what they represent (place value)

Vocabulary: column, even, multiples, multiplication facts, multiple, multiply, ones place, position, repeated addition, row, sequence, skip count, tens place, vertical

Materials:
BLM Even Multiple Charts (p. E-63)
BLM Even Multiples (p. E-68)

Review skip counting by 4s. Write on the board:

0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32

Remind students that we can use skip counting by 2s to then skip count by 4s. SAY: Starting at 0 (point to 0), we can skip the next number (draw an arrow from 0 to 4) to get to 4. We can then skip count from 4 over 6 to 8, and so on. Continuing this way gives the skip counting by 4s:

0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32

Copy the multiples of 4 separately, and extend the sequence to 44:

0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44
SAY: These numbers are the multiples of 4. Skip counting by 4s helps us add repeated 4s. Write on the board:

\[
\begin{align*}
4 + 4 &= 8 \\
4 + 4 + 4 &= 12 \\
4 + 4 + 4 + 4 + 4 &= 20
\end{align*}
\]

SAY: You can write each of these as a multiplication sentence. Write each multiplication sentence under the repeated addition:

\[
\begin{align*}
2 \times 4 &= 8 \\
3 \times 4 &= 12 \\
5 \times 4 &= 20
\end{align*}
\]

Ask students to copy the multiples of 4 in their notebooks to help them with the following exercises.

**Exercises:**
1. Underline the multiples of 4.
   
   0, 3, 4, 6, 8, 10, 12, 13, 16, 18, 19, 20, 22, 24, 25, 28, 30, 31, 32, 34, 36
   
   **Answers:** 0, 4, 8, 12, 16, 20, 24, 28, 32, 36

2. Use skip counting to add.
   
   a) \(4 + 4 = \)  
   b) \(2 + 2 + 2 = \)  
   c) \(2 + 2 + 2 + 2 = \)  
   
   d) \(4 + 4 + 4 = \)  
   e) \(2 + 2 + 2 + 2 + 2 = \)  
   f) \(4 + 4 + 4 + 4 = \)  
   
   g) \(2 + 2 + 2 + 2 + 2 = \)  
   h) \(4 + 4 + 4 + 4 + 4 = \)  
   i) \(4 + 4 + 4 + 4 + 4 + 4 = \)  
   
   **Answers:** a) 8, b) 6, c) 8, d) 12, e) 10, f) 16, g) 12, h) 20, i) 24

Remind students how to multiply by skip counting on their fingers. Go through a few examples, skip counting on your fingers to several multiples of 2 or 4. SAY: For the next exercise, you can skip count on your fingers or use your number list.

**Exercises:** Use skip counting to complete the multiplication sentence.

a) \(2 \times 4 = \)  
   b) \(3 \times 2 = \)  
   c) \(3 \times 5 = \)  
   
   d) \(3 \times 4 = \)  
   e) \(4 \times 2 = \)  
   f) \(4 \times 4 = \)  
   
   g) \(5 \times 2 = \)  
   h) \(5 \times 4 = \)  
   i) \(6 \times 4 = \)  
   
   **Answers:** a) 8, b) 6, c) 8, d) 12, e) 8, f) 16, g) 10, h) 20, i) 24

**The multiples of 4 chart.** SAY: *Multiplication facts*, like \(2 \times 3 = 6\) and \(5 \times 7 = 35\), are very useful to know when doing math. We are going to use charts to help us learn and remember these multiplication facts. First we are going to use charts to help us with multiples of 4.

Project one of the charts from BLM Even Multiple Charts. Label a row going from left to right, and a column going from top to bottom. SAY: This chart has 2 rows and 5 columns. Each
square has a smaller number in it that labels the square. This number is called its position. The position tells us the place in the chart. (see picture below)

Fill in the chart, moving from left to right across the first row and then the second, with the numbers you get when you skip count by 4s, starting with 4. The completed chart is shown below:

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<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td>1</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
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<td>24</td>
<td>28</td>
<td>32</td>
<td>36</td>
<td>40</td>
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</table>

If students wonder why zero isn’t in the chart, let them know that you will be teaching them to multiply by zero in another lesson. SAY: This chart can help us remember our multiplication facts for the number 4. 4 is in position 1, so 1 × 4 = 4; 8 is in position 2, so 2 × 4 = 8; 36 is in position 9, so 9 × 4 = 36.

Using the chart above, ask volunteers to help fill in the blanks below:

- ___ is in position 7, so 7 × 4 = ___.
- ___ is in position 5, so 5 × 4 = ___.
- ___ is in position 6, so 6 × 4 = ___.
- ___ is in position 3, so 3 × 4 = ___.
- ___ is in position 4, so 4 × 4 = ___.
- ___ is in position 10, so 10 × 4 = ___.

(28, 20, 24, 12, 16, 40)

Seeing patterns in multiples of 4. Return to the chart on the board and circle the ones digits for all numbers in a column as shown below:
SAY: These numbers are in the ones place.

Have students find the patterns in the chart. If they need help, PROMPT: What can you say about the number in the ones place? (in any column, the number in the ones place is the same, so 4 in the first column, 8 in the second, and so on)

Redraw the chart for 4s but this time place a 0 in the tens place for the multiples 4 and 8. Circle the tens place for all numbers in a column as shown below.

ASK: What can you say about the number in the tens place? (the number in the tens place is always 2 more than in the row above) SAY: So, if we know the first row, we can figure out the numbers in the tens place in the second row.

Draw the chart again but this time fill out only the first row, as shown below:

Use the patterns described earlier to find the numbers to the second row.

Using a chart from BLM Even Multiple Charts, have students fill in the first row by skip counting by 4s. Ask them to use the patterns discussed in class, skip counting, or another strategy to fill in the second row. Students should practice filling in charts until they can fill in the whole chart for multiples of 4 on their own. To vary the activity, create charts that are partly filled in in erratic ways and have students first decide if the charts are for 2s or 4s and then complete the charts. You may also have students who learn the table quickly fill in a chart starting at 44 (don’t forget to modify the position numbers to start at 11). Encourage students to look for patterns in these charts.

**Exercises:**

1. Use the multiples of 4 chart to fill in the blanks.
   a) 24 is in position ___, so ___ × 4 = 24.
   b) 8 is in position ___, so ___ × 4 = 8.
   c) 12 is in position ___, so ___ × 4 = 12.
   d) 20 is in position ___, so ___ × 4 = 20.
   e) 28 is in position ___, so ___ × 4 = 28.
   f) 40 is in position ___, so ___ × 4 = 40.

   **Answers:** a) 6, b) 2, c) 3, d) 5, e) 7, f) 10
2. Circle the numbers that are multiples of 4. Above each multiple, write the position it has in the multiples of 4 chart.

2, 4, 8, 9, 12, 15, 16, 18, 20, 22, 23, 24, 27, 28, 29, 31, 32, 36, 38, 40

Answers:

2, 4, 8, 9, 12, 15, 16, 18, 20, 22, 23, 24, 27, 28, 29, 31, 32, 36, 38, 40

Play “What number is hidden?” (see Introduction) Have students play the game using the completed chart for multiples of 4.

Remembering multiples of 6. ASK: What are some ways of finding the multiples of 6? (skip count by 6s starting at 6; find the multiples of 3 and circle every other one; use repeated addition) Together, write the multiples of 3 on the board:

0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 ...

Use this list to find the multiples of 6. Circle every second number as you say it out loud.

0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 ...

Continue to find the multiples of 6 up to 60.

The multiples of 6 chart. Project one of the charts from BLM Even Multiple Charts on the board or draw a chart with two rows and five columns, and fill in the position numbers. With help from student volunteers, fill in the chart with multiples of 6. SAY: We are going to fill in a new chart to help us remember our multiplication facts for the number 6. Remember, the position number tells us what to multiply by 6, and the number in the square tells us the answer.

ASK: For multiples of 6, what number goes in position 1? (6) What about position 2? What is 2 times 6? (12) Have volunteers tell you the numbers for the remaining boxes, in order. The completed chart will look like this:

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<tr>
<th></th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>36</td>
<td>42</td>
<td>48</td>
<td>54</td>
<td>60</td>
</tr>
</tbody>
</table>

Seeing patterns in multiples of 6. ASK: What patterns do you see in the chart for multiples of 6? (the number in the ones place is the same in any column, the number in the tens place is always 3 more than in the row above) To help students see the pattern, point out examples such as the ones place number is 6 in the first column, 2 in the second column, and so on.
**Exercises:**

1. Use the multiples of 6 chart to fill in the blanks.
   a) ___ is in position 7, so $7 \times 6 =$ ___.
   b) ___ is in position 5, so $5 \times 6 =$ ___.
   c) ___ is in position 6, so $6 \times 6 =$ ___.
   d) ___ is in position 3, so $3 \times 6 =$ ___.
   e) ___ is in position 4, so $4 \times 6 =$ ___.
   f) ___ is in position 10, so $10 \times 6 =$ ___.

   **Answers:** a) 42, b) 30, c) 36, d) 18, e) 24, f) 60

2. Use the multiples of 6 chart to fill in the blanks.
   a) 24 is in position ___, so ___ $\times 6 =$ 24.
   b) 18 is in position ___, so ___ $\times 6 =$ 18.
   c) 12 is in position ___, so ___ $\times 6 =$ 12.
   d) 42 is in position ___, so ___ $\times 6 =$ 42.
   e) 54 is in position ___, so ___ $\times 6 =$ 54.
   f) 30 is in position ___, so ___ $\times 6 =$ 30.

   **Answers:** a) 4, b) 3, c) 2, d) 7, e) 9, f) 5

3. Circle the numbers that are multiples of 6. Above each multiple, write the position it has in the multiples of 6 chart.

   4, 6, 9, 12, 15, 16, 18, 20, 24, 28, 30, 33, 36, 40, 42, 48, 50, 54, 56, 60

   **Answers:**

   1   2   3   4   5   6   7   8   9   10
   4, 6, 9, 12, 15, 16, 18, 20, 24, 28, 30, 33, 36, 40, 42, 48, 50, 54, 56, 60

**Practicing with even multiples.** Have students skip count by 6s to fill in the first row in one of the charts on BLM Even Multiple Charts. Ask students to use the patterns discussed in class, skip counting, or another strategy to fill in the second row. Students should practice filling in charts from BLM Even Multiple Charts until they can fill in a whole chart with multiples of 6 on their own. To vary the activity, create charts that are only partly filled in and have students complete them. You could leave out some numbers in sequence or at random. Then, create incomplete charts for either multiples of 4 or 6 and have students identify which chart they have before they complete it. You may also have students who learn the multiples of 6 chart quickly fill in a chart starting at 66 (remember to modify position numbers to start at 11). Encourage students to look for patterns in these charts.

**Play “What number is hidden?”** (see Introduction) Have students play the game using the completed multiples of 6 chart.

**The multiples of 2 chart.** Draw a chart with two rows and five columns and fill in the position numbers, or use one of the charts from BLM Even Multiple Charts. With help from student volunteers, fill in the chart with multiples of 2 as shown below:

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ASK: What patterns for the ones place and the tens place can you see in the multiples of 2? (the number in the ones place is the same within any column, the number in the tens place goes up by 1 from one row to the next)

**Summarizing multiplication patterns.** Draw on the board:

<table>
<thead>
<tr>
<th>Multiples of ___</th>
<th>Pattern in the ones place</th>
<th>Pattern in the tens place</th>
</tr>
</thead>
<tbody>
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ASK: What patterns did we see for multiples of 2 in columns in the ones place? What patterns did we see in the tens place? Repeat for multiples of 4 and 6. The completed table is shown below:

<table>
<thead>
<tr>
<th>Multiples of ___</th>
<th>Pattern in the ones place</th>
<th>Pattern in the tens place</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>stay the same</td>
<td>go up by 1</td>
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<tr>
<td>4</td>
<td>stay the same</td>
<td>go up by 2</td>
</tr>
<tr>
<td>6</td>
<td>stay the same</td>
<td>go up by 3</td>
</tr>
</tbody>
</table>

**NOTE:** Encourage students to practice filling in BLM Even Multiple Charts with multiples of 2, 4, and 6 until they can do it easily, using the patterns, memory, or other strategies.

Give students **BLM Even Multiples.** SAY: Use skip counting, repeated addition, patterns, or your memory to answer the questions. Try to check your answers by using a different strategy. (1. cross out 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23; 2. a) 10, b) 4, c) 8, d) 2, e) 6, f) 12, g) 20, h) 18, i) 14, j) 16, Bonus: 12, Bonus: 18; 3. cross out 2, 6, 10, 14, 18, 22, 26, 30, 34, 36, 38, 42; 4. a) 12, b) 8, c) 16, d) 4, e) 20, f) 24, g) 40, h) 32, i) 28, j) 36, Bonus: 20, Bonus: 36; 5. cross out 3, 9, 15, 21, 27, 33, 39, 45, 51, 57, 63; 6. a) 6, b) 12, c) 24, d) 30, e) 18, f) 36, g) 60, h) 48, i) 42, j) 54, Bonus: 42, Bonus: 54)

**Writing multiplication sentences in column format.** SAY: Just like with addition, we can write multiplication so that it is vertical. Write on the board:

\[
\begin{align*}
3 \times 4 &= \frac{12}{4} \\
3 \times 4 &= \frac{3}{12} \\
5 \times 2 &= \frac{5}{2} \\
5 \times 2 &= \frac{10}{2}
\end{align*}
\]

Have students help you solve 5 \times 2.
Exercises: Complete the multiplication sentence.

a) \(3 \times 2\)  

b) \(4 \times 4\)  

c) \(3 \times 6\)  

d) \(5 \times 4\)  

e) \(6 \times 4\)  

f) \(5 \times 6\)

Answers: a) 6, b) 16, c) 18, d) 20, e) 24, f) 30

Extensions

1. a) Fill in four charts on BLM Even Multiple Charts, one chart each for the multiples of 2, 4, 6, and 8.
   b) For multiples of 8, what are the patterns for the ones place and the tens place?
   c) Is there a pattern for the tens place that works for multiples of 2, 4, 6, and 8?

   Answers: b) in a column, the ones stay the same; in a column, the tens go up by 4;
   c) numbers in the tens place in a column go up from one row to the next by a number related to
   the multiple number for the chart: 1 + 1 = 2 for the multiples of 2, 2 + 2 = 4 for the multiples of 4,
   3 + 3 = 6 for the multiples of 6, and 4 + 4 = 8 for the multiples of 8

2. Use the numbers from 0 to 5 to complete the multiplication.

   a) \(\underline{\phantom{00}} \times 6\)  
     \[\quad 8\]
   b) \(4 \times \underline{\phantom{0}}\)  
     \[2\]
   c) \(3 \times \underline{\phantom{0}}\)  
     \[2\]

   Answers: a) \(3 \times 6 = 18\), b) \(4 \times 5 = 20\), c) \(3 \times 4 = 12\)

3. Use the numbers from 1 to 9 to complete the multiplication.

   a) \(\underline{\phantom{0}} \times \underline{\phantom{0}}\)  
     \[1 \quad 2\]
   b) \(7 \times \underline{\phantom{0}}\)  
     \[3\]
   c) \(3 \times \underline{\phantom{0}}\)  
     \[7\]
   d) \(\underline{\phantom{0}} \times 4\)  
     \[6\]
   e) \(9 \times \underline{\phantom{0}}\)  
     \[3\]

   Answers: a) \(3 \times 4 = 12\) (or \(3 \times 4, 2 \times 6, 6 \times 2\)); b) \(7 \times 5 = 35\);
   c) \(3 \times 9 = 27\); d) \(4 \times 4 = 16\) (or \(9 \times 4 = 36\)); e) \(9 \times 4 = 36\)
## Even Multiple Charts

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Even Multiples

1. Cross out the numbers that are not multiples of 2.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

2. Complete the multiplication sentence.

   a) $5 \times 2 = ____$
   b) $2 \times 2 = ____$
   c) $4 \times 2 = ____$
   d) $1 \times 2 = ____$
   e) $3 \times 2 = ____$
   f) $6 \times 2 = ____$
   g) $10 \times 2 = ____$
   h) $9 \times 2 = ____$
   i) $7 \times 2 = ____$
   j) $8 \times 2 = ____$
   BONUS $2 \times 6 = ____$
   BONUS $2 \times 9 = ____$

3. Cross out the numbers that are not multiples of 4.

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44

4. Complete the multiplication sentence.

   a) $3 \times 4 = ____$
   b) $2 \times 4 = ____$
   c) $4 \times 4 = ____$
   d) $1 \times 4 = ____$
   e) $5 \times 4 = ____$
   f) $6 \times 4 = ____$
   g) $10 \times 4 = ____$
   h) $8 \times 4 = ____$
   i) $7 \times 4 = ____$
   j) $9 \times 4 = ____$
   BONUS $4 \times 5 = ____$
   BONUS $4 \times 9 = ____$

5. Cross out the numbers that are not multiples of 6.

0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66

6. Complete the multiplication sentence.

   a) $1 \times 6 = ____$
   b) $2 \times 6 = ____$
   c) $4 \times 6 = ____$
   d) $5 \times 6 = ____$
   e) $3 \times 6 = ____$
   f) $6 \times 6 = ____$
   g) $10 \times 6 = ____$
   h) $8 \times 6 = ____$
   i) $7 \times 6 = ____$
   j) $9 \times 6 = ____$
   BONUS $6 \times 7 = ____$
   BONUS $6 \times 9 = ____
You can write the multiples of 4 in a chart with 2 rows of 5 squares.

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<th>row</th>
<th>04</th>
<th>08</th>
<th>12</th>
<th>16</th>
<th>20</th>
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<tr>
<td></td>
<td>24</td>
<td>28</td>
<td>32</td>
<td>36</td>
<td>40</td>
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</table>

You can use the patterns in the chart to help remember the multiples of 4.

1. Describe any patterns you see in the chart above.

2. a) 24 is in position _____  b) 8 is in position _____  c) 40 is in position _____

3. a) 28 is in position _____  b) 32 is in position _____  c) 16 is in position _____
   
   \[ \underline{7} \times 4 = 28 \]  
   \[ \underline{\_\_\_} \times 4 = 32 \]  
   \[ \underline{\_\_\_} \times 4 = 16 \]

   d) 36 is in position _____  e) 4 is in position _____  f) 20 is in position _____
   
   \[ \underline{\_\_\_} \times 4 = 36 \]  
   \[ \underline{\_\_\_} \times 4 = 4 \]  
   \[ \underline{\_\_\_} \times 4 = 20 \]

4. Use the patterns in the chart to help remember the multiples of 4.  
Try each question without looking at the chart.

   a) \[ \underline{4} \times \underline{1} \]  
   b) \[ \underline{4} \times \underline{3} \]  
   c) \[ \underline{4} \times \underline{5} \]  
   d) \[ \underline{4} \times \underline{6} \]  
   e) \[ \underline{4} \times \underline{2} \]  
   f) \[ \underline{4} \times \underline{9} \]
You can write the multiples of 6 in a chart with 2 rows of 5 squares.

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<th>18</th>
<th>24</th>
<th>30</th>
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<td>36</td>
<td>42</td>
<td>48</td>
<td>54</td>
<td>60</td>
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</tbody>
</table>

You can use the patterns in the chart to help remember the multiples of 6.

5. Describe any patterns you see in the chart above.

6. a) 42 is in position _____  b) 18 is in position _____  c) 30 is in position _____

d) 24 is in position _____  e) 60 is in position _____  f) 6 is in position _____

7. a) 54 is in position _____  b) 36 is in position _____  c) 12 is in position _____

    _____ × 6 = 54    _____ × 6 = 36    _____ × 6 = 12

d) 24 is in position _____  e) 60 is in position _____  f) 6 is in position _____

    _____ × 6 = 24    _____ × 6 = 60    _____ × 6 = 6

8. Use the patterns in the chart to help remember the multiples of 6. Try each question without looking at the chart.

   a) 6 × 5  b) 6 × 4  c) 6 × 7  d) 6 × 3  e) 6 × 1  f) 6 × 8

Write the multiples of 8 in a chart with 2 rows of 5 squares. What patterns do you see?