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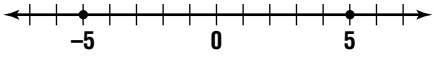
8-1 Integers (pages 294–298)

An **integer** is any number from this set of the whole numbers and their opposites: {… −3, −2, −1, 0, 1, 2, 3, …}.

Writing and Graphing Integers	• Integers that are greater than zero are **positive integers**. You can write positive integers with or without a + sign. • Integers that are less than zero are **negative integers**. You write negative integers with a − sign. • Zero is the only integer that is neither positive nor negative. • Each integer has an **opposite** that is the same distance from zero but in the opposite direction on the number line.
Comparing Integers	• Recall that $7 > 3$ means 7 is greater than 3. $-7 < 3$ means that −7 is less than 3. • To order integers, first graph them on a number line. Then write them in order from left to right, or least to greatest.

EXAMPLES

A Graph 5 and its opposite on a number line.



A number line always has arrows on both ends, with zero and at least one other number marked to show the size of a unit. Make a dot to show the integers you are graphing.

B Which is greater, −7 or −3?

Think of both of these on a number line. Which integer is to the left? A number to the left is always less than the number to the right.

$-7 < -3$ or $-3 > -7$

Try These Together

1. Order from least to greatest: 2, −2, 5, −5, 0.

2. Write an integer to represent a debt of $9.

PRACTICE

Draw a number line from −10 to 10. Graph each integer on the number line.

3. 2 **4.** −4 **5.** −6 **6.** 5

Replace each ● with <, >, or = to make a true sentence.

7. −3 ● 5 **8.** 8 ● 2 **9.** −9 ● −9 **10.** −7 ● −12

11. Order −5, 6, − 9, and −1 from least to greatest.

12. **Standardized Test Practice** Which integer is the opposite of −25?

A −25 **B** 25 **C** 5 **D** −5

Answers: **1.** −5, −2, 0, 2, 5 **2.** −$9 **3–6.** See Answer Key. **7.** < **8.** > **9.** = **10.** > **11.** −9, −5, −1, 6 **12.** B

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8-2 Adding Integers (pages 300–303)

You can use a number line to add integers.

Adding Integers	To find the sum of 5 + (−7), follow these steps. • Start at zero on the number line. • Go 5 in the positive direction (right). • From that point, go 7 in the negative direction (left). • The point where you end (−2) is the sum.

EXAMPLES

A Is this sum positive, negative, or zero?
$-3 + 5$

Which integer is farther from zero? +5. The sum will have the same sign as the integer that is farther from zero. The sum of −3 + 5 is positive.

B Find the sum of $-4 + (-3)$.

Start at zero on the number line. Go 4 in the negative direction. From that point, go 3 more in the negative direction. You end at the point −7. The sum of −4 + (−3) is −7.

Try These Together

1. Is 8 + (−10) positive, negative, or zero?
HINT: Which integer is farther from zero?

2. Find the sum of −12 + 13.
HINT: Use a number line.

PRACTICE

Tell whether each sum is* positive, negative, *or* zero *without adding.

3. 2 + 4 **4.** 5 + (−10) **5.** −8 + (−2) **6.** −3 + (−3)

7. −1 + 5 **8.** −4 + (−4) **9.** 5 + (−3) **10.** 6 + (−6)

Add.

11. −8 + 16 **12.** 15 + (−5) **13.** 4 + (−3) **14.** −7 + 5

15. 3 + (−5) **16.** −2 + (−2) **17.** −6 + 3 **18.** 8 + (−4)

19. What is 2 plus −4 plus −3?

20. Find the sum of −14 and 22.

21. Football In a football game, team A was on the 50 yard line. Then they lost 7 yards on the next play. What yard line are they on now?

22. **Standardized Test Practice** What is the sum of −8, 4, and −2?

A −6 **B** −8 **C** 4 **D** 2

Answers: **1.** negative **2.** 1 **3.** positive **4.** negative **5.** negative **6.** negative **7.** positive **8.** negative **9.** positive **10.** zero **11.** 8 **12.** 10 **13.** 1 **14.** −2 **15.** −2 **16.** −4 **17.** −3 **18.** 4 **19.** −5 **20.** 8 **21.** 43 yard line **22.** A

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8-3 Subtracting Integers (pages 304–307)

You can use counters or a number line to subtract integers.

Subtracting Integers	To find the difference $4 - (-7)$, follow these steps. • Place 4 positive counters on a mat. • To subtract -7, you must remove 7 negative counters. To be able to do this, first add 7 zero pairs to the mat. • Remove 7 negative counters. There are 11 positive counters remaining on the mat. • $4 - (-7) = 11$

EXAMPLES

A Find $-3 - (-4)$.

Begin with 3 negative counters. Add a zero pair to the mat, then remove 4 negative counters. There is 1 positive counter remaining.

$-3 - (-4) = 1$

B Find $6 - 8$.

Start at zero on the number line and go to 6. From there go 8 in the negative direction (left). You end at -2.

$6 - 8 = -2$

Try These Together

1. Find $6 - (-9)$.

HINT: Begin with 6 positive counters, then add 9 zero pairs.

2. Find $-9 - 3$.

HINT: Start at zero and go 9 in the negative direction. From there, go 3 more in the negative direction.

PRACTICE

Subtract. Use counters or a number line.

3. $4 - 2$ **4.** $3 - 5$ **5.** $4 - 7$ **6.** $5 - 1$

7. $4 - (-5)$ **8.** $-3 - (-3)$ **9.** $6 - 9$ **10.** $-10 - 5$

11. $-7 - (-2)$ **12.** $14 - (-1)$ **13.** $8 - (-3)$ **14.** $-9 - 4$

15. Find $-3 + 2 - (-6)$.

16. Find the value of $x - y$ if $x = -7$ and $y = 3$.

17. Landscaping Charlie is a landscaper. He planted a row of flowers 2 feet back from the street. He then planted a row of bushes 4 feet behind the flowers. What negative integer represents how far back from the street the row of bushes is?

18. **Standardized Test Practice** What is the difference $-15 - (-5)$?

A -10 **B** -20 **C** 10 **D** 20

Answers: **1.** 15 **2.** −12 **3.** 2 **4.** −2 **5.** −3 **6.** 4 **7.** 9 **8.** 0 **9.** −3 **10.** −15 **11.** −5 **12.** 15 **13.** 11 **14.** −13 **15.** 5 **16.** −10 **17.** −6 **18.** A

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8-4 Multiplying Integers (pages 310–313)

Remember that multiplication is repeated addition. You can multiply integers by using counters or by using a number line to show repeated addition.

Multiplying Integers	$4 \times (-3)$ means to put 4 sets of 3 negative counters on a mat. Then count the counters. There are 12 negative counters, so $4 \times (-3) = -12$. $-4 \times (-3)$ means to remove 4 sets of 3 negative counters. To be able to do this, you must first place 4 sets of 3 zero pairs on the mat. Then remove the 4 sets of 3 negative counters. There are 12 positive counters remaining on the mat, so $-4 \times (-3) = 12$.

EXAMPLES

A Find -3×5.

-3×5 means to remove 3 sets of 5 positive counters. Begin with 3 sets of 5 zero pairs on a mat. Then remove the 3 sets of 5 positive counters. There are 15 negative counters remaining, so $-3 \times 5 = -15$.

B Find $2(-11)$.

You can also use a number line. Begin at zero. Move 11 units to the left, then 11 more units to the left. You end at -22, so $2(-11) = -22$.

Try These Together

1. What is the product of -4 and -8?

HINT: Begin with 4 sets of 8 zero pairs. Then remove the 4 sets of 8 negative counters.

2. Find the product of 6 and -2.

HINT: Begin at zero on a number line. Move 2 units to the left 6 times.

PRACTICE

Multiply.

3. $1 \times (-1)$ **4.** 5×4 **5.** $-3 \times (-3)$ **6.** -6×2

7. $8 \times (-4)$ **8.** $-3 \times (-7)$ **9.** $5 \times (-3)$ **10.** -1×9

11. $-6(-4)$ **12.** $-10(-3)$ **13.** $7(-5)$ **14.** $8(-9)$

15. Solve $12(-3) = a$.

16. What is the product of -8 and -2?

17. **Time** In winter, the days get shorter until December 21st. If each day is 2 minutes shorter than the day before, how many minutes will be lost in 5 days?

18. **Standardized Test Practice** Find the product of -7 and -4.

A 3 **B** -11 **C** 28 **D** -21

Answers: **1.** 32 **2.** −12 **3.** −1 **4.** 20 **5.** 9 **6.** −12 **7.** −32 **8.** 21 **9.** −15 **10.** −9 **11.** 24 **12.** 30 **13.** −35 **14.** −72 **15.** −36 **16.** 16 **17.** 10 minutes **18.** C

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8-5 Dividing Integers (pages 316–319)

You can model dividing integers with counters or you can use a pattern.

Dividing Integers	• When you divide two positive integers, or two negative integers, the quotient is positive. • When you divide a negative integer and a positive integer, the quotient is negative.

EXAMPLES

A Find $-15 \div (-3)$.

The signs are the same. The quotient is positive.

$-15 \div (-3) = 5$

B Find $6 \div (-2)$.

The signs are different. The quotient is negative.

$6 \div (-2) = -3$

Try These Together

1. Find $-12 \div 3$.

HINT: If you divide 12 negative counters into 3 groups, how many negative counters are in each group?

2. Find $-20 \div (-5)$.

HINT: Do the two integers have the same sign or different signs?

PRACTICE

Divide.

3. $8 \div 2$

4. $6 \div (-3)$

5. $-2 \div 1$

6. $10 \div 5$

7. $14 \div (-7)$

8. $-12 \div (-3)$

9. $24 \div (-6)$

10. $-1 \div (-1)$

11. $-16 \div 4$

12. $-9 \div (-3)$

13. $4 \div 2$

14. $-5 \div (-1)$

15. Find the value of $-32 \div -16$.

16. Divide 42 by -7.

17. Stock Market Mr. Jimenez lost $320 in 4 days in the stock market. How much money did he lose each day?

18. Plumbing The Chens' kitchen faucet has a leak. It drips 3 quarts of water every day. How many quarts of water does it drip in one week?

19. **Standardized Test Practice** What is -81 divided by 9?

A -8 **B** 8 **C** -9 **D** 9

Answers: **1.** −4 **2.** 4 **3.** 4 **4.** −2 **5.** −2 **6.** 2 **7.** −2 **8.** 4 **9.** −4 **10.** 1 **11.** −4 **12.** 3 **13.** 2 **14.** 5 **15.** 2 **16.** −6 **17.** $80 **18.** 21 quarts **19.** C

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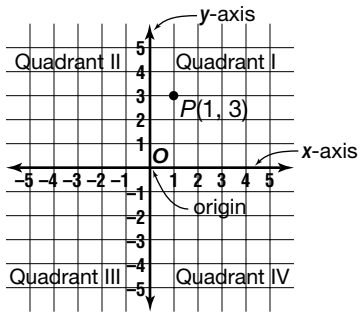
8-6 The Coordinate Plane (pages 320–323)

A **coordinate plane** consists of a horizontal line (called the ***x*-axis**) and a vertical line (called the ***y*-axis**) that intersect at the **origin**.



- The *x*-axis and the *y*-axis divide the plane into four **quadrants**.
- You can name point *P* with an **ordered pair** of numbers. The order makes a difference. The pair (1,3) is not the same as (3,1).
- The first number in the pair tells you how far to move to the right or left of the origin. It is called the *x*-coordinate.
- The second number in the pair tells you how far to move up or down from the *x*-axis. It is called the *y*-coordinate.

EXAMPLES

A Give the ordered pair for the point which is 2 units to the right of the origin and 3 units down.

Show movements to the right and up with positive integers and movements to the left and down with negative integers. This ordered pair is (2, −3).

B What is the ordered pair for the point 4 units to the left of the origin and 5 units up?

Since you move to the left, the x-coordinate is negative. This ordered pair is (−4, 5).

Try These Together

1. What are the coordinates of the origin?

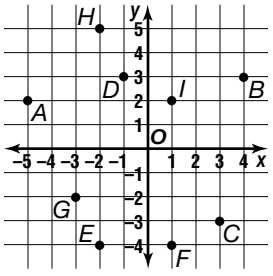
HINT: How much will you move from zero?

2. What is true of all points in Quadrant III?

HINT: Which ways do you move from the origin to get to a point in Quadrant III?

PRACTICE

Write the ordered pair that names each point.



3. *D*

4. *A*

5. *I*

6. *C*

7. *G*

8. *H*

9. *B*

10. *F*

11. *E*

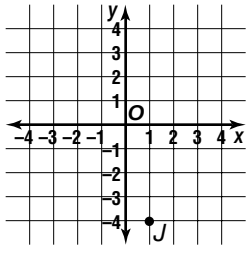
12. **Standardized Test Practice** In which quadrant is Point *J* located?

A Quadrant I

B Quadrant II

C Quadrant III

D Quadrant IV



Answers: **1.** (0, 0) **2.** Both the coordinates are negative. **3.** (−1, 3) **4.** (−5, 2) **5.** (1, 2) **6.** (3, −3) **7.** (−3, −2) **8.** (−2, 5) **9.** (4, 3) **10.** (1, −4) **11.** (−2, −4) **12.** D

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8

Chapter 8 Review

Up-and-Down Scavenger Hunt

You've entered a haunted house with your friends. The only way you can get out is to find the key to give to the doorkeeper. The key is located under a board on one of the steps on the staircase. You must use your knowledge of integers to find the step where the key is located. All positive integers indicate the number of steps you go up, and negative integers indicate the number of steps you go down.

1. Starting at the bottom of the staircase, go up 5 steps. Then go -3 steps. On which step are you located?

2. From your present location, go to the step that is 3 times the value of your current step. On which step are you now?

3. Subtract -11 steps from your location and go to the corresponding step. Where are you now?

4. First go up one step and then divide the step you are on by -3 to find the number of steps you take next. On which step did you end up?

5. Add -8 steps to your present location and go to the corresponding step. Then multiply the step you are on by 4. The product is the step under which the key is hidden. Which step is it?

Answers are located on p. 106.