

B.1 The Number Line

Essential Question How can you use a number line to represent real-life events?



1 ACTIVITY: Seconds to Liftoff

Work with a partner. You are listening to the NASA Command Center before the liftoff of a space shuttle.

You hear the following:

“T minus 10 seconds ... go for main engine start ... T minus 9 ... 8 ... 7 ... 6 ... 5 ... 4 ... 3 ... 2 ... 1 ... we have liftoff.”



Draw a number line. Then locate the following events at appropriate points on the number line.



2 ACTIVITY: Being Careful with Terminology

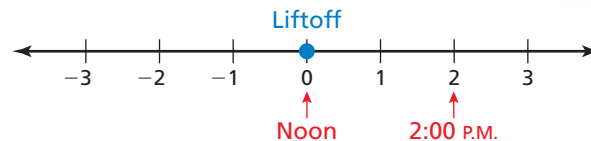
Work with a partner.

- Use a number line to show that the phrase “3 seconds away from liftoff” can have two meanings.
- Reword the phrase “3 seconds away from liftoff” in two ways so that each meaning is absolutely clear.
- Explain why you must be very careful with terminology if you are working in the NASA Command Center for a space shuttle launch.

3 ACTIVITY: A Day in the Life of an Astronaut

Make a time line that shows a day in the life of an astronaut. Use the Internet or another reference source to gather information.

- Use a number line with units representing hours. Start at 12 hours before liftoff and end at 12 hours after liftoff.



- Illustrate your time line with drawings or photographs.
- Include at least five events before liftoff, such as when the astronauts suit up.
- Include at least five events after liftoff, such as when the space shuttle enters Earth's orbit.

What Is Your Answer?

- IN YOUR OWN WORDS** How can you use a number line to represent real-life events?
- Describe how you can use a number line to create a time line.

Practice

Use what you learned about the number line to complete Exercises 4–6 on page A14.

Key Vocabulary

absolute value,
p. A13

The following numbers are *integers*. *Negative integers* are less than 0. *Positive integers* are greater than 0.

negative integers positive integers

..., -3, -2, -1, 0, 1, 2, 3, ...

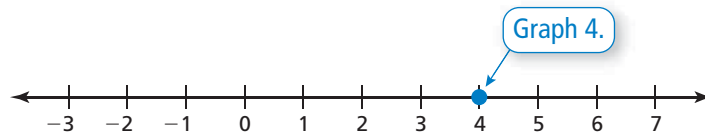
Zero is neither negative nor positive.

You can use a number line to graph and compare integers.

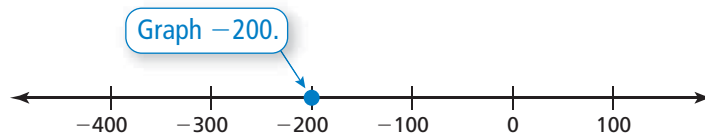
EXAMPLE 1 Writing and Graphing Integers

Write and graph the integer that represents the situation.

- a. The temperature outside is 4 degrees above zero.



- b. A contestant on a game show loses 200 points.

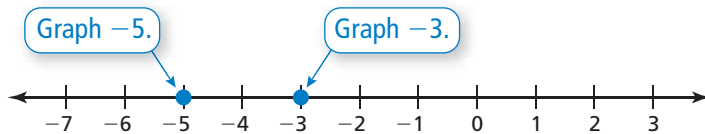


EXAMPLE 2 Comparing Integers

Remember

On a number line, numbers to the left are less than numbers to the right. Numbers to the right are greater than numbers to the left.

Which is greater, -3 or -5?



∴ -3 is to the right of -5. So, -3 is greater.

On Your Own

Write and graph the integer that represents the situation.

- You climb 76 feet to the top of a water slide.
- You dig a hole at the beach that is 2 feet deep.
- Which is greater, 0 or -4?
- Which is greater, -7 or -2?

Now You're Ready
Exercises 4-17

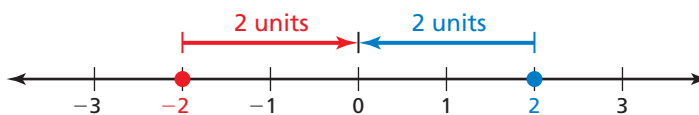
Key Idea

Absolute Value

Words The **absolute value** of a number is the distance between the number and 0 on a number line. The absolute value of a number a is written as $|a|$.

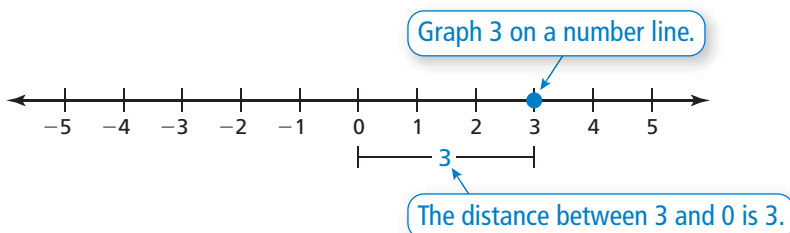
Numbers

$$|-2| = 2 \quad |2| = 2$$



EXAMPLE 3 Finding Absolute Value

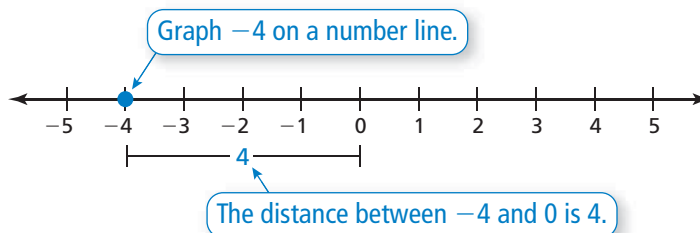
Find the absolute value of 3.



∴ So, $|3| = 3$.

EXAMPLE 4 Finding Absolute Value

Find the absolute value of -4 .



∴ So, $|-4| = 4$.

On Your Own

Find the absolute value of the integer.

- 5
- -1
- -6
- 73
- Write two integers that have an absolute value of 7.



Vocabulary and Concept Check

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

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

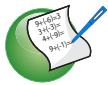
2. **VOCABULARY** Explain how to find the absolute value of an integer.
3. **WHICH ONE DOESN'T BELONG?** Which expression does *not* belong with the other three? Explain your reasoning.

2

$|2|$

-2

$|-2|$



Practice and Problem Solving

Write and graph the integer that represents the situation.

- 1 4. You gain 10 bonus points on a quiz. 5. The temperature is 6 degrees below zero.
6. A football team loses 3 yards. 7. You swim down to 6 feet below sea level.
8. A person climbs 600 feet up a mountain. 9. A company earns a profit of \$800.

Tell which integer is greater.

- 2 10. $-1, -4$ 11. $-3, 6$ 12. $-7, 2$ 13. $-5, 5$
14. $9, -11$ 15. $13, 20$ 16. $-15, -10$ 17. $8, -12$

Find the absolute value of the integer.

- 3 4 18. -2 19. 3 20. 23 21. -17
22. -56 23. -110 24. 49 25. 11

26. **ERROR ANALYSIS** Describe and correct the error in finding the absolute value.

$$\times \quad -|-15| = 15$$

27. **OCEAN** A diver is 15 feet below sea level. A scientist on a boat is 12 feet above sea level.
- Write an integer for the position of each person relative to sea level.
 - Find the absolute value of each integer.
 - Who is farther from sea level?

Find the median of the data.

28. $-7, 3, -2, 0, 1, -5, 9$ 29. $-12, -8, -15, 1, 3, -4, 10, 2, 6$

Copy and complete the statement using $<$, $>$, or $=$.

30. 6 $| -8 |$

31. $| -10 |$ $| -9 |$

32. $| -2 |$ $| 4 |$

Order the values from least to greatest.

33. $5, 0, | -1 |, | 4 |, -2$

34. $| -3 |, | 5 |, -3, -4, | -4 |$

35. $10, | -6 |, 9, | 3 |, -11, 0$

36. $-18, | 30 |, -19, | -22 |, -20, | -18 |$

Simplify the expression.

37. $| 0 |$

38. $-| 6 |$

39. $-| -1 |$

Tell whether the statement is *always*, *sometimes*, or *never* true. Explain.

40. Zero is a positive integer.

41. The absolute value of a number is greater than the number.

42. The absolute value of a negative number is positive.



43. **ELEVATION** The table shows the highest and lowest elevations for five states.

- a. Order the states by their highest elevations, from least to greatest.
- b. Order the states by their lowest elevations, from least to greatest.

State	Highest Elevation (ft)	Lowest Elevation (ft)
Arkansas	2753	55
California	14,494	-282
Florida	345	0
Louisiana	535	-8
Tennessee	6643	178

44. **NUMBER LINE** Point A is on a number line halfway between -17 and 5 . Point B is halfway between point A and 0 . What integer is represented by point B ?

45. **Critical Thinking** The absolute value of x is less than the absolute value of y . Describe all possible relationships between x and y .



Fair Game Review what you learned in previous grades & lessons

Use a number line to find the sum.

46. $2 + 5$

47. $3 + 8$

48. $4 + 4$

49. $12 + 9$

50. **MULTIPLE CHOICE** What is the area of the circle?

Use 3.14 for π .

(A) 53.38 m^2

(B) 106.76 m^2

(C) 226.87 m^2

(D) 907.46 m^2

