Lesson 5: The Opposite of a Number's Opposite

Student Outcomes

- Students understand that, for instance, the opposite of -5 is denoted $-(-5)$ and is equal to 5. In general, they know that the opposite of the opposite is the original number; e.g., $-(-a) = a$.
- Students locate and position opposite numbers on a number line.

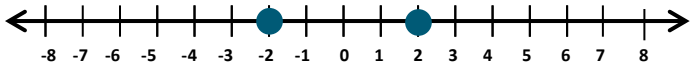
Classwork

Opening Exercises (7 minutes)

Students work independently for 5 minutes to complete the following review problems.

Opening Exercises

1. **Locate the number -2 and its opposite on the number line below.**



2. **Write an integer that represents each of the following:**
   a. **90 feet below sea level**

      -90

   b. **$\$100$ of debt**

      -100

   c. **2℃ above zero**

      2

3. **Joe is at the ice cream shop and his house is 10 blocks north of the shop. The park is 10 blocks south of the ice cream shop. When he is at the ice cream shop, is Joe closer to the park or his house? How could the number zero be used in this situation? Explain.**

   He is the same distance from his house and the park because both are located 10 blocks away from the ice cream shop, but in opposite directions. In this situation, zero represents the location of the ice cream shop.

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Example 1 (8 minutes): The Opposite of an Opposite of a Number

What is the opposite of the opposite of 8? How can we illustrate this number on a number line?

- Before starting the example, allow students to discuss their predictions in groups for one minute. Choose a few students to share their responses with the rest of the class.

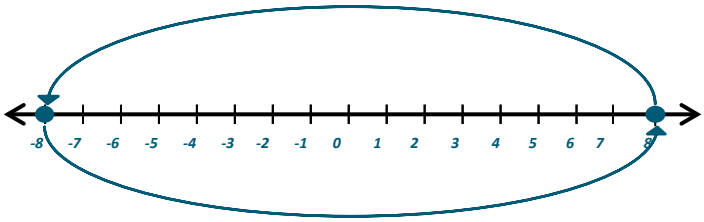
Example 1: The Opposite of an Opposite of a Number

What is the opposite of the opposite of 8? How can we illustrate this number on a number line?

a. **What number is 8 units to the right of 0?** 8

b. **How can you illustrate locating the opposite of 8 on this number line? What is the opposite of 8?** −8

c. **Use the same process to locate the opposite of −8. What is the opposite of −8?** 8



d. **The opposite of an opposite of a number is** *the number itself* .

Scaffolding:

For visual learners, use the curved arrows initially to develop conceptual understanding of how to find the opposite of an opposite of a number.

Example 2 (8 minutes): Writing the Opposite of an Opposite of a Number

In this example, students will use the "−" symbol to indicate "the opposite of a number." Teacher will display the task, "Explain why $-(-5) = 5$" on the board. A "−" symbol means "the opposite of a number."

$$-(-5) = 5$$

Since the opposite of 5 is negative 5, and the opposite of negative 5 is positive 5, then $-(-5) = 5$.

Pose the following questions to the class to check for understanding.

- What is the opposite of negative six?
  - 6
- What is the opposite of the opposite of 10?
  - 10
- How would you write the opposite of the opposite of −12?
  - *The opposite of* -12*:* $-(-12) = 12$. *The opposite of* 12*:* $-(12) = -12$. *So,* $-(12) = -12$
- What does a "−" symbol mean?
  - *It can mean the opposite of a number.*
- What is the opposite of the opposite of a debit of \$12?
  - *A debit of* \$12 *is* -12. *The opposite of* -12 *is* 12, *or a credit of* \$12. *The opposite of a credit of* \$12 *is a debit of* \$12.
- In general, the opposite of the opposite of a number is the original number; e.g., $-(-a) = a$.

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Exercise (12 minutes)

Students work in groups of 3–4 to find the opposite of an opposite of a set of given numbers. Allow 4–5 minutes for review as a whole class. Distribute each group member two cards with an integer on it. (Use sticky notes or index cards.) Students will complete the table using all the cards in their group.

Exercise

Complete the table using the cards in your group.

Person	Card (a)	Opposite of Card ($-a$)	Opposite of Opposite of Card $-(a)$
Jackson	4	$-(4) = -4$	$-(-4) = 4$
DeVonte	150	$-(150) = -150$	$-(-150) = 150$
Cheryl	-6	$-(-6) = 6$	$-(6) = -6$
Toby	-9	$-(-9) = 9$	$-(9) = -9$

1. **Write the opposite of the opposite of -10 as an equation.**

   The opposite of -10*:* $-(-10) = 10$*; the opposite of* 10*:* $-(10) = -10$*. Therefore,* $\big(-(-(-10))\big) = -10$.

2. **In general, the opposite of the opposite of a number is the** *original number.*

3. **Provide a real-world example of this rule. Show your work.**

   The opposite of the opposite of 100 *feet below sea level is* 100 *feet below sea level.*
   -100 *is* 100 *feet below sea level*
   $-(-100) = 100$*, the opposite of* -100
   $-(100) = -100$*, the opposite of* 100

Closing (3 minutes)

- What is the opposite of an opposite of a number? Support your answer with an example.
  - *The opposite of an opposite of a number is the original number. The opposite of the opposite of negative* 6 *is negative* 6 *because the opposite of* -6 *is* 6*. The opposite of* 6 *is* -6.
- What is the relationship between the location of a nonzero number on the number line and the location of its opposite on the number line?
  - *A number and its opposite are located the same distance from* 0 *on a number line, but on opposite sides of* 0.

Exit Ticket (7 minutes)

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Name _____ Date_____

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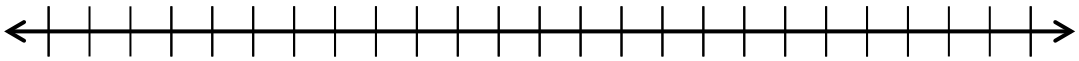
Exit Ticket

1. Jane completes several example problems that ask her to the find the opposite of the opposite of a number, and for each example, the result is a positive number. Jane concludes that when she takes the opposite of the opposite of any number, the result will always be positive. Is Jane correct? Why or why not?

2. To support your answer from the previous question, create an example, written as an equation. Illustrate your example on the number line below.



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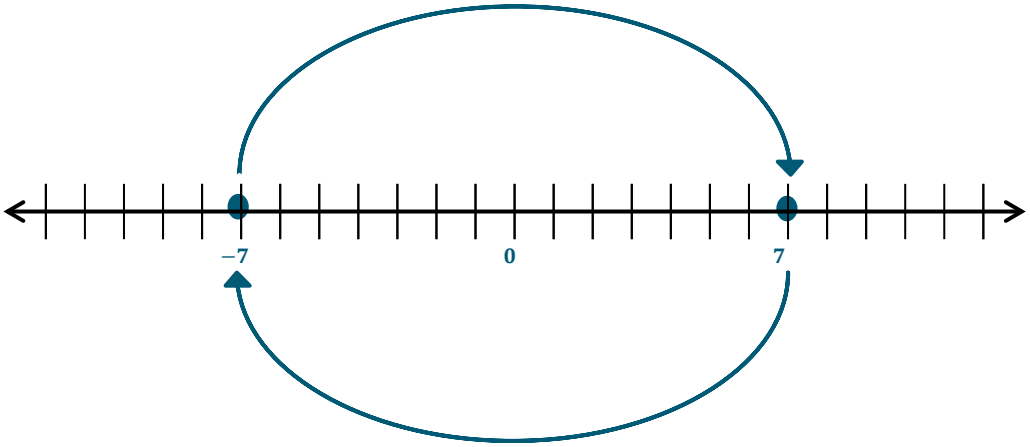
Exit Ticket Sample Solutions

1. Jane completes several example problems that ask her to the find the opposite of the opposite of a number, and for each example, the result is a positive number. Jane concludes that when she takes the opposite of the opposite of any number, the result will always be positive. Is Jane correct? Why or why not?

   She is not correct. The opposite of the opposite of a number is the number itself. So, if Jane starts with a negative number, she will end with a negative number.

2. To support your answer from the previous question, create an example, written as an equation. Illustrate your example on the number line below.

   If Jane starts with -7, the opposite of the opposite of -7 is written as $-(-(-7)) = -7$ or the opposite of -7: $-(-7) = 7$; the opposite of 7: $-(7) = -7$.



Problem Set Sample Solutions

1. Read each description carefully and write an equation that represents the description.
   a. The opposite of negative seven.

      $-(-7) = 7$

   b. The opposite of the opposite of twenty-five.

      $-(-25) = 25$

   c. The opposite of fifteen.

      $-(15) = -15$

   d. The opposite of negative thirty-six.

      $-(-36) = 36$

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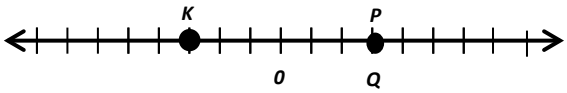
2. Jose graphed the opposite of the opposite of 3 on the number line. First, he graphed point P on the number line 3 units to the right of zero. Next, he graphed the opposite of P, 3 units to the left of zero and labeled it K. Finally, he graphed the opposite of K and labeled it Q.



a. Is his diagram correct? If not, explain his error and correctly locate and label point Q.

Yes, his diagram is correct. It shows that P is 3 because it is 3 units to the right of zero. The opposite of 3 is -3, which is point K (3 units to the left of zero). The opposite of -3 is 3, so point Q is 3 units to the right of zero.

b. Write the relationship between the points:

P and K *They are opposites.*

K and Q *They are opposites.*

P and Q *They are the same.*

3. Read each real-world description. Write the integer that represents the opposite of the opposite. Show your work to support your answer.

a. A temperature rise of 15 degrees Fahrenheit.

-15 *is the opposite of* 15 *(fall in temperature)*
15 *is the opposite of* -15 *(rise in temperature)*
$-(-15) = 15$

b. A gain of 55 yards.

-55 *is the opposite of* 55 *(loss of yards)*
55 *is the opposite of* -55 *(gain of yards)*
$-(-55) = 55$

c. A loss of 10 pounds.

10 *is the opposite of* -10 *(gain of pounds)*
-10 *is the opposite of* 10 *(loss of pounds)*
$-(10) = -10$

d. A withdrawal of $\$2,000$.

$2,000$ *is the opposite of* $-2,000$ *(deposit)*
$-2,000$ *is the opposite of* $2,000$ *(withdrawal)*
$-(2,000) = -2,000$

4. Write the integer that represents the statement. Locate and label each point on the number line below.

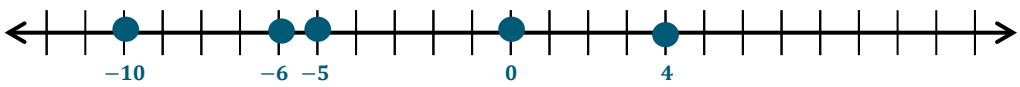
a. The opposite of a gain of 6. -6

b. The opposite of a deposit of $\$10$. -10

c. The opposite of the opposite of 0. 0

d. The opposite of the opposite of 4. 4

e. The opposite of the opposite of a loss of 5. -5



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