Lesson Plan -- Multiplying and Dividing Integers

Chapter Resources
- Lesson 3-9 Multiply Integers
- Lesson 3-9 Multiply Integers Answers
- Lesson 3-10 Divide Integers
- Lesson 3-10 Divide Integers Answers
### Words to Remember

Multiplication is the same as repeated addition.

\[
4 \times 2 = 2 + 2 + 2 + 2 = 8
\]

\[
5(-6) = -6 + (-6) + (-6) + (-6) + (-6) = -30
\]

### Getting Started

In Lesson 3-7 you added integers. Now you will multiply integers by using repeated addition. You will also learn some patterns about the sign of the product of two integers.

### Multiplying Two Integers

Find the product by rewriting it as repeated addition.

a. \(3 \times 15\)

b. \(5(-2)\)

c. \(3 \times (-1)\)

**Solution**

a. \(3 \times 15 = 15 + 15 + 15 = 45\)

b. \(5(-2) = -2 + (-2) + (-2) + (-2) + (-2) = -10\)

c. \(3 \times (-1) = -1 + (-1) + (-1) = -3\)

### Try This

Use repeated addition to find the product.

1. \(5 \times 8\)

2. \(2(-4)\)

3. \(4(6)\)

4. \(3 \times (-7)\)
**Example 2** Finding a Pattern for Multiplication

Look back at Example 1 and at the table below to find a pattern, or rule, for multiplying integers. What do you notice about the product of a positive integer and a negative integer? About the product of two negative integers?

<table>
<thead>
<tr>
<th>Integer</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 × (−3)</td>
<td>−6</td>
</tr>
<tr>
<td>1 × (−3)</td>
<td>−3</td>
</tr>
<tr>
<td>0 × (−3)</td>
<td>0</td>
</tr>
<tr>
<td>−1 × (−3)</td>
<td>3</td>
</tr>
<tr>
<td>−2 × (−3)</td>
<td>6</td>
</tr>
</tbody>
</table>

**Solution**

The product of a positive integer and a negative integer is negative.
The product of two negative integers is positive.

**Try this** Will the product be positive or negative?

5. 46 × (−8)
6. (−46) × (−85)

7. (−46) × (−85) × (−85)
8. (−46) × (−46) × (−85) × (−85)

**Example 3** Multiplying Two Integers

Use the rules for multiplying integers from Example 2 to find the product.

a. 4 × (−4)
b. −5(−7)

**Solution**

a. 4 × (−4) = −16 The product of a positive integer and a negative integer is negative.

b. −5 × (−7) = 35 The product of two negative integers is positive.

**Try this** Use the multiplication rules to find the product.

9. 6(−10) =
10. −8 × (−4) =
Summarize

The product of two negative integers is positive.
The product of a positive integer and a negative integer is negative.

Practice

Match each product with the repeated addition that represents it.

1. \(4 \times (-3)\) ______
   - \(A. -3 + (-3) + (-3) + (-3)\)

2. \(3 \times (-4)\) ______
   - \(B. 4 + 4 + 4\)

3. \(3 \times 4\) ______
   - \(C. -4 + (-4) + (-4)\)

Find the product.

4. \(10(5) = \) ______
5. \(4(-8) = \) ______

6. \(-12 \times 11 = \) ______
7. \(10 \times (-10) = \) ______

8. \(14 \times 3 = \) ______
9. \(-42 \times 0 = \) ______

10. \(8(-9) = \) ______
11. \(-20(-6) = \) ______

12. \(-33(1) = \) ______
13. \(2(-3)(-1) = \) ______

14. \(-3 \times 8 \times 2 = \) ______
15. \(12(-3)(5) = \) ______

16. \(-6 \times 4 \times 0 = \) ______
17. \(-3(2)(-4) = \) ______

18. \(-5(-7)(-1) = \) ______
19. \(12(2)(-8) = \) ______
Write a product expression to represent the situation. Decide whether the numbers are positive or negative. Then simplify the expression and explain what the answer means.

20. The temperature drops $2^\circ F$ each hour. What is the total change in temperature after 12 hours?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

21. Sylvia burns 6 calories per minute when she runs. How many calories does she burn when she runs for 15 minutes?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

22. Chandler drives his car 20 miles round trip to work everyday. How many total miles does he drive to and from work in 5 days?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

23. **Fill in the missing words.** The product of a negative integer and a positive integer is ________. The product of two negative integers is ________.

24. **Explain your reasoning.** Use an example to help you explain how multiplication is like repeated addition.

_________________________________________________________________________________
_________________________________________________________________________________
Lesson 3-9, pp. 34–37

Try this:
1. \(8 + 8 + 8 + 8 + 8 = 40\)
2. \(-4 + (-4) = -8\)
3. \(6 + 6 + 6 + 6 = 24\)
4. \(-7 + (-7) + (-7) = -21\)
5. negative
6. positive
7. negative
8. positive
9. \(-60\)
10. 32

Practice:
1. A
2. C
3. B
4. 50
5. \(-32\)
6. \(-132\)
7. \(-100\)
8. 42
9. 0
10. \(-72\)
11. 120
12. \(-33\)
13. 6
14. \(-48\)
15. \(-180\)
16. 0
17. 24
18. \(-35\)
19. \(-192\)
20. \((-2)(12); \text{negative}; -24; \text{Sample answer: The temperature dropped 24°F in 12 hours.}\)
21. \((-6)(15); \text{negative}; -90; \text{Sample answer: Sylvia burns 90 calories running for 15 minutes.}\)
22. 20(5); positive; 100; \text{Sample answer: Chandler drives 100 miles to and from work in 5 days.}\)
23. negative; positive
24. \text{Sample answer: Multiplication is like repeated addition since }3(-2) = -2 + (-2) + (-2) = -6.\)
Divide Integers

Words to Remember

Quotient: The result of dividing two integers

Related problem: You can rewrite a division problem as the related multiplication problem.

\[
16 \div 8 = 2 \rightarrow 8 \times 2 = 16
\]

Getting Started

In Lesson 3-9 you multiplied integers. Now you will use multiplication and mental math to divide integers.

Rewriting Division as Multiplication

Rewrite the division problem as a related multiplication problem.

a. \(48 \div (-6) = ?\)

b. \(-64 \div 8 = ?\)

Solution

a. \(48 \div (-6) = ?\) is related to the verbal multiplication expression:

“Some number times \(-6\) is equal to \(48\),” so \(? \times (-6) = 48\)

b. \(-64 \div 8 = ?\) is related to the verbal multiplication expression:

“Some number times \(8\) is equal to \(-64\),” so \(? \times 8 = -64\)

Try This

Rewrite the division problem as a related multiplication problem.

1. \(36 \div (-3) = ?\)

2. \(-15 \div (-5) = ?\)
Rules for the Division of Integers  The rules for multiplication of integers also hold true for division. The quotient of two integers with the same sign is positive. The quotient of two integers with different signs is negative.

**Example 1**

**Dividing Integers**

Determine whether the quotient will be positive or negative.

a.  $75 ÷ (-15) = \_\_

b.  $-36 ÷ (-6) = \_\_\

**Solution**

a. Since the integers in the expression have **different signs** (one positive and one negative), the quotient will be **negative**.

b. Since the integers in the expression have the **same sign** (both are negative), the quotient will be **positive**.

**Example 2**

**Dividing Integers**

Rewrite and solve a related multiplication equation for $-40 ÷ (-8) = \_\_\_$. 

**Solution**

**Step 1** Think “What number times $-8$ equals $-40$?”

\[ \_\_\_ \times (-8) = -40 \]

**Step 2** Solve using mental math.

Since the integers $-40$ and $-8$ have the same sign, their quotient will be positive.

\[ 5 \times (-8) = -40, \text{ so } -40 ÷ (-8) = 5 \]

**Try This**  Find the quotient.

3.  $88 ÷ 11 = \_\_\_ 

4.  $-32 ÷ 4 = \_\_\_ 

5.  $-125 ÷ -5 = \_\_\_ 

6.  $180 ÷ (-15) = \_\_\_ 

Math Intervention

Book 3  Integers and Rational Numbers  39
Summarize

Finding the Quotient of Integers

The quotient of two integers with the same sign is positive. The quotient of two integers with different signs is negative.

One method for finding the quotient of two integers is to begin by rewriting the division problem as a multiplication problem.

Practice

Tell if the quotient is positive (P) or negative (N).

1. \(15 \div (-3)\) _____
2. \(-144 \div (-12)\) _____
3. \(-180 \div 18\) _____
4. \(155 \div 5\) _____

Rewrite the quotient as a related multiplication problem.

5. \(105 \div (-5) = ?\) _____
6. \(156 \div (-12) = ?\) _____
7. \(-99 \div 11 = ?\) _____
8. \(-32 \div (-4) = ?\) _____

Find the quotient.

9. \(-5 \div (-1) = \) _____
10. \(14 \div (-2) = \) _____
11. \(75 \div (-3) = \) _____
12. \(-64 \div (-8) = \) _____
13. \(21 \div 3 = \) _____
14. \(-60 \div (-5) = \) _____
15. \(36 \div 4 = \) _____
16. \(-36 \div 6 = \) _____
19. Fill in the missing words. The quotient of two integers with the same sign will be a __________ number. The quotient of two integers with different signs will be a ______________ number.

20. Compare. How is dividing integers similar to multiplying integers?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Lesson 3-10, pp. 38–41

Try this:
1. \( \frac{2}{3} \times (-3) = 36 \)
2. \( \frac{2}{3} \times (-5) = -15 \)
3. 8
4. -8
5. 25
6. -12

Practice:
1. N
2. P
3. N
4. P
5. \( \frac{2}{3} \times (-5) = 105 \)
6. \( \frac{2}{3} \times (-12) = 156 \)
7. \( \frac{2}{3} \times 11 = -99 \)
8. \( \frac{2}{3} \times (-4) = -32 \)
9. 5
10. -7
11. -25
12. 8
13. 7
14. 12
15. 9
16. -6
17. \( 75 \div 5; 15 \); Sample answer: Each person receives 15 pieces of strawberries.
18. \( 675 \div 3; 225 \); Sample answer: Each person can use 225 minutes on the cellular telephone each month.
19. positive; negative

20. Sample answer: One method for finding a quotient is to begin by representing the quotient as a multiplication expression and then using mental math to solve it.