

6.1 Integers

Essential Question How can you represent numbers that are less than 0?

1 ACTIVITY: Reading Thermometers

Work with a partner. The thermometers show the temperatures in four cities.

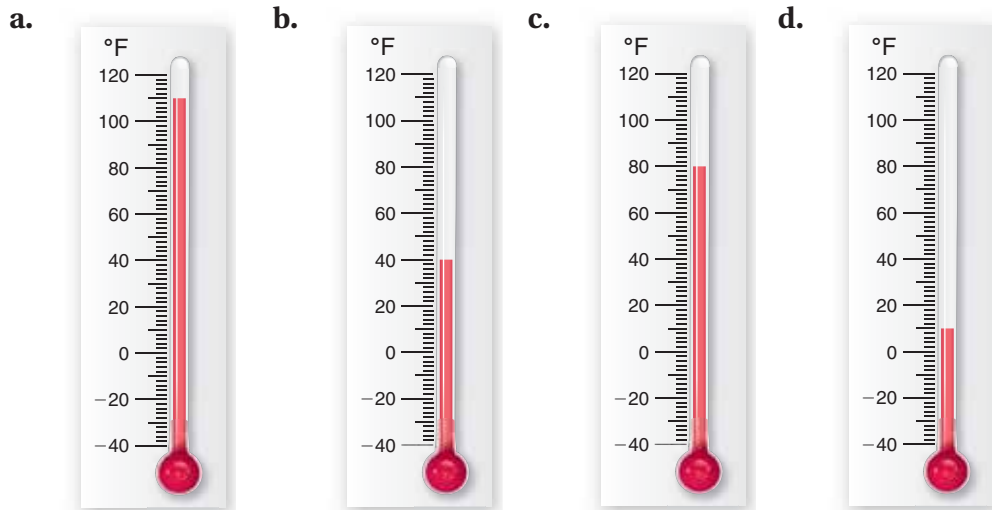
Honolulu, Hawaii

Anchorage, Alaska

Death Valley, California

Seattle, Washington

Write each temperature. Then match each temperature with its most appropriate location.

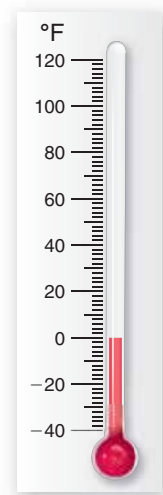


e. How would you describe all the temperatures in relation to 0°F ?

2 ACTIVITY: Describing a Temperature

Work with a partner. The thermometer shows the coldest temperature ever recorded in Seattle, Washington.

- What is the temperature?
- How do you write temperatures that are colder than this?
- Suppose the record for the coldest temperature in Seattle is broken by 10 degrees. What is the new coldest temperature? Draw a thermometer that shows the new coldest temperature.
- How is the new coldest temperature different from the temperatures in Activity 1?



Integers

In this lesson, you will

- understand positive and negative integers and use them to describe real-life situations.
- graph integers on a number line.

Learning Standards

MACC.6.NS.3.5
MACC.6.NS.3.6a
MACC.6.NS.3.6c

3 ACTIVITY: Extending the System of Whole Numbers

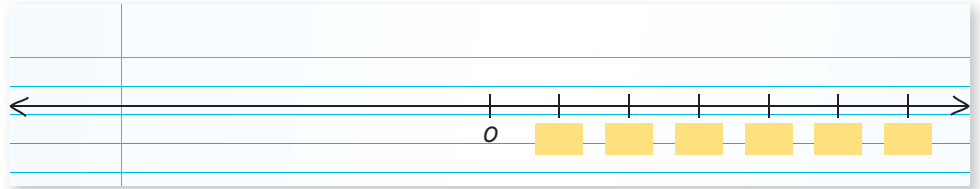
Math Practice 8

Maintain Oversight

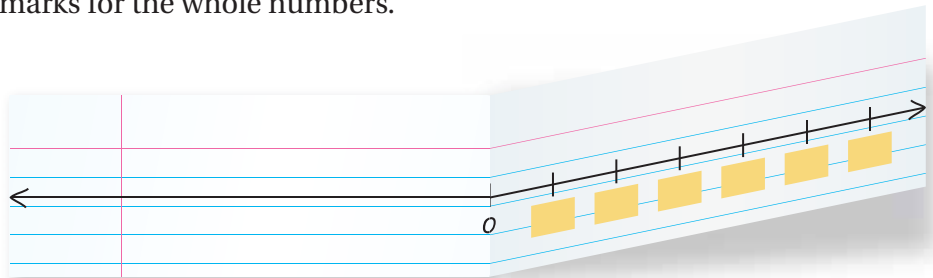
How does this activity help you represent numbers less than 0?

Work with a partner.

- a. Copy and complete the number line using whole numbers only.



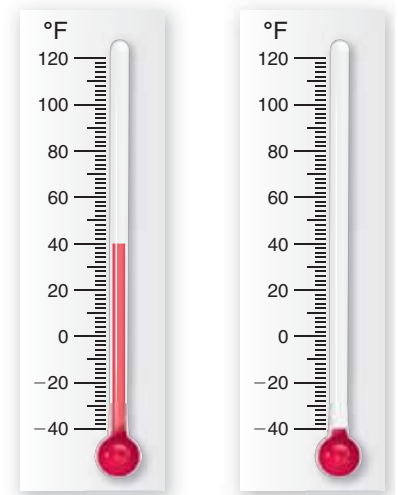
- b. Fold the paper with your number line around 0 so that the lines overlap. Make tick marks on the other side of the number line to match the tick marks for the whole numbers.



- c. **STRUCTURE** Compare this number line to the thermometers from Activities 1 and 2. What do you think the new tick marks represent? How would you label them?

What Is Your Answer?

- IN YOUR OWN WORDS** How can you represent numbers that are less than 0?
- Describe another real-life example that uses numbers that are less than 0.
- REASONING** How are the temperatures shown by the thermometers at the right similar? How are they different?
- WRITING** The temperature in a town on Thursday evening is 25°F . On Sunday morning, the temperature drops below 0°F . Write a story to describe what may have happened in the town. Be sure to include the temperatures for each day.



Practice

Use what you learned about positive and negative numbers to complete Exercises 4–7 on page 252.

Key Vocabulary

positive numbers,
p. 250
negative numbers,
p. 250
opposites, p. 250
integers, p. 250

Positive numbers are greater than 0. They can be written with or without a positive sign (+).

+1 5 +20 10,000

Negative numbers are less than 0. They are written with a negative sign (-).

-1 -5 -20 -10,000

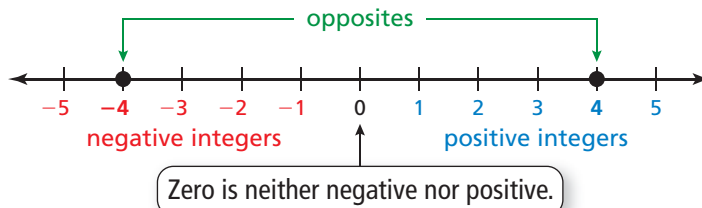
Two numbers that are the same distance from 0 on a number line, but on opposite sides of 0, are called **opposites**. The opposite of 0 is 0.

Key Idea**The Meaning of a Word****Opposite**

When you sit across from your friend at the lunch table, you sit **opposite** your friend.

Integers

Words **Integers** are the set of whole numbers and their opposites.

Graph**EXAMPLE 1 Writing Positive and Negative Integers**

Write a positive or negative integer that represents the situation.

- a. A contestant gains 250 points on a game show.

Gains indicates a number greater than 0. So, use a positive integer.

••• +250, or 250

- b. Gasoline freezes at 40 degrees below zero.

Below zero indicates a number less than 0. So, use a negative integer.

••• -40

On Your Own

Write a positive or negative integer that represents the situation.

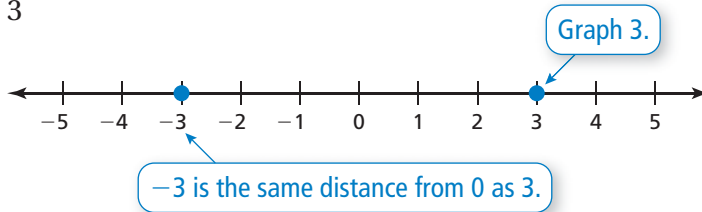
1. A hiker climbs 900 feet up a mountain.
2. You have a debt of \$24.
3. A student loses 5 points for being late to class.
4. A savings account earns \$10.

Now You're Ready
Exercises 8–13

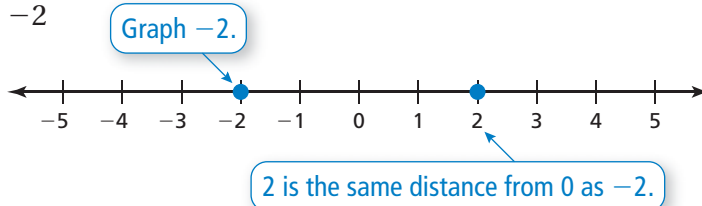
EXAMPLE 2 Graphing Integers

Graph each integer and its opposite.

a. 3



b. -2



Reading

You can think of the negative sign ($-$) as referring to the opposite of a number. In Example 2(b), you can read -2 as "the opposite of 2."

EXAMPLE 3 Real-Life Application

You deliver flowers to an office building. You enter at ground level and go down 2 floors to make the first delivery. Then you go up 7 floors to make the second delivery.

a. Write an integer that represents each position.

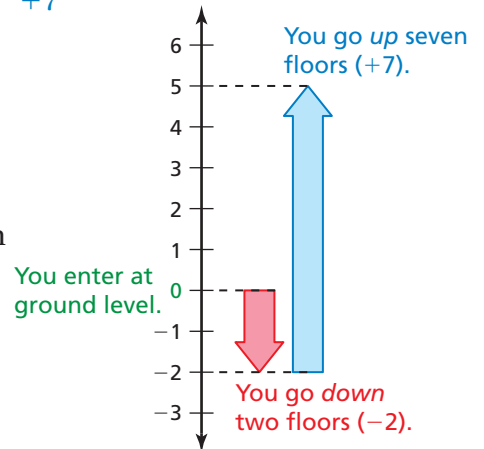
Position	Integer
You enter at ground level.	0
You go down 2 floors.	-2
You go up 7 floors.	+7

b. Write an integer that represents how you return to ground level.

Use a number line to model your movement, as shown.

The second delivery is on the fifth floor. You must go down 5 floors to return to ground level.

- The integer representing "down 5 floors" is -5 .



On Your Own

Graph the integer and its opposite.

5. 6 6. -4 7. -12 8. 1

9. **WHAT IF?** In Example 3, you go up 9 floors to make the second delivery. Write an integer that represents how you return to ground level.

Now You're Ready
Exercises 16–23

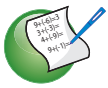


Vocabulary and Concept Check

1. **VOCABULARY** Which of the following numbers are integers?

$$8, -4.1, -9, \frac{1}{6}, 1.75, 22$$

2. **OPEN-ENDED** Describe a real-life example that you can represent by -1200 .
3. **VOCABULARY** List three words or phrases used in real life that indicate negative numbers.



Practice and Problem Solving

Graph the number that represents the situation on a number line.

4. A football team loses 3 yards. 5. The temperature is 6 degrees below zero.
6. A person climbs 600 feet up a mountain. 7. You earn \$15 raking leaves.

Write a positive or negative integer that represents the situation.

- 1 8. You withdraw \$42 from an account. 9. An airplane climbs to 37,500 feet.
10. The temperature rises 17 degrees. 11. You lose 56 points in a video game.
12. A ball falls 350 centimeters. 13. You receive 5 bonus points in class.
14. **STOCK MARKET** A stock market gains 83 points. The next day, the stock market loses 47 points. Write each amount as an integer.
15. **SCUBA DIVING** The world record for scuba diving is 318 meters below sea level. Write this as an integer.

Graph the integer and its opposite.

- 2 16. -5 17. -8 18. 14 19. 9
20. 30 21. -150 22. -32 23. 400

24. **ERROR ANALYSIS** Describe and correct the error in describing positive integers.



The positive integers are $0, 1, 2, 3, \dots$

25. **TEMPERATURE** The highest temperature in February is 25°F . The lowest temperature in February is the opposite of the highest temperature. Graph both temperatures.

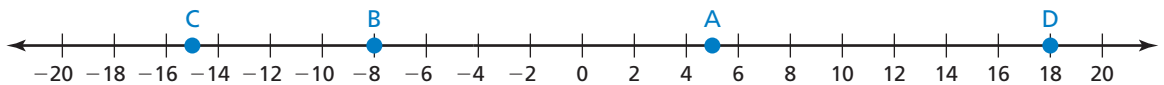
Identify the integer represented by the point on the number line.

26. A

27. B

28. C

29. D



30. **TIDES** Use the information below.

- Low tide is 1 foot below the average water level.
- High tide is 5 feet higher than low tide.

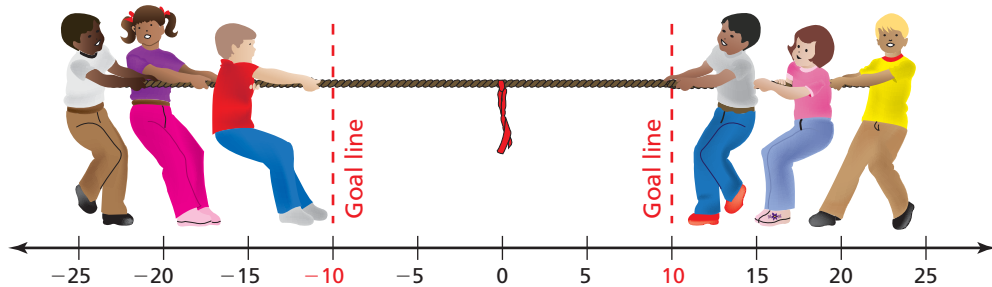
Write an integer that represents the average water level relative to high tide.



31. **REPEATED REASONING** Choose any positive integer.

- Find the opposite of the integer.
- Find the opposite of the integer in part (a).
- What can you conclude about the opposite of the opposite of the integer? Is this true for all integers? Use a number line to justify your answer.
- Describe the meaning of $-(-(-6))$. Find its value.

32. **Number Sense** In a game of tug-of-war, a team wins by pulling the flag over its goal line. The flag begins at 0. During a game, the flag moves 8 feet to the right, 12 feet to the left, and 13 feet back to the right. Did a team win? Explain.



Fair Game Review what you learned in previous grades & lessons

Order the numbers from least to greatest. (*Skills Review Handbook*)

33. $\frac{7}{8}, \frac{1}{2}, \frac{3}{8}, \frac{3}{4}$

34. 4.5, 4.316, 4.32, 4.312

35. **MULTIPLE CHOICE** The height of a statue is 276 inches. What is the height of the statue in meters? Round your answer to the nearest hundredth. (*Section 5.7*)

(A) 1.09 m

(B) 7.01 m

(C) 108.66 m

(D) 701.04 m