OA3-23 Patterns in Multiplication of Odd Numbers

Pages 90–91

Standards: 3.OA.D.9

Goals:
Students will find patterns in the multiplication of odd numbers
Students will practice multiplication facts for odd numbers, particularly for multiples of 3 and 7.

Prior Knowledge Required:
Can skip count by 3s
Can write multiplication sentences
Can model multiplication with equal groups

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

Materials:
BLM Odd Multiple Charts (p. E-64)
BLM Skip Counting Chart (p. E-66)
BLM Odd Multiples (p. E-69)

Multiples of 3. Write on the board:

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

SAY: These numbers are the multiples of 3. They are the numbers you get when you multiply by 3. ASK: What is 1 times 3? (3) What is 2 times 3? (6) Write the multiplication sentences on the board and continue so that students help you complete the list below.

1 × 3 = 3
2 × 3 = 6
3 × 3 = 9
4 × 3 = 12
5 × 3 = 15
6 × 3 = 18
7 × 3 = 21
8 × 3 = 24
9 × 3 = 27
10 × 3 = 30
The multiples of 3 chart. Remind students that a chart can help them recall multiplication facts. Draw a chart with 3 rows and 3 columns and write in the position numbers in the top left corner, or use a chart from BLM Odd Multiple Charts. Skip count with students to fill in the multiples of 3. The finished chart should look like this:

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<td>27</td>
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SAY: This chart can help us remember our multiplication facts for the number 3. The position number tells us what number to multiply by, and the number in the square tells us the answer.

Exercises:
1. Use the multiples of 3 chart to fill in the blanks.
   a) ____ is in position 7, so 7 × 3 = ___.
   b) ____ is in position 5, so 5 × 3 = ____.
   c) ____ is in position 6, so 6 × 3 = ____.
   d) ____ is in position 3, so 3 × 3 = ____.
   e) ____ is in position 4, so 4 × 3 = ____.
   f) ____ is in position 9, so 9 × 3 = ____.
   **Bonus:** There is no 10 position in this chart, but we know that 10 × 3 = ____.
   **Answers:** a) 21, b) 15, c) 18, d) 9, e) 12, f) 27, Bonus: 30

2. Use the multiples of 3 chart to fill in the blanks.
   a) 24 is in position ___, so ___ × 3 = 24.
   b) 18 is in position ___, so ___ × 3 = 18.
   c) 12 is in position ___, so ___ × 3 = 12.
   d) 21 is in position ___, so ___ × 3 = 21.
   e) 27 is in position ___, so ___ × 3 = 27.
   f) 15 is in position ___, so ___ × 3 = 15.
   **Answers:** a) 8, b) 6, c) 4, d) 7, e) 9, f) 5

3. Circle the numbers that are multiples of 3. Above each multiple, write the position it has in the multiples of 3 chart.
   3, 5, 6, 8, 9, 10, 11, 12, 14, 15, 16, 18, 19, 21, 22, 24, 25, 26, 27, 28, 30
   **Answers:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 18, 19, 21, 22, 24, 25, 26, 27, 28, 30

**Practicing multiples of 3.** Point to the multiples of 3 chart on the board. **ASK:** What patterns do you see in the chart? What is the value of the tens in each row? (each multiple in the first row has 0 tens, the second row has 1 ten, and the third row has 2 tens) What do you get if you add the number in the tens position to the number in the ones position? (for each number in a
column, the number in the tens place and the number in the ones place add to the same number)

Have students skip count by 3s to fill in the first row of one of the charts on BLM Odd Multiple Charts. 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 3 on their own. Students who learn the table quickly can fill in the chart starting at 33 in position 11 (remember to change the position numbers so that they start from 11). Encourage students to look for patterns in these charts.

Play “What number is hidden?” (see Introduction) Have students play the game using their completed multiples of 3 chart. To make this more challenging, students can be given extra tokens to cover several sequential numbers.

Addition with 7. SAY: We are going to learn some multiplication facts for the number 7. First we are going to practice adding and skip counting with 7. ASK: What are some ways to make 7 by adding two numbers? (6 + 1, 5 + 2, 3 + 4) SAY: Breaking 7 into smaller numbers is sometimes helpful when skip counting. Write on the board:

\[
7 + 7 \\
14 + 7 \\
28 + 7
\]

Then, rewrite each addition by breaking apart the 7 into two smaller addends as shown below:

\[
\begin{align*}
7 + 7 & \\
& = 7 + 3 + 4 \\
14 + 7 & \\
& = 14 + 6 + 1 \\
28 + 7 & \\
& = 28 + 2 + 5
\end{align*}
\]

SAY: Breaking apart the 7 into two smaller numbers like this makes the addition easier because we can add using a multiple of 10. For each addition, add the first two numbers (to make the multiple of 10), then find the final answer, as shown below:

\[
\begin{align*}
7 + 7 & \\
& = 10 + 4 = 14 \\
14 + 7 & \\
& = 20 + 1 = 21 \\
28 + 7 & \\
& = 30 + 5 = 35
\end{align*}
\]

(MP.7) Exercises: Break 7 into two numbers to make these addition problems easier.

\[
\begin{align*}
a) 7 + 7 & = 7 + ___ + ____ = ____ \\
b) 49 + 7 & = 49 + ___ + ____ = ____ \\
c) 35 + 7 & = 35 + ___ + ____ = ____ \\
d) 56 + 7 & = 56 + ___ + ____ = ____ \\
e) 84 + 7 & = 84 + ___ + ____ = ____ \\
f) 77 + 7 & = 77 + ___ + ____ = ____
\end{align*}
\]
Answers: a) \(7 + 3 + 4 = 10 + 4 = 14\), b) \(49 + 1 + 6 = 50 + 1 = 56\), c) \(35 + 5 + 2 = 40 + 2 = 42\), d) \(56 + 4 + 3 = 60 + 3 = 63\), e) \(84 + 6 + 1 = 90 + 1 = 91\), f) \(77 + 3 + 4 = 80 + 4 = 84\)

**Summarizing multiplication facts for 7.** As a class, skip count by 7s from 0 to 70. Give each student a copy of BLM Skip Counting Chart. Skip count by 7s together while students fill in the first column. Have students complete the rest of the chart on their own. The completed chart should look like this:

<table>
<thead>
<tr>
<th>Skip Count by 7s</th>
<th>Tens</th>
<th>Ones</th>
<th>Even or Odd?</th>
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<tbody>
<tr>
<td>0</td>
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<td>42</td>
<td>4</td>
<td>2</td>
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<tr>
<td>49</td>
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<tr>
<td>56</td>
<td>5</td>
<td>6</td>
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<td>63</td>
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<td>odd</td>
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<tr>
<td>70</td>
<td>7</td>
<td>0</td>
<td>even</td>
</tr>
</tbody>
</table>

ASK: Is there a pattern in the last column? (yes) What is the pattern? (the numbers alternate: even, odd, even, odd) Do you notice anything about the ones column? (the ones column contains all digits from 0 to 9)

**The multiples of 7 chart.** Draw a chart with 3 rows and 3 columns and write the position numbers in the top left corner, or display a chart from BLM Odd Multiple Charts. Skip count with students to fill in the multiples of 7, as shown below:

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<td>8</td>
<td>56</td>
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<td>9</td>
<td>63</td>
</tr>
</tbody>
</table>

SAY: This chart can help us remember our multiplication facts for the number 7. ASK: Do you see any patterns in the chart? PROMPT: What patterns do you see in the first column? (the number in the ones place goes up by 1) What patterns do you see in the second and
third columns? (the number in the ones place also goes up by 1) How do the digits in the tens place change as you go down a column? (they go up by 2) What pattern do you see in the ones place as you read across the rows? (the ones place goes down by 3) What happens to the tens place as you go across a row? (the tens digits go up by 1)

Exercises:
1. Use the multiples of 7 chart to fill in the blanks.
   a) ___ is in position 7, so 7 × 7 = ___. b) ___ is in position 5, so 5 × 7 = ___.
   c) ___ is in position 6, so 6 × 7 = ___. d) ___ is in position 3, so 3 × 7 = ___.
   e) ___ is in position 4, so 4 × 7 = ___. f) ___ is in position 9, so 9 × 7 = ___.
   Bonus: There is no 10 position in this chart, but we know that 10 × 7 = ___.
   Answers: a) 49, b) 35, c) 42, d) 21, e) 28, f) 63, Bonus: 70

2. Use the multiples of 7 chart to fill in the blanks.
   a) 14 is in position ___, so ___ × 7 = 14. b) 28 is in position ___, so ___ × 7 = 28.
   c) 21 is in position ___, so ___ × 7 = 21. d) 42 is in position ___, so ___ × 7 = 42.
   e) 49 is in position ___, so ___ × 7 = 49. f) 63 is in position ___, so ___ × 7 = 63.
   Answers: a) 2, b) 4, c) 3, d) 6, e) 7, f) 9

3. Circle the numbers that are multiples of 7. Above each multiple, write the position it has in the multiples of 7 chart.

3, 7, 12, 14, 19, 21, 27, 28, 34, 35, 41, 42, 47, 49, 54, 56, 60, 63, 69, 70
   Answers:
   1  2  3  4  5  6  7  8  9  10
   3, 7  12, 14, 19, 21, 27, 28, 34, 35, 41, 42, 47, 49, 54, 56, 60, 63, 69, 70

Using a chart from BLM Odd Multiple Charts, have students fill in the first row by skip counting by 7s. Ask students to fill in the remaining rows using the patterns discussed in class, skip counting, or another strategy. Students should practice filling in charts from BLM Odd Multiple Charts until they can fill in the whole chart for multiples of 7 on their own. Students who master the table quickly could fill in a new chart starting at 77 in position 11 (remember to change the position numbers so that they start from 11).

Play “What number is hidden?” (see Introduction) Have students play the game using the completed multiples of 7 chart.

Practice with multiples of odd numbers. Give each student a copy of BLM Odd Multiples. SAY: Complete the multiplication questions on this sheet. You can use skip counting, repeated addition, patterns, or your memory. Check your answers by using a different strategy. (1. cross out 2, 4, 7, 10, 11, 13, 17, 23, 25, 28; 2. a) 3, b) 6, c) 12, d) 15, e) 9, f) 18, g) 30, h) 24, i) 21, j) 27, Bonus: 3, Bonus: 24; 3. cross out 1, 4, 6, 7, 14, 17, 21, 22, 26, 31, 44, 47, 48; 4. a) 5, b) 10, c) 20, d) 25, e) 15, f) 30, g) 50, h) 40, i) 35, j) 45, Bonus: 30, Bonus: 45; 5. cross out 3, 9, 12, 18, 25, 30, 36, 55, 61, 67; 6. a) 7, b) 14, c) 35, d) 28, e) 21, f) 49, g) 70, h) 42, i) 56, j) 63, Bonus: 14, Bonus: 21)
Extensions
(MP.3) 1. Sue started at 0 and skip counted by 7s. All her numbers were odd. Did she skip count correctly? How do you know?
**Answer:** No. When you skip count by 7s starting from 0, there are both even and odd numbers.

2. John started at 0 and skip counted by 7s or 3s. He did not say 27, but he did say 28. What was he skip counting by?
**Answer:** He was skip counting by 7s (28 is a multiple of 7, 27 is a multiple of 3 and not 7).

3. Jen started at 0 and skip counted by 7s or 3s. She did not say 14, but she counted past it. What was she skip counting by?
**Answer:** She was skip counting by 3s. She would have skip counted 0, 3, 6, 9, 12, 15, and on.

4. Alice started at 0 and skip counted by 3s, 5s, or 7s. She said the number 12 while she was skip counting. What was Alice skip counting by?
**Answer:** She was skip counting by 3s. 12 is a multiple of 3, but not a multiple of 5 or 7.

5. Use repeated addition to find the multiples of 9. At each step, using your previous answer and breaking 9 into smaller numbers can help. Examples:
   
   \[
   \begin{align*}
   1 \times 9 &= 9 \\
   2 \times 9 &= 9 + 9 = 9 + 1 + 8 = 10 + 8 = 18 \\
   3 \times 9 &= 18 + 9 = 18 + 2 + 7 = 27 \\
   4 \times 9 &= 27 + 9 = 27 + 3 + 6 = 36 
   \end{align*}
   
   **Answer:** multiples of 9: 0, 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, …

6. Fill in a chart on BLM Odd Multiple Charts with multiples of 9 and describe any patterns you see.
**Answers:**

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In each column, from row to row, the number in the tens place increases by 3. Across each row the ones digits decrease as the tens digits increase. The tens digit and the ones digit of each number add to 9. For example, 0 + 9 = 9, 1 + 8 = 9, 7 + 2 = 9.
## Odd Multiple Charts

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## Skip Counting Chart

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<th>Skip Count by ____</th>
<th>Tens</th>
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Odd Multiples

1. Cross out the numbers that are not multiples of 3.
   0  2  3  4  6  7  9  10  11  12  13  15  17  18  21  23  24  25  27  28  30

2. Complete the multiplication sentence.
   a) 1 \times 3 = 
   b) 2 \times 3 = 
   c) 4 \times 3 = 
   d) 5 \times 3 = 
   e) 3 \times 3 = 
   f) 6 \times 3 = 
   g) 10 \times 3 = 
   h) 8 \times 3 = 
   i) 7 \times 3 = 
   j) 9 \times 3 = 
   BONUS \times 3 = 1 
   BONUS \times 3 = 8 

3. Cross out the numbers that are not multiples of 5.
   0  1  4  5  6  7  10  14  15  17  20  21  22  25  26  30  31  35  40  44  45  47  48

4. Complete the multiplication sentence.
   a) 1 \times 5 = 
   b) 2 \times 5 = 
   c) 4 \times 5 = 
   d) 5 \times 5 = 
   e) 3 \times 5 = 
   f) 6 \times 5 = 
   g) 10 \times 5 = 
   h) 8 \times 5 = 
   i) 7 \times 5 = 
   j) 9 \times 5 = 
   BONUS \times 6 = 
   BONUS \times 9 = 

5. Cross out the numbers that are not multiples of 7.
   0  3  7  9  12  14  18  21  25  28  30  35  36  42  49  55  56  61  67  70

6. Complete the multiplication sentence.
   a) 1 \times 7 = 
   b) 2 \times 7 = 
   c) 5 \times 7 = 
   d) 4 \times 7 = 
   e) 3 \times 7 = 
   f) 7 \times 7 = 
   g) 10 \times 7 = 
   h) 6 \times 7 = 
   i) 8 \times 7 = 
   j) 9 \times 7 = 
   BONUS \times 2 = 
   BONUS \times 3 =
OA3-23 Patterns in Multiplication of Odd Numbers

You can write the multiples of 3 in a chart with 3 rows of 3 squares.

You can use the patterns in the chart to help remember the multiples of 3.

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

18 is in position 6 in the chart.

2. a) 12 is in position ____  b) 27 is in position ____  c) 6 is in position ____

3. a) 24 is in position ____  b) 15 is in position ____  c) 21 is in position ____
   ____ × 3 = 24  ____ × 3 = 15  ____ × 3 = 21
   d) 3 is in position ____  e) 18 is in position ____  f) 9 is in position ____
   ____ × 3 = 3  ____ × 3 = 18  ____ × 3 = 9

4. Use the patterns in the chart to help remember the multiples of 3.
   Try each question without looking at the chart.

   a) 3 × 2  b) 3 × 4  c) 3 × 6  d) 3 × 1  e) 3 × 9  f) 3 × 3

5. Fred saw 4 tricycles at a park. How many wheels did he see?
You can write the multiples of 7 in a chart with 3 rows of 3 squares.

You can use the patterns in the chart to help remember the multiples of 7.

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

_________________________________________________________________________
_________________________________________________________________________

28 is in position 4 in the chart.

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<tbody>
<tr>
<td>07</td>
<td>14</td>
<td>21</td>
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<tr>
<td>28</td>
<td>35</td>
<td>42</td>
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<tr>
<td>49</td>
<td>56</td>
<td>63</td>
</tr>
</tbody>
</table>

7. a) 7 is in position _____  b) 56 is in position _____  c) 49 is in position _____

8. a) 14 is in position _____  b) 21 is in position _____  c) 63 is in position _____

   _____ × 7 = 14  
   _____ × 7 = 21  
   _____ × 7 = 63

d) 28 is in position _____  e) 42 is in position _____  f) 35 is in position _____

   _____ × 7 = 28  
   _____ × 7 = 42  
   _____ × 7 = 35

9. Use the patterns in the chart to help remember the multiples of 7. Try each question without looking at the chart.

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

10. Write the multiples of 9 in a chart with 3 rows of 3 squares. What patterns do you see?