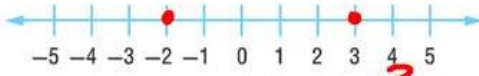


# Opposites and Absolute Value

**CCSS Use Math Tools** Use the number line to determine the distance between each integer and zero.

Show your work.

1.  $-2$  2



2.  $+3$  3

Integer	Distance Between Integer and Zero	Opposite Integer	Distance Between Opposite Integer and Zero
3	3	-3	3
3.	4	-4	4
4.	7	-7	7
5.	-11	11	11
6.	-13	13	13
7.	19	-19	19
8.	-21	21	21

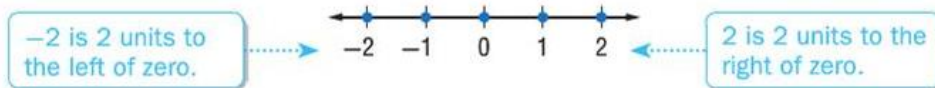
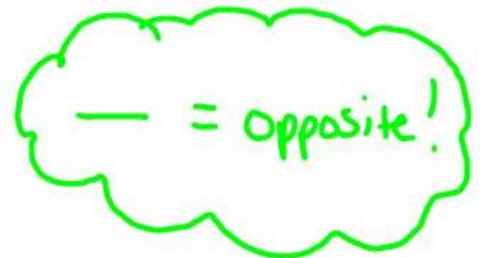
9. **CCSS Reason Inductively** What can you conclude about the distance from zero for both an integer and its opposite?

*The distances are equal/the same and always positive!*

## Find Opposites

Positive numbers, such as 2, are graphed to the right (or above) zero on a number line. Negative numbers, such as  $-2$ , are graphed to the left (or below) zero on a number line.

**Opposites** are numbers that are the same distance from zero in opposite directions. Since 0 is not negative nor positive, 0 is its own opposite. The opposite of the opposite of a number, is the number itself. For example, the opposite of the opposite of 3,  $-(-3)$  is 3.



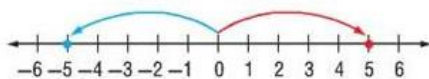
## Examples



1. Find the opposite of  $-5$ .

**Method 1 Use a number line.**

Draw a number line and graph  $-5$ .



So, 5 is the opposite of  $-5$ .

*-5 is 5 units to the left of 0. The integer 5 is 5 units to the right of 0.*

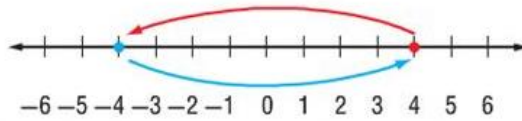
**Method 2 Use symbols.**

The integer  $-5$  uses the negative symbol.

The opposite of a negative symbol is a positive symbol.

So, the opposite of  $-5$  is  $+5$ , or 5.

## 2. Find the opposite of the opposite of 4.



The opposite of 4 is  $-4$ .  
The opposite of  $-4$  is 4.

So, 4 is the opposite of the opposite of 4.

a. -3

Show your work.

b. -2

### Got It? Do these problems to find out.

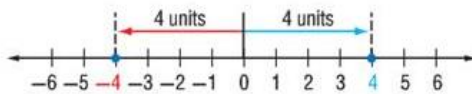
a. What is the opposite of 3?

b. What is the opposite of the opposite of  $-2$ ?

## Absolute Value

**Words** The absolute value of a number is the distance between the number and zero on a number line.

**Model**



**Symbols**  $|4| = 4$  The absolute value of 4 is 4.  
 $|-4| = 4$  The absolute value of  $-4$  is 4.

The integers  $-4$  and  $4$  are each 4 units from 0, even though they are on opposite sides of 0.  $|-4|$  is read *absolute value of negative four*.

## Key Concept

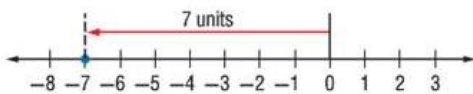
### Absolute Value

Since distance cannot be negative, the absolute value of a number is always positive or zero.

## Examples



3. Evaluate  $|-7|$ .



The graph of  $-7$  is 7 units from 0 on the number line.

So,  $|-7| = 7$ .

4. Evaluate  $|5| + |-6|$ .

$$\begin{aligned} |5| + |-6| &= 5 + |-6| && \text{The absolute value of 5 is 5.} \\ &= 5 + 6 && \text{The absolute value of } -6 \text{ is 6.} \\ &= 11 && \text{Simplify.} \end{aligned}$$

5. Evaluate  $|-7| - |3|$ .

$$\begin{aligned} |-7| - |3| &= 7 - 3 && \text{Find the absolute value of } -7 \text{ and 3.} \\ &= 4 && \text{Simplify.} \end{aligned}$$

Show your work.

c. 14

d. 12

e. 6

### Got It? Do these problems to find out.

c.  $|14|$

14

d.  $|-9| + |3|$

9 + 3

e.  $|-8| - |-2|$

8 - 2

# Guided Practice



1. What is the opposite of 0? (Example 1)

Show your work.

0

2. What is the opposite of the opposite of 6? (Example 2)

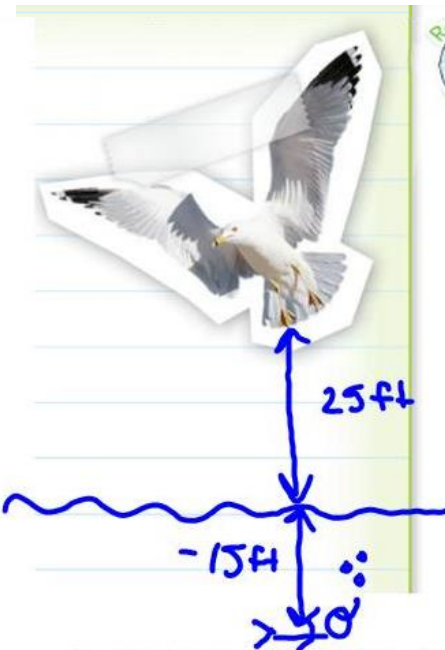
6

Evaluate each expression. (Examples 3-5)

3.  $|-5| = 5$

4.  $|20| - |-3| = 17$   
 $20 - 3$

5.  $|-16| + |-12| = 28$   
 $16 + 12$



## Example



6. A seagull is flying 25 feet above sea level. Nevaeh is diving 15 feet below sea level. What is the distance between Nevaeh and the seagull?

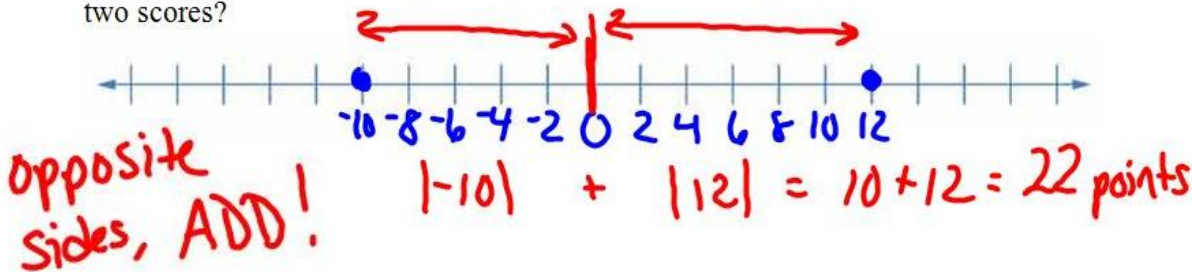
The expression  $|25|$  describes the seagull's distance above sea level. The expression  $|-15|$  describes the Nevaeh's distance below sea level.

To find the distance, add the absolute values.

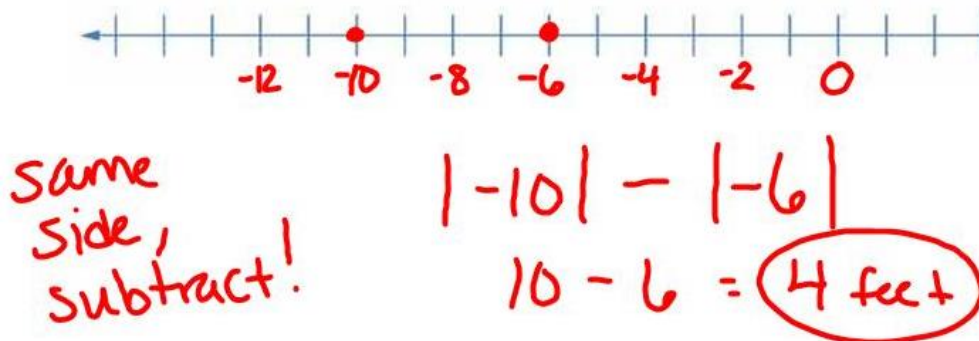
$$\begin{aligned} |25| + |-15| &= 25 + |-15| && \text{The absolute value of 25 is 25.} \\ &= 25 + 15 && \text{The absolute value of -15 is 15.} \\ &= 40 && \text{Add.} \end{aligned}$$

So, the total distance is 40 feet.

1) A player in a game has -10 points. His opponent has 12 points. What is the difference between the two scores?



2) Lily saw a jelly fish at 6 feet below sea level. She saw a bright blue fish at 10 feet below sea level. What is the distance between the blue fish and the jelly fish?



21. **CCSS Reason Abstractly** Explain why the absolute value of a number is never negative. Absolute value is distance and distance cannot be negative.

22. **CCSS Reason Abstractly** Explain why an account balance less than  $-40$  dollars represents a debt greater than 40 dollars.

Sample answer: Absolute value can be used to represent the amount of debt, but the value of the number is based on its position on the number line. So, an account balance less than  $-40$  dollars, such as  $-50$  dollars, has a greater absolute value, but a smaller value.

Find the opposite of each integer.

24.  $-2$  2

25.  $15$   $-15$

26.  $42$   $-42$

Find the opposite of the opposite of each integer.

27.  $9$  9

28.  $0$  0

29.  $-8$   $-8$

Evaluate each expression.

30.  $|18| =$  18

31.  $|0| =$  0

32.  $|25| =$  25

33.  $|2| + |-13| =$  15

34.  $|-20| - |17| =$  3

35.  $|-16| - |5| =$  11

41. Sally received a lunch account notice stating her current balance as  $-\$14.45$ . Her friend James received a similar notice stating his account balance as  $-\$10.75$ . Which student is more in debt? Use absolute value to explain your answer.

| Sally because  $-14.45$  is farther away from 0 than  $-10.75$ .

42. The temperature in Anchorage, Alaska, USA yesterday was  $-13^{\circ}\text{F}$ . The temperature in Whitehorse, Yukon, Canada was  $-6^{\circ}\text{F}$  yesterday. What is the difference in the temperatures?



$$|-13| - |-6| = 13 - 6 = \boxed{7^{\circ}\text{F}}$$