

## Fractions, Decimals, and Percents

To express a percent as a decimal, divide by 100 and write as a decimal.

**Examples** Express each percent as a fraction and as a decimal.

**1** 56%

$$56\% = \frac{56}{100} \text{ or } \frac{14}{25}$$

$$56\% = 0.56$$

**2** 3.4%

$$3.4\% = \frac{3.4}{100} \text{ or } \frac{17}{500}$$

$$3.4\% = 0.034$$

To express a decimal as a percent, first write the decimal as a fraction with a denominator of 100. Then write the fraction as a percent.

**Examples** Express each decimal as a percent.

**3** 0.3

$$\begin{aligned} 0.3 &= \frac{3}{10} \\ &= 30\% \end{aligned}$$

**4** 0.17

$$\begin{aligned} 0.17 &= \frac{17}{100} \\ &= 17\% \end{aligned}$$

To express a fraction as a percent, you can use a proportion.

**Examples** Express each fraction as a percent.

**5**  $\frac{7}{20}$

$$\begin{aligned} \frac{7}{20} &= \frac{n}{100} \\ 20 \times n &= 7 \times 100 \\ 20n &= 700 \\ n &= 35 \end{aligned}$$

**6**  $\frac{5}{12}$

$$\begin{aligned} \frac{5}{12} &= \frac{n}{100} \\ 12 \times n &= 5 \times 100 \\ 12n &= 500 \\ n &\approx 41.7 \end{aligned}$$

**Express each percent as a decimal.**

1. 45%

2. 91%

3. 24.5%

4. 8.37%

**Express each decimal as a percent.**

5. 0.13

6. 0.06

7. 0.765

8. 0.0122

**Express each fraction as a percent.**

9.  $\frac{11}{50}$

10.  $\frac{13}{20}$

11.  $\frac{1}{8}$

12.  $\frac{433}{1,000}$

## Multiplying Decimals

Multiply decimals just like you multiply whole numbers. The number of decimal places in the product is equal to the sum of the number of decimal places in the factors.

**Example**     **Multiply 0.038 and 0.17.**

$$\begin{array}{r} 0.038 \quad \leftarrow \text{three decimal places} \\ \times 0.17 \quad \leftarrow \text{two decimal places} \\ \hline 266 \\ \underline{38} \\ 0.00646 \quad \leftarrow \text{five decimal places} \end{array}$$

The product is 0.00646.

**Multiply.**

1. 
$$\begin{array}{r} 0.8 \\ \times 7 \\ \hline \end{array}$$

2. 
$$\begin{array}{r} 0.04 \\ \times 0.3 \\ \hline \end{array}$$

3. 
$$\begin{array}{r} 0.16 \\ \times 26 \\ \hline \end{array}$$

4. 
$$\begin{array}{r} 0.003 \\ \times 4.2 \\ \hline \end{array}$$

5.  $12.2 \times 0.06$

6.  $0.0015 \times 0.15$

7.  $1.9 \times 2.2$

## Dividing Decimals

To divide by a decimal, change the divisor to a whole number.

**Example** Find  $0.5194 \div 0.49$ .

$$\begin{array}{r} 1.06 \\ 0.49 \overline{)0.51.94} \\ \underline{49} \phantom{00} \\ 294 \\ \underline{294} \\ 0 \end{array}$$

*Change 0.49 to 49.*

*Move the decimal point two places to the right.*

*Move the decimal point in the dividend the same number of places to the right.*

*Divide as with whole numbers.*

**Without finding or changing each quotient, change each problem so that the divisor is a whole number.**

1.  $3.4 \div 1.1$

2.  $76.44 \div 0.006$

3.  $0.56 \div 0.4$

4.  $89.45 \div 0.908$

5.  $5.675 \div 6.8$

6.  $0.00864 \div 0.012$

**Divide.**

7.  $0.9 \overline{)6.3}$

8.  $0.6 \overline{)0.540}$

9.  $0.3 \overline{)129}$

# Decimals and Fractions

To express a fraction as a decimal, divide the numerator of the fraction by the denominator.

**Example 1** Express  $\frac{3}{8}$  as a decimal.

$$\begin{array}{r} 0.375 \\ 8 \overline{)3.000} \end{array} \quad \frac{3}{8} = 0.375$$

A decimal like 0.375 is a terminating decimal. The decimal equivalents for some fractions are repeating decimals rather than terminating decimals. Use a bar to indicate the digits that repeat.

**Examples 2** Express  $\frac{5}{12}$  as a decimal.

$$\begin{array}{r} 0.41666 \\ 12 \overline{)5.00000} \end{array} = 0.41\overline{6}$$

**3** Express  $\frac{13}{33}$  as a decimal.

$$\begin{array}{r} 0.393939 \dots \\ 33 \overline{)13.000000} \end{array} = 0.\overline{39}$$

**4** Express  $5\frac{2}{5}$  as a decimal.

$$\begin{array}{r} 0.4 \\ 5 \overline{)2.0} \end{array} = 0.4 \quad 5\frac{2}{5} = 5.4$$

**Express each fraction or mixed number as a decimal. If the decimal is a repeating decimal, use bar notation.**

1.  $\frac{7}{20}$

2.  $\frac{7}{10}$

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

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

5.  $\frac{9}{50}$

6.  $\frac{1}{99}$

7.  $\frac{7}{11}$

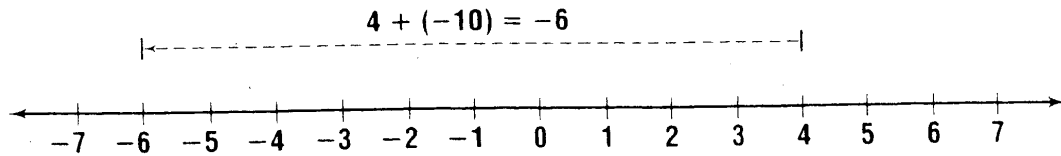
8.  $\frac{1}{2}$

## Adding Integers

You can use a number line to add integers. Locate the first addend on the number line. Move right if the second addend is positive. Move left if the second addend is negative.

**Example 1** Solve  $d = 4 + (-10)$ .

Start at 4. Since  $-10$  is negative, move left 10 units.



So,  $d = -6$ .

When you add integers, remember the following.

The sum of two positive integers is positive.

The sum of two negative integers is negative.

The sum of a positive integer and a negative integer is positive if the positive integer has the greater absolute value and negative if the negative integer has the greater absolute value.

**Examples 2** Solve  $t = 24 + (-13)$ .

$|24| > |-13|$ , so the sum is positive.

The difference of 24 and 13 is 11, so  $t = 11$ .

**3** Solve  $-17 + 16 = m$ .

$|-17| > |16|$ , so the sum is negative.

The difference of 17 and 16 is 1, so  $m = -1$ .

**Solve each equation.**

1.  $h = 15 + (-10)$

2.  $-20 + (-9) = g$

3.  $s = -9 + 39$

4.  $-50 + 20 = p$

5.  $y = -11 + (-19)$

6.  $z = 12 + 15$

7.  $500 + (-250) = w$

8.  $e = 48 + (-8)$

9.  $-80 + (-20) = v$

10.  $t = -109 + 49$

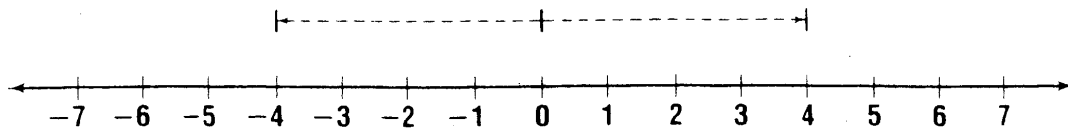
11.  $544 + 206 = b$

12.  $4 + (-16) = d$

## Subtracting Integers

An integer and its **opposite** are the same distance from 0 on a number line.

4 and  $-4$  are opposites.



The sum of an integer and its opposite is 0.  $-4 + 4 = 0$

To subtract an integer, add its opposite.

**Examples** 1 Solve  $4 - 8 = y$ .

$$\begin{aligned}4 - 8 &= y && \text{To subtract 8,} \\4 + (-8) &= y && \text{add -8.} \\-4 &= y\end{aligned}$$

2 Solve  $4 - (-4) = x$ .

$$\begin{aligned}4 - (-4) &= x && \text{To subtract -4,} \\4 + 4 &= x && \text{add 4.} \\8 &= x\end{aligned}$$

**Solve each equation.**

- $b = 16 - (-3)$
- $n = -8 - 25$
- $w = -11 - (-6)$
- $-19 - (-3) = h$
- $65 - (-45) = k$
- $-19 - 20 = c$
- $s = 100 - (-72)$
- $z = -44 - (-33)$
- $d = 89 - 17$
- $-80 - (-35) = p$
- $98 - (-90) = f$
- $-75 - 23 = g$

# Multiplying Integers

The product of two positive integers is positive.

<b>Examples</b>	$k = 4(9)$	$m = 6(7)(2)$	$j = 5(3)(5)$
	$k = 36$	$m = 42(2)$	$j = 15(5)$
		$m = 84$	$j = 75$

The product of two negative integers is positive.

<b>Examples</b>	$h = (-7)(-5)$	$v = (-9)^2$	$z = (-25)(-7)$
	$h = 35$	$v = -9(-9)$	$z = 175$
		$v = 81$	

The product of a positive integer and a negative integer is negative.

<b>Examples</b>	$c = (-20)(8)$	$g = (70)(-3)(2)$	$y = (-6)(5)^2$
	$c = -160$	$g = -210(2)$	$y = (-6)25$
		$g = -420$	$y = -150$

**Solve each equation.**

- |                    |                     |                               |
|--------------------|---------------------|-------------------------------|
| 1. $z = 8(9)$      | 2. $t = -4(8)$      | 3. $b = 4(-5)$                |
| 4. $-5(-5) = h$    | 5. $-40(6) = n$     | 6. $20(-9) = y$               |
| 7. $2(-5)(-8) = h$ | 8. $g = -6(-3)(-2)$ | 9. $w = -5(10)(-4)$           |
| 10. $t = (-20)^2$  | 11. $-10(9)^2 = p$  | 12. $r = (5)^2 \cdot (-10)^2$ |

## Dividing Integers

If two integers have the same sign, their quotient is positive.

**Examples**  $m = 420 \div 7$       *The signs are the same.*  
 $m = 60$       *The quotient is positive.*

$d = 290 \div 29$       *The signs are the same.*  
 $d = 10$       *The quotient is positive.*

If two integers have different signs, their quotient is negative.

**Examples**  $f = -25 \div 5$       *The signs are different.*  
 $f = -5$       *The quotient is negative.*

$a = \frac{20}{-4}$       *The signs are different.*  
 $a = -5$       *The quotient is negative.*

**Solve each equation.**

1.  $81 \div -9 = c$

2.  $r = \frac{-72}{8}$

3.  $b = 680 \div 4$

4.  $-325 \div (-5) = p$

5.  $-700 \div 35 = y$

6.  $t = -560 \div (-80)$



## Adding and Subtracting Unlike Fractions

To add or subtract fractions or mixed numbers with unlike denominators, rename the fractions with a common denominator. Then add or subtract.

**Examples 1** Solve  $a = -\frac{5}{8} + \left(-\frac{3}{4}\right)$ . The least common denominator of 8 and 4 is 8.

$$a = -\frac{5}{8} + \left(-\frac{6}{8}\right) \quad \text{Rename } -\frac{3}{4} \text{ as } -\frac{6}{8}.$$

$$a = -\frac{11}{8} \quad \text{Add.}$$

$$a = -1\frac{3}{8} \quad \text{Rename the improper fraction as a mixed number.}$$

**2** Solve  $c = -2\frac{3}{5} - 1\frac{1}{2}$ . The least common denominator of 5 and 2 is 10.

$$c = -2\frac{6}{10} - 1\frac{5}{10} \quad \text{Rename } \frac{3}{5} \text{ as } \frac{6}{10}. \text{ Rename } \frac{1}{2} \text{ as } \frac{5}{10}.$$

$$c = -3\frac{11}{10} \quad \text{Subtract.}$$

$$c = -4\frac{1}{10} \quad \text{Rename } \frac{11}{10} \text{ as } 1\frac{1}{10}.$$

**3** Solve  $r = 5\frac{1}{4} - 2\frac{2}{3}$ . The least common denominator of 4 and 3 is 12.

$$r = 5\frac{3}{12} - 2\frac{8}{12} \quad \text{Rename } \frac{1}{4} \text{ as } \frac{3}{12}. \text{ Rename } \frac{2}{3} \text{ as } \frac{8}{12}.$$

$$r = 4\frac{15}{12} - 2\frac{8}{12} \quad \text{Rename } 5\frac{3}{12} \text{ as } 4\frac{15}{12}.$$

$$r = 2\frac{7}{12} \quad \text{Subtract.}$$

**Solve each equation. Write the solution in simplest form.**

1.  $n = \frac{3}{4} + \frac{1}{3}$

2.  $\frac{7}{8} - \frac{2}{3} = k$

3.  $-\frac{11}{12} - \frac{1}{2} = y$

4.  $1\frac{1}{2} + \left(-1\frac{1}{5}\right) = v$

5.  $x = -3\frac{2}{3} + \left(-1\frac{1}{6}\right)$

6.  $m = 10\frac{11}{12} + 9\frac{3}{8}$

7.  $p = 7\frac{1}{3} - \left(-2\frac{5}{9}\right)$

8.  $-\frac{15}{16} - \frac{3}{8} = f$

9.  $3\frac{4}{5} - \left(-5\frac{1}{2}\right) = c$

# Multiplying Fractions

To multiply fractions, multiply the numerators and multiply the denominators. Use the rules for multiplying integers when you multiply negative fractions.

**Example 1** Solve  $k = -\frac{4}{7} \times \frac{5}{9}$ .

$$k = -\frac{4 \times 5}{7 \times 9}$$

*Multiply the numerators.  
Multiply the denominators.*

$$k = -\frac{20}{63}$$

*The product of two rational numbers with different signs is negative.*

**Example 2** Solve  $n = 3\frac{1}{3} \times 2\frac{1}{5}$ .

$$n = \frac{\overset{2}{\cancel{10}}}{3} \times \frac{\overset{11}{\cancel{5}}}{5}$$

*Rename  $3\frac{1}{3}$  as  $\frac{10}{3}$ . Rename  $2\frac{1}{5}$  as  $\frac{11}{5}$ .  
The GCF of 10 and 5 is 5. Divide 10 and 5 by 5.*

$$n = \frac{2 \times 11}{3 \times 1} = \frac{22}{3}$$

*Multiply the numerators.  
Multiply the denominators.*

$$n = 7\frac{1}{3}$$

*Simplify.*

**Solve each equation. Write the solution in simplest form.**

1.  $k = \frac{2}{3} \times \frac{3}{5}$

2.  $-\frac{1}{2} \times \frac{7}{9} = m$

3.  $-\frac{4}{7} \times \left(-\frac{7}{8}\right) = n$

4.  $1\frac{1}{2} \times 1\frac{2}{3} = v$

5.  $x = -2\frac{1}{4} \times \frac{2}{9}$

6.  $r = -8 \times \left(-\frac{3}{4}\right)$

## Dividing Fractions

To divide by a fraction, multiply by its multiplicative inverse. Use the rules for dividing integers when you divide negative fractions.

**Examples 1** Solve  $m = 24 \div \frac{3}{4}$ .

$$m = \frac{24}{1} \div \frac{3}{4}$$

Rename 24 as  $\frac{24}{1}$ .

$$m = \frac{24}{1} \times \frac{4}{3}$$

Multiply by  $\frac{4}{3}$ , the multiplicative inverse of  $\frac{3}{4}$ .

$$m = 32$$

**2** Solve  $p = -2\frac{1}{3} \div \frac{5}{6}$ .

$$p = -\frac{7}{3} \div \frac{5}{6}$$

Rename  $-2\frac{1}{3}$  as  $-\frac{7}{3}$ .

$$p = -\frac{7}{3} \times \frac{6}{5}$$

Multiply by  $\frac{6}{5}$ , the multiplicative inverse of  $\frac{5}{6}$ .

$$p = -\frac{14}{5}$$

The product of a negative number and a positive number is negative.

$$p = -2\frac{4}{5}$$

Rename  $-\frac{14}{5}$  as  $-2\frac{4}{5}$ .

**3** Solve  $r = -\frac{7}{8} \div \left(-4\frac{1}{2}\right)$ .

$$r = -\frac{7}{8} \div \left(-\frac{9}{2}\right)$$

Rename  $-4\frac{1}{2}$  as  $-\frac{9}{2}$ .

$$r = -\frac{7}{8} \times \left(-\frac{2}{9}\right)$$

Multiply by  $-\frac{2}{9}$ , the multiplicative inverse of  $-\frac{9}{2}$ .

$$r = \frac{7}{36}$$

The product of two negative numbers is positive.

**Solve each equation. Write the solution in simplest form.**

1.  $y = \frac{4}{5} \div \frac{1}{10}$

2.  $15 \div \frac{5}{8} = k$

3.  $r = -25 \div 1\frac{3}{7}$

4.  $5\frac{1}{3} \div \left(-\frac{3}{8}\right) = t$

5.  $f = -\frac{15}{16} \div \left(-\frac{3}{4}\right)$

6.  $7\frac{1}{2} \div \left(-2\frac{1}{2}\right) = y$