

2-2

Adding Integers (Pages 64–68)

You already know that the sum of two positive integers is a positive integer. The rules below will help you find the sign of the sum of two negative integers and the sign of the sum of a positive and a negative integer.

Adding Integers with the Same Sign	To add integers with the same sign, add their absolute values. Give the result the same sign as the integers.
Adding Integers with Different Signs	To add integers with different signs, subtract their absolute values. Give the result the same sign as the integer with the greater absolute value.

Examples

a. Solve $g = -2 + (-10)$.

Add the absolute values. Give the result the same sign as the integers.

$$g = -(|-2| + |-10|)$$

$$g = -(2 + 10) \text{ or } -12$$

b. Solve $n = -7 + 2$.

Subtract the absolute values. The result is negative because $|-7| > |2|$.

$$n = -(|-7| - |2|)$$

$$n = -(7 - 2) \text{ or } -5$$

Practice

Solve each equation.

1. $y = 7 + (-14)$

2. $b = -12 + 4$

3. $16 + (-4) = z$

4. $a = 6 + (-15)$

5. $c = 16 + (-15)$

6. $-12 + 31 = q$

7. $-3 + 8 = m$

8. $-4 + 13 = s$

9. $t = (-13) + 7$

10. $-7 + 8 = b$

11. $d = 10 + (-19)$

12. $f = -3 + 17$

Write an addition sentence for each situation. Then find the sum.

13. A hot air balloon is 750 feet high. It descends 325 feet.

14. Cameron owes \$800 on his credit card and \$750 on his rent.

Solve each equation.

15. $y = 4 + (-10) + (-2)$

16. $-2 + 4 + (-6) = x$

Simplify each expression.

17. $8x + (-12x)$

18. $-5m + 9m$

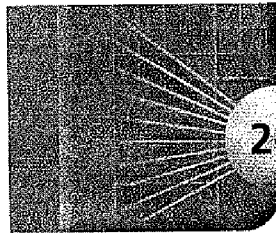
19. **Standardized Test Practice** In the high deserts of New Mexico, the morning temperature averages -2°C in the spring. During a spring day, the temperature increases by an average of 27°C . What is the average high temperature during the spring?

A 29°C

B 25°C

C -25°C

D -29°C

**Subtracting Integers** (Pages 70–74)

Adding and subtracting are inverse operations that “undo” each other. Similarly, when you add opposites, like 4 and -4 , they “undo” each other because the sum is zero. An integer and its opposite are called **additive inverses** of each other.

Additive Inverse Property	The sum of an integer and its additive inverse is zero. $5 + (-5) = 0$ or $a + (-a) = 0$
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Use the following rule to subtract integers.

Subtracting Integers	To subtract an integer, add its additive inverse. $3 - 5 = 3 + (-5)$ or $a - b = a + (-b)$
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Examples

a. Solve $s = -4 - 5$.

$$\begin{aligned} s &= -4 - 5 \\ s &= -4 + (-5) \quad \text{Add the opposite of 5, or } -5. \\ s &= -9 \end{aligned}$$

b. Solve $w = 12 - (-6)$.

$$\begin{aligned} w &= 12 - (-6) \\ w &= 12 + 6 \quad \text{Add the opposite of } -6, \text{ or } 6. \\ w &= 18 \end{aligned}$$

Practice

Solve each equation.

- | | | |
|---------------------|----------------------|--------------------|
| 1. $x = -3 - 4$ | 2. $a = -7 - 6$ | 3. $-18 - 4 = k$ |
| 4. $-24 - 7 = b$ | 5. $-5 - 12 = c$ | 6. $-18 - 7 = m$ |
| 7. $j = 32 - 8$ | 8. $r = 8 - (-4)$ | 9. $22 - (-3) = z$ |
| 10. $-9 - (-6) = d$ | 11. $-17 - (-6) = g$ | 12. $h = 4 - 10$ |

Evaluate each expression.

- | | |
|------------------------------|----------------------------|
| 13. $n - (-11)$, if $n = 4$ | 14. $18 - k$, if $k = 5$ |
| 15. $9 - (-g)$, if $g = 9$ | 16. $-11 - k$, if $k = 5$ |

Simplify each expression.

- | | | | |
|---------------|----------------|----------------|--------------------|
| 17. $-x - 7x$ | 18. $8m - 18m$ | 19. $-2a - 7a$ | 20. $9xy - (-8xy)$ |
|---------------|----------------|----------------|--------------------|
21. Is the statement $n = -(-n)$ true or false?

22. **Standardized Test Practice** The elevation of Death Valley, California, is 282 feet below sea level, or -282 feet. To travel from Death Valley to Beatty, Nevada, you must travel over a mountain pass, Daylight Pass, that has an elevation of 4317 feet above sea level. What is the change in elevation from Death Valley to Daylight Pass?

- A 4599 ft B 4035 ft C -4035 ft D -4599 ft

2-4

Multiplying Integers (Pages 75–79)

Use the following rules for multiplying integers.

Multiplying Integers with Different Signs	The product of two integers with different signs is negative.
Multiplying Integers with the Same Signs	The product of two integers with the same sign is positive.

Examples Find the products.

a. $13 \cdot (-12)$

The two integers have different signs. Their product is negative.

$$13 \cdot (-12) = -156$$

b. $(-15)(-8)$

The two integers have the same sign. Their product is positive.

$$(-15)(-8) = 120$$

Try These Together

Solve each equation.

1. $y = 8(-12)$

2. $s = -6(9)$

3. $z = (15)(2)$

HINT: Remember, if the factors have the same sign, the product is positive. If the factors have different signs, the product is negative.

Practice

Solve each equation.

4. $-4 \cdot 3 = z$

5. $c = 7(-5)$

6. $d = (-10)(2)$

7. $b = (4)(7)$

8. $t = -6(-2)$

9. $f = (13)(-2)$

10. $g = -10(2)(-3)$

11. $-6(-7)(-2) = a$

12. $14(4)(-1) = h$

Evaluate each expression.

13. $4y$, if $y = -7$

14. gh , if $g = 7$ and $h = -3$

15. $6t$, if $t = 8$

16. $-8d$, if $d = -4$

17. $9xy$, if $x = 2$ and $y = -1$

18. $-3x$, if $x = -13$

Find each product.

19. $7(6x)$

20. $-3gh(-2)$

21. $-14(3d)$

22. $-8x(-2y)$

23. $5n(-7)$

24. $-7(7)(-n)$

25. **Standardized Test Practice** The price of a share of stock changed by $-\$3$ each day for 5 days. What was the overall change in the price of a share of the stock for the 5-day period?

A \$15

B \$8

C $-\$8$

D $-\$15$

2-5

Dividing Integers (Pages 80–84)

The rules for dividing integers are similar to the rules for multiplying integers.

Dividing Integers with Different Signs	The quotient of two integers with different signs is negative.
Dividing Integers with the Same Signs	The quotient of two integers with the same sign is positive.

Examples Divide.

a. $72 \div (-24)$

The two integers have different signs.

Their quotient is negative.

$$72 \div (-24) = -3$$

b. $(-65) \div (-5)$

The two integers have the same sign.

Their quotient is positive.

$$(-65) \div (-5) = 13$$

Practice**Divide.**

1. $-48 \div 6$

2. $\frac{35}{-7}$

3. $-42 \div -6$

4. $-81 \div 9$

5. $-126 \div (-6)$

6. $36 \div (-3)$

7. $63 \div 9$

8. $-72 \div -9$

9. Divide -48 by 8 .

10. Find the quotient of 110 and -11 .

Solve each equation.

11. $t = 72 \div -6$

12. $-84 \div 6 = p$

13. $-40 \div (-8) = f$

14. $u = -36 \div (-4)$

15. $128 \div 16 = a$

16. $s = -51 \div (-17)$

Evaluate each expression.

17. $a \div 11$ if $a = -143$

18. $-54 \div (-c)$ if $c = 9$

19. $h \div 12$ if $h = 84$

20. $n \div (-12)$ if $n = -168$

21. $-80 \div k$ if $k = 5$

22. $h \div 7$ if $h = 91$

23. **Weather** The temperature change at a weather station was -28°F in just a few hours. The average hourly change was -4°F . Over how many hours did the temperature drop occur?

24. **Standardized Test Practice** Eduardo used money from his savings account to pay back a loan. The change in his balance was $-\$144$ over the period of the loan. What was the monthly change in his balance if he paid back the loan in 3 equal monthly payments?

A $-\$432$

B $-\$48$

C $\$48$

D $\$432$

3-5 Solving Two-Step Equations (Pages 120–124)

To solve an equation with more than one operation, use the work backward strategy and undo each operation. This means you will follow the order of operations in *reverse* order.

Examples Solve each equation. Check your solution.

a. $4a + 12 = 40$

$4a + 12 - 12 = 40 - 12$ Subtract to undo the addition.

$\frac{4a}{4} = \frac{28}{4}$ Divide to undo the multiplication.

$a = 7$

Does $4(7) + 12 = 40$?

$28 + 12 = 40$

$40 = 40$

True

The solution is 7.

b. $\frac{g}{5} - 8 = 7$

$\frac{g}{5} - 8 + 8 = 7 + 8$ Add to undo the subtraction.

$\frac{g}{5} = 15$

$\frac{g}{5} \cdot 5 = 15 \cdot 5$ Multiply to undo the division.

$g = 75$

Does $\frac{75}{5} - 8 = 7$?

$15 - 8 = 7$ Do the division first.

$7 = 7$ True

The solution is 75.

Try These Together

Solve each equation. Check your solution.

1. $55 = 4x + 5$

2. $3y - 6 = 3$

3. $4 - 4b = -8$

HINT: Work backward to undo each operation until the variable is alone on one side of the equation.

Practice

Solve each equation. Check your solution.

4. $-5 - 2t = 15$

5. $-4y + 2 = 7$

6. $1.5 = 0.3 + 4y$

7. $14 = 3 + \frac{a}{2}$

8. $-\frac{3x}{7} = 21$

9. $\frac{2}{3}n - 3 = 8$

10. $\frac{q - 15}{5} = 4$

11. $\frac{6 - x}{4} = -6$

12. $8 = \frac{n + 5}{6}$

13. $\frac{b}{-3} - 8 = -12$

14. $\frac{5 + x}{-12} = -4$

15. $\frac{-x - (-3)}{7} = 15$

16. **Consumerism** Carlos bought 5 boxes of floppy disks for his computer. He also bought a paper punch. The paper punch cost \$12. The boxes of floppy disks were all the same price. If the total cost before tax was \$27, how much did each box of floppy disks cost?

17. **Standardized Test Practice** Solve the equation $\frac{-4 - 2x}{9} = 12$.

A -56

B 56

C 112

D 108

3-7

Using Formulas (Pages 131–136)

Formulas can help you solve many different types of problems. A **formula** shows the relationship among certain quantities. For example, to find the number of miles per gallon that a car gets, you can use the following formula: miles driven (m) divided by gallons of gas used (g) equals miles per gallon (mpg), or $m \div g = \text{mpg}$.

Example

Fred bought a sport utility vehicle (SUV), but now he is concerned about the amount of gas it is using. If Fred needs to refill the 25-gallon tank after driving 350 miles, what gas mileage is his SUV getting?

$$m \div g = \text{mpg} \quad \text{Use the formula.}$$

$$350 \div 25 = \text{mpg} \quad \text{Replace } m \text{ with } 350 \text{ and } g \text{ with } 25.$$

$$350 \div 25 = 14 \text{ mpg} \quad \text{Fred's SUV only gets 14 miles per gallon.}$$

Practice

Solve by replacing the variables in each formula with the given values.

- $A = \ell w$, if $\ell = 12$ and $w = 9$
- $S = (n - 2)180$, if $n = 4$
- $I = \frac{1}{20}pt$, if $p = 500$ and $t = 2$
- $A = \frac{bh}{2}$, if $b = 7$ and $h = 10$
- $d = 50t$, if $d = 350$
- $P = 2\ell + 2w$, if $P = 40$ and $\ell = 6$
- $C = \frac{5}{9}(F - 32)$, if $F = 32$
- $S = \frac{n(n + 1)}{2}$, if $n = 12$
- Physics** The density d of a substance is given by the formula $d = \frac{m}{v}$, where m is the mass of a sample of the substance and v is the volume of the sample. Solve $d = \frac{m}{v}$ if $m = 14$ and $v = 2$.
- Food** The formula for the circumference of a circle is $C = 2\pi r$, where r is the radius of the circle and π is a constant that is about 3.14. If a pizza has a radius of 8 inches, what is the circumference of the pizza? Round your answer to the nearest inch.
- Standardized Test Practice** A train leaves Station A at 11:12 A.M. and arrives at Station B at 2:42 P.M. The train travels at a speed of 80 miles per hour. How many miles does the train travel?
A 216 mi **B** 280 mi **C** 200 mi **D** 680 mi

5-1

Writing Fractions as Decimals (Pages 200–204)

To change a fraction to an **equivalent decimal**, divide the numerator by the denominator. If the division comes to an end (that is, gives a remainder of zero), the decimal is a *terminating* decimal. If the division never ends (that is, never gives a zero remainder), the decimal is a *repeating* decimal. For example, $\frac{1}{8}$ gives the terminating decimal 0.125, and $\frac{5}{6}$ gives the repeating decimal 0.8333..., which is written $0.8\bar{3}$. The bar over the 3 indicates that the 3 repeats forever. You can use a calculator to change a fraction to a decimal.

Examples

a. Write $2\frac{2}{5}$ as a decimal.

Method 1: Use paper and pencil.

$$2\frac{2}{5} = 2 + \frac{2}{5} \qquad \begin{array}{r} .4 \\ 5 \overline{)2.0} \\ \underline{-20} \\ 0 \end{array}$$

So $2 + 0.4 = 2.4$.

Method 2: Use a calculator.

Enter 2 $\boxed{+}$ 2 $\boxed{\div}$ 5 $\boxed{=}$. Result: 2.4.

Make sure your calculator follows the order of operations.

b. Replace \odot with $<$, $>$, or $=$: $\frac{2}{3} \odot \frac{3}{4}$.

Method 1: Rewrite as decimals.

$$\frac{2}{3} = 0.\bar{6} \qquad \frac{3}{4} = 0.75$$

$$0.6 < 0.75$$

Method 2: Write equivalent fractions with like denominators.

The LCM is 12.

$$\frac{2}{3} = \frac{8}{12} \text{ and } \frac{3}{4} = \frac{9}{12}$$

$$\frac{8}{12} < \frac{9}{12}, \text{ so } \frac{2}{3} < \frac{3}{4}.$$

Try These Together
Write each fraction as a decimal. Use a bar to show a repeating decimal.

1. $\frac{4}{10}$ 2. $\frac{7}{9}$ 3. $-\frac{1}{2}$ 4. $5\frac{7}{16}$

Practice

Write each fraction as a decimal. Use a bar to show a repeating decimal.

5. $-\frac{3}{4}$

6. $4\frac{16}{20}$

7. $\frac{3}{9}$

8. $\frac{18}{25}$

Replace each \odot with $>$, $<$, or $=$ to make a true sentence.

9. $\frac{7}{8} \odot \frac{5}{9}$

10. $-2\frac{2}{5} \odot -2\frac{1}{4}$

11. $\frac{7}{12} \odot \frac{21}{36}$

12. **Standardized Test Practice** An airplane flies at about 600 miles per hour. At some point during its landing, it drops to about $\frac{2}{9}$ of this speed.

Write this fraction as a decimal.

A 0.60

B 0.50

C 0.40

D $0.\bar{2}$

