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Study Guide

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Multiplying Rational Numbers

Use the following rules to multiply two rational numbers and to simplify expressions.

Rules		Examples
Rational Numbers with Different Signs	The product of two rational numbers having different signs is negative.	$5(-2.5) = -12.5$ $-6(4.8) = -28.8$ $0.4(-1.5x) = -0.6x$
Rational Numbers with the Same Sign	The product of two rational numbers having the same sign is positive.	$(-4.2)(-8) = 33.6$ $12(3.2) = 38.4$ $(3w)(2.1y) = 6.3wy$
Fractions	To multiply fractions, multiply the numerators and multiply the denominators.	$-\frac{3}{5} \cdot \frac{1}{4} = -\frac{3}{20}$ $-\frac{1}{2} \cdot \left(-2\frac{1}{3}\right) = -\frac{1}{2} \cdot \left(-\frac{7}{3}\right)$ $= \frac{7}{6}$ or $1\frac{1}{6}$

Find each product.

1. $3.8(-4)$

2. $-6(-1.2)$

3. $6(6.1)$

4. $-0.5(-5.2)$

5. $(-8.4) \cdot 0$

6. $-2.4 \cdot (10.5)$

7. $\frac{1}{7} \cdot \frac{2}{3}$

8. $-2 \cdot \left(-\frac{2}{5}\right)$

9. $-\frac{2}{3} \cdot \frac{2}{9}$

10. $-\frac{5}{3} \cdot \left(-\frac{2}{7}\right)$

11. $0 \cdot \left(-\frac{1}{5}\right)$

12. $\frac{1}{3}\left(-1\frac{1}{4}\right)$

Simplify each expression.

13. $3(1.4a)$

14. $-0.6x\,(-3y)$

15. $\frac{1}{4} \cdot \left(-\frac{1}{2}b\right)$

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Multiplying Rational Numbers

Find each product.

1. $3.9 \cdot (-3)$

2. $-6(-5.4)$

3. $4 \cdot (-7.3)$

4. $-2.6(1.5)$

5. $(-4.4)(-0.5)$

6. $-3.7 \cdot 2$

7. $(-8.3)(-1)$

8. $-2.5(2.8)$

9. $-3 \cdot (-6.3)$

10. $-\frac{1}{4}\left(-\frac{3}{5}\right)$

11. $-5 \cdot \frac{2}{3}$

12. $\frac{5}{6}\left(\frac{7}{9}\right)$

13. $-\frac{6}{7} \cdot \frac{1}{3}$

14. $-\frac{3}{8}(-3)$

15. $\frac{2}{5}\left(-\frac{8}{9}\right)$

16. $6\frac{3}{4}\left(\frac{1}{6}\right)$

17. $-\frac{2}{3} \cdot \left(-4\frac{1}{2}\right)$

18. $1\frac{4}{5}\left(-\frac{3}{7}\right)$

Simplify each expression.

19. $4(-2.3z)$

20. $-5.5x(-0.8)$

21. $-4.2r(1.5s)$

22. $6\left(\frac{1}{7}t\right)$

23. $-\frac{1}{3} \cdot \frac{4}{5}g$

24. $\frac{2}{9}k\left(-\frac{1}{2}\right)$

25. $\left(\frac{1}{4}a\right)\left(\frac{5}{8}b\right)$

26. $\frac{5}{6}m\left(-\frac{1}{3}n\right)$

27. $3x\left(\frac{4}{9}y\right)$

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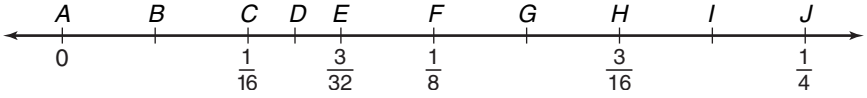
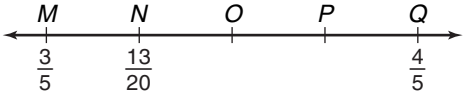
Density of Rational Numbers

Shown below is a portion of the number line containing all points from 0 to $\frac{1}{4}$. The coordinate of point F is $\frac{1}{8}$, which is half of $\frac{1}{4}$.



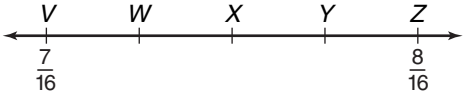
The coordinate of point C is $\frac{1}{16}$, which is half of $\frac{1}{8}$.

Between any two rational numbers, there is an unlimited number of other rational numbers. This property is called the **density property** of rational numbers.



$$\frac{13}{20} > \frac{3}{5} \text{ and } \frac{13}{20} < \frac{4}{5}$$

The easiest point to locate between two given points is the point halfway between those two points. This point is half the sum of the two coordinates.



$$\frac{1}{2}\left(\frac{7}{16} + \frac{8}{16}\right) \rightarrow \frac{1}{2}\left(\frac{15}{16}\right) \rightarrow \frac{15}{32}$$

The coordinate of point X is $\frac{15}{32}$.

Using the number lines above, state the coordinates of each point. Assume that each point is halfway between the points to the left and right.

1. B **2.** D **3.** G **4.** I

5. O **6.** P **7.** W **8.** Y

Name the rational number that is halfway between the two given numbers on a number line.

9. $\frac{1}{2}$ and $\frac{3}{4}$ **10.** 0 and 5 **11.** 4 and $5\frac{1}{4}$

12. $1\frac{1}{2}$ and $\frac{5}{8}$ **13.** $\frac{1}{2}$ and $\frac{2}{3}$ **14.** $\frac{7}{8}$ and $\frac{8}{9}$

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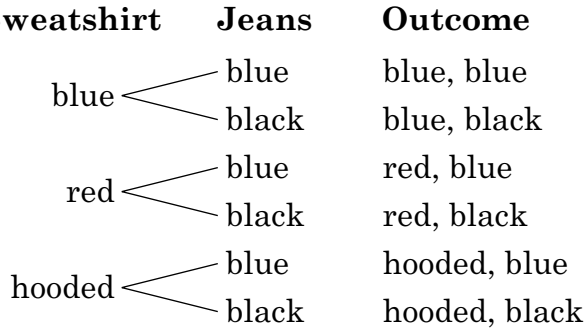
Counting Outcomes

Jeremy has three sweatshirts and two pairs of jeans. One way to find the number of different outfits is to draw a tree diagram, as shown below.

Sweatshirts	Jeans
blue red hooded	blue black



Since there are six outcomes, there are six outfits possible.

The **Fundamental Counting Principle** can also be used to count outcomes. It states that if an event M can occur in m ways and is followed by event N that can occur in n ways, then the event M followed by event N can occur in $m \times n$ ways.

3 sweatshirts $\times$ 2 jeans = 3×2 or 6 outfits

Find the number of possible outcomes by drawing a tree diagram.

1. sandwich with one condiment

Menu Item	Condiment
hamburger cheeseburger hot dog	ketchup mustard pickle onion

2. computer with one peripheral

Computer	Peripheral
desk model laptop	DVD drive CD-Rom drive floppy disk drive

Find the number of possible outcomes by using the Fundamental Counting Principle.

3. A certain game includes cards with 3 different pictures, 4 colors, and 6 numbers. Find the number of cards in the game.

4. Find the number of possible ways of answering a true-false test that has twelve questions.

5. Suppose you can order sweaters from a catalog in 8 sizes, 3 colors, and 2 delivery methods. Find the number of possible sweater orders.

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Counting Outcomes

Determine whether each is an outcome or a sample space for the given experiment.

1. (H, T, H); tossing a coin three times

2. (green, black); choosing one marble from a box of green and black marbles

3. (green, green), (green, black), (black, green), (black, black); choosing two marbles, one at a time, from a box of several green and several black marbles

4. (3, 1, 4, 5); rolling a number cube four times

5. (1, 2, 3, 4, 5, 6); rolling a number cube once

6. (red, black); choosing two cards from a standard deck

7. (dime, penny); choosing two coins from a bag of dimes, nickels, and pennies

8. (dime, nickel, penny); choosing one coin from a bag of dimes, nickels, and pennies

Find the number of possible outcomes by drawing a tree diagram.

9. Suppose you can have granola or wheat flakes for cereal with a choice of strawberries, bananas, peaches, or blackberries.

10. Suppose you can travel by car, train, or bus to meet a friend. You can leave either in the morning or the afternoon.

Find the number of possible outcomes by using the Fundamental Counting Principle.

11. Suppose you toss a coin five times.

12. Suppose you can make an outfit from six sweaters, four pairs of jeans, and two pairs of shoes.

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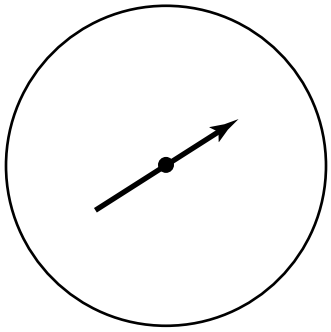
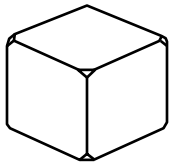
Outcomes

Complete.

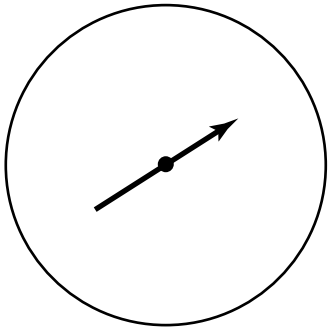
1. Complete the spinner so that it will have six different possible outcomes.



2. List the numbers that could be placed on the die to provide only four different possible outcomes.



3. Complete the spinner so that it is more likely to land on red than blue.



4. List the months in which you could choose a date and have 30 possible outcomes.

5. There are white, green, and blue marbles in a bag. What is the minimum number of each so that it is twice as likely that you draw a green one as a white one, and three times as likely that you draw a blue one as a green one?

6. A year between 1950 and 2001 is chosen at random. How many possible outcomes are there where the year is a leap year? List them.

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Dividing Rational Numbers

Use the following rules to divide rational numbers or fractions.

Rule or Property		Examples
Dividing Rational Numbers	The quotient of two numbers having different signs is negative The quotient of two numbers having the same sign is positive.	$-4.8 \div 6 = -0.8$ $4.8 \div (-6) = -0.8$ $2.8 \div (0.4) = 7$ $-2.8 \div (-0.4) = 7$
Multiplicative Inverse Property	For every number $\frac{a}{b}$, where $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ such that $\frac{a}{b} \cdot \frac{b}{a} = 1$.	$-\frac{3}{4}$ and $-\frac{4}{3}$ are multiplicative inverses.
Dividing Fractions	$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$, where $b, c, d \neq 0$	$\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \cdot \frac{4}{3}$ or $\frac{8}{15}$ $\frac{3}{4} \div (-6) = \frac{3}{4} \cdot \left(-\frac{1}{6}\right)$ $= -\frac{3}{24}$ or $-\frac{1}{8}$

Find each quotient.

1. $-8 \div 2.5$

2. $-1.6 \div (-2)$

3. $3.6 \div 0.6$

4. $5.5 \div (-5.5)$

5. $0 \div -0.6$

6. $-18.7 \div 5.5$

7. $-42 \div (-0.5)$

8. $0 \div \frac{2}{7}$

9. $-\frac{4}{5} \div \frac{4}{5}$

10. $\frac{1}{7} \div \frac{2}{5}$

11. $-\frac{2}{5} \div \frac{1}{2}$

12. $\frac{1}{9} \div (-4)$

13. $-\frac{3}{8} \div \frac{11}{8}$

14. $-\frac{3}{7} \div \left(-\frac{7}{3}\right)$

15. $\frac{3}{4} \div \frac{1}{5}$

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Practice

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Dividing Rational Numbers

Find each quotient.

1. $-8.5 \div 5$

2. $4.2 \div 14$

3. $2.8 \div (-0.5)$

4. $3.6 \div (-6)$

5. $-5.1 \div (-1.7)$

6. $7.8 \div (-0.3)$

7. $-4.8 \div 1.2$

8. $7.5 \div (-1.5)$

9. $-3.7 \div (-0.1)$

10. $-\frac{3}{4} \div \frac{5}{2}$

11. $\frac{1}{5} \div \frac{1}{3}$

12. $4 \div \frac{9}{10}$

13. $\frac{5}{6} \div \left(-\frac{2}{3}\right)$

14. $-\frac{3}{8} \div 6$

15. $-\frac{2}{7} \div (-3)$

16. $-\frac{4}{5} \div 4\frac{1}{2}$

17. $-2\frac{2}{3} \div \frac{3}{4}$

18. $-1\frac{1}{8} \div \left(-\frac{5}{7}\right)$

Evaluate each expression if $m = \frac{1}{5}$ and $n = -\frac{3}{4}$.

19. $\frac{m}{4}$

20. $\frac{5}{n}$

21. $-\frac{m}{7}$

22. $\frac{6}{m}$

23. $\frac{n}{3}$

24. $\frac{n}{m}$

25. $\frac{m}{n}$

26. $-\frac{2m}{3}$

27. $-\frac{1}{3n}$

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Decimal Hunt

Each of the sentences below is missing two parts, an operation symbol (+ , − , × , ÷) and a result. The missing results are given in the box at the right. Use guess and check to find the operations and the results that make each sentence true.

1. 12.35 ◯ 4.16 = ☐

2. 6.25 ◯ 3.06 = ☐

3. 38.052 ◯ 12.6 = ☐

4. 0.08 ◯ 2.5 = ☐

5. 21.45 ◯ 13.237 = ☐

6. 1.987 ◯ 1.025 = ☐

7. 7.23 ◯ 8.669 = ☐

8. 30.68 ◯ 12.228 = ☐

9. 8.35 ◯ 3.24 = ☐

10. 2.3625 ◯ 1.35 = ☐

0.032
1.75
2.036675
3.02
8.213
9.31
15.899
18.452
27.054
51.376

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Solving Multiplication and Division Equations

Use the following rules to solve algebraic equations.

Rule or Property		Examples
Division Property of Equality	For any numbers a, b, and c, with $c \neq 0$, if $a = b$, then $\frac{a}{c} = \frac{b}{c}$.	$4x = -24$ $\frac{4x}{4} = \frac{-24}{4}$ $x = 6$
Multiplication Property of Equality	For any numbers a, b, and c, if $a = b$, then $ac = bc$.	$\frac{1}{4}x = 12$ $4 \cdot \frac{1}{4}x = 4 \cdot 12$ $x = 48$

Solve each equation.

1. $8y = 48$

2. $-6x = 42$

3. $3.6 = 12n$

4. $1.5 = -3w$

5. $0 = -0.6y$

6. $18 = 0.5x$

7. $-6 = -8y$

8. $\frac{7}{4}n = 1$

9. $\frac{1}{5}x = 10$

10. $\frac{3}{4}y = 12$

11. $-\frac{3}{5}y = -3$

12. $4 = -\frac{1}{2}x$

13. $8 = \frac{x}{-2}$

14. $-\frac{4}{5}n = -\frac{1}{4}$

15. $\frac{1}{2} = -\frac{5}{8}x$

16. $1.2y = 9$

17. $-4x = 12.8$

18. $-\frac{n}{3} = \frac{1}{3}$

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Practice

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Solving Multiplication and Division Equations

Solve each equation.

1. $7p = -42$

2. $-3z = 27$

3. $-8q = -56$

4. $-28 = 2a$

5. $5f = 40$

6. $-9g = 18$

7. $-48 = -12r$

8. $4 = 0.8w$

9. $-2.4t = 6$

10. $0 = 5.3k$

11. $-1.6s = -8$

12. $2.5d = -11$

13. $\frac{m}{9} = 2$

14. $-8 = \frac{y}{4}$

15. $\frac{2}{5}s = 18$

16. $-2 = -\frac{8}{3}b$

17. $-\frac{c}{6} = 6$

18. $-\frac{v}{12} = -5$

19. $\frac{1}{8}d = -1$

20. $4 = \frac{4}{5}x$

21. $-\frac{7}{6}r = 28$

22. $\frac{9}{10}z = -9$

23. $-\frac{b}{18} = 2$

24. $-\frac{3}{7}n = -21$

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Puzzle

Solve each equation. The first one is completed.

1. $\frac{m}{12} = 13$	**1.** 156	U
2. $17v = -578$	**2.** _____	E
3. $\frac{c}{75} = 18$	**3.** _____	R
4. $-252d = -5796$	**4.** _____	H
5. $64 \cdot w = 5568$	**5.** _____	O
6. $g \div 29 = 61$	**6.** _____	B
7. $p(85) = -7225$	**7.** _____	T
8. $39x = 663$	**8.** _____	I
9. $\frac{k}{18} = 30$	**9.** _____	A
10. $\frac{z}{-94} = -32$	**10.** _____	N
11. $-112q = 1456$	**11.** _____	F
12. $201y = -1608$	**12.** _____	S

Put the letter that is next to each solution in the box below the corresponding solution shown above.

What is a RINGLEADER?

−85	23	−34		−13	17	1350	−8	−85		87	3008	−34

17	3008		−85	23	−34		1769	540	−85	23	−85	156	1769

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Solving Multi-Step Equations

Some equations require more than one step to solve. To solve a problem that has more than one step, the best strategy is to undo the operations in reverse order. Always check your solution.

Example 1: Solve $3x - 8 = 31$.

$$3x - 8 = 31$$
$$3x - 8 + 8 = 31 + 8$$
$$3x = 39$$
$$\frac{3x}{3} = \frac{39}{3}$$
$$x = 13$$

Check: $3x - 8 = 31$

$3(13) - 8 \stackrel{?}{=} 31$

$39 - 8 \stackrel{?}{=} 31$

$31 = 31$ ✓

Example 2: Solve $\frac{x}{4} + 6 = 12$.

$$\frac{x}{4} + 6 = 12$$
$$\frac{x}{4} + 6 - 6 = 12 - 6$$
$$\frac{x}{4} = 6$$
$$4 \cdot \frac{x}{4} = 4 \cdot 6$$
$$x = 24$$

Check: $\frac{x}{4} + 6 = 12$

$\frac{24}{4} + 6 \stackrel{?}{=} 12$

$6 + 6 \stackrel{?}{=} 12$

$12 = 12$ ✓

Solve each equation. Check your solution.

1. $6y - 4 = 50$

2. $-8x - 2 = 38$

3. $-15 = -12n + 9$

4. $-2m + 6 = 22$

5. $-4y - 8 = 30$

6. $-1.5x + 6 = -54$

7. $8.2y + 4 = 65.5$

8. $-1.5 = 3w + 6$

9. $-8 = -2.5x + 5$

10. $\frac{x}{2} + 7 = 9$

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

12. $\frac{x}{-6} - 12 = 2$

13. $3x + 7 = 7$

14. $-8 = 1.5y + 4$

15. $\frac{y}{2} + 2 = 25$

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Solving Multi-Step Equations

Solve each equation. Check your solution.

1. $8z - 6 = 18$

2. $-4s + 1 = 9$

3. $12 = -3k + 3$

4. $5 - 2f = 19$

5. $-31 = -6w - 7$

6. $6 + 7r = 13$

7. $-8 = 8 - 2c$

8. $0.4u + 1 = 6.6$

9. $3b - 2.5 = 5$

10. $4.7 + 2g = 7.3$

11. $-2.1q - 1 = -1$

12. $-2 = \frac{t}{4} - 3$

13. $\frac{p}{9} + 4 = 7$

14. $7 - \frac{m}{2} = 0$

15. $8 = 5 - \frac{c}{6}$

16. $\frac{y - 5}{3} = 2$

17. $1 = \frac{c + 1}{-8}$

18. $\frac{-4a + 4}{5} = -4$

19. $-4 = \frac{x}{7} + 3$

20. $\frac{8h - 2}{9} = 6$

21. $9 - \frac{1}{4}j = 5$

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Equations With No Solutions

Not every equation has a solution. Watch what happens when we try to solve the following equation.

$$\begin{aligned} 8 - (3 - 2x) &= 5x - 3x \\ 8 - 3 + 2x &= 2x \\ 5 + 2x &= 2x \\ 5 &= 0 \end{aligned}$$

Since the equation is equivalent to the false statement $5 = 0$, it has no solution. There is no value of x that will make the equation true.

Write a false statement that shows each equation has no solution.

1. $1 - 2t = 2(1 - t)$

2. $11y - 7y = 5 + 4y - 6$

3. $-7x^2 + 5 + 6x^2 = 12 - (2 + x^2)$

4. $2(2 - y^2) = 5 - (5 + 2y^2)$

5. $\frac{3}{2} + \frac{2}{3}p - 1 = \frac{1}{3}(1 + 2p)$

6. $0.5(1 + 3m) = 1.05 - (1 - 1.5m)$

Solve each equation if possible.

7. $5(3 - m) = 15m + 15$

8. $-9x + 12x = 3(2 - x)$

9. $10(0.2 + 0.4c) = 10c + 0.2 - 6c$

10. $13 - (3 - n) = 5(n + 2)$

11. $2(1 + 4t) = 8 - (3 - 8t)$

12. $3(d - 1) + 2 = 3(d + 2) - 5$

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Variables on Both Sides

Some equations contain variables on both sides and require more than one step to solve. To solve these equations, first use the Addition or Subtraction Property of Equality to write an equivalent equation that has all of the variables on one side. Then solve and check.

Example 1: Solve $2x - 6 = x + 4$.

$$2x - 6 = x + 4$$
$$2x - 6 - x = x + 4 - x$$
$$x - 6 = 4$$
$$x - 6 + 6 = 4 + 6$$
$$x = 10$$

Check: $2x - 6 = x + 4$

$$2(10) - 6 \stackrel{?}{=} 10 + 4$$
$$20 - 6 \stackrel{?}{=} 14$$
$$14 = 14 \checkmark$$

Example 2: Solve $\frac{1}{4}x - 12 = \frac{3}{4}x$.

$$\frac{1}{4}x - 12 = \frac{3}{4}x$$
$$\frac{1}{4}x - 12 - \frac{1}{4}x = \frac{3}{4}x - \frac{1}{4}x$$
$$-12 = \frac{1}{2}x$$
$$2 \cdot (-12) = 2 \cdot \frac{1}{2}x$$
$$-24 = x$$

Check: $\frac{1}{4}x - 12 = \frac{3}{4}x$

$$\frac{1}{4}(-24) - 12 \stackrel{?}{=} \frac{3}{4}(-24)$$
$$-6 - 12 \stackrel{?}{=} -18$$
$$-18 = -18 \checkmark$$

Solve each equation. Check your solution.

1. $6m - 40 = m$

2. $-5y - 2 = y + 10$

3. $-15n = -12n + 9$

4. $-4y + 6 = -3y + 12$

5. $6y - 8 = 6y - 6 - 2$

6. $-15x + 8 = -15x - 7$

7. $4.2y + 4.4 = 3.1y$

8. $w = 3.8w - 7$

9. $-8 - m = -3.5m + 5$

10. $\frac{1}{5}x + 12 = \frac{2}{5}x$

11. $\frac{1}{3}x - 8 = -\frac{1}{3}x$

12. $\frac{3}{7}x - 14 = -\frac{5}{7}x + 2$

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Variables on Both Sides

Solve each equation. Check your solution.

1. $9r = 3r + 6$

2. $5s - 6 = 2s$

3. $7p - 12 = 3p$

4. $11w = -16 + 7w$

5. $-3b + 9 = 9 - 3b$

6. $8 + 2m = -2m - 16$

7. $12x + 5 = 11 + 12x$

8. $-6g + 14 = -12 - 8g$

9. $-15 + 7t = 30 - 2t$

10. $5a + 4 = -2a - 10$

11. $1.4h - 3 = 2 + h$

12. $5.3 + d = -2d + 4.7$

13. $3.6z + 6 = -2 + 2z$

14. $4f - 3.7 = 3f - 1.8$

15. $\frac{3}{5}n - 10 = \frac{2}{5}n$

16. $\frac{5}{8}j = 8 + \frac{3}{8}j$

17. $\frac{2}{3}q - 2 = \frac{1}{3}q + 7$

18. $-\frac{1}{4}p + 4 = \frac{3}{4}p + 8$

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Enrichment

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Identities

Any equation that is true for every value of the variable is called an **identity.** When you try to solve an identity, you end up with a statement that is always true. Here is an example.

$$8 - (5 - 6x) = 3(1 + 2x)$$
$$8 - 5 + 6x = 3 + 6x$$
$$3 + 6x = 3 + 6x$$

State whether each equation is an identity. If it is not, find its solution.

1. $2(2 - 3x) = 3(3 + x) + 4$

2. $5(m + 1) + 6 = 3(4 + m) + (2m - 1)$

3. $(5t + 9) - (3t - 13) = 2(11 + t)$

4. $14 - (6 - 3c) = 4c - c$

5. $3y - 2(y + 19) = 9y - 3(9 - y)$

6. $3(3h - 1) = 4(h + 3)$

7. Start with the true statement $3x - 2 = 3x - 2$. Use it to create an identity of your own.

8. Start with the false statement $1 = 2$. Use it to create an equation with no solution.

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Study Guide

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Grouping Symbols

The first step in solving any equation that contains grouping symbols is to remove the parentheses by using the Distributive Property. Then solve and check.

Example 1: Solve $6(2x + 1) = 42$.

$$\begin{aligned} 6(2x + 1) &= 42 \\ 12x + 6 &= 42 \\ 12x + 6 - 6 &= 42 - 6 \\ 12x &= 36 \\ x &= 3 \end{aligned}$$

Check:
$$\begin{aligned} 6(2x + 1) &= 42 \\ 6(2(3) + 1) &\stackrel{?}{=} 42 \\ 6(6 + 1) &\stackrel{?}{=} 42 \\ 6(7) &\stackrel{?}{=} 42 \\ 42 &= 42 \checkmark \end{aligned}$$

Example 2: Solve $\frac{3}{4}(12x + 8) = -21$

$$\begin{aligned} \tfrac{3}{4}(12x + 8) &= -21 \\ 9x + 6 &= -21 \\ 9x + 6 - 6 &= -21 - 6 \\ 9x &= -27 \\ x &= -3 \end{aligned}$$

Check:
$$\begin{aligned} \tfrac{3}{4}(12x + 8) &= -21 \\ \tfrac{3}{4}(12 \cdot (-3) + 8) &\stackrel{?}{=} -21 \\ \tfrac{3}{4}(-36 + 8) &\stackrel{?}{=} -21 \\ \tfrac{3}{4}(-28) &\stackrel{?}{=} -21 \\ -21 &= -21 \checkmark \end{aligned}$$

Solve each equation. Check your solution.

1. $3(n - 2) = 12$

2. $-24 = 4(y - 2)$

3. $-12 = -2(4x + 2)$

4. $6 + 2(x - 5) = 2x - 4$

5. $-3x = 2(3x + 9)$

6. $x = 3(-2x + 9) + 8$

7. $4.2(y - 2) = 14.7$

8. $w = 3.5(w - 6)$

9. $3.6 - 1.2n = -2.8(n - 5)$

10. $\frac{1}{3}(x - 9) = 18$

11. $\frac{1}{2}(8x + 24) = 4$

12. $\frac{3}{4}(-12x - 8) = x + 34$

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Practice

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Grouping Symbols

Solve each equation. Check your solution.

1. $15 = 3(h - 1)$

2. $3(2z + 8) = -6$

3. $7 = 4(5 - 2x) + 3$

4. $2(p + 6) - 10 = 12$

5. $4a - 7 = 4(a - 2) + 1$

6. $13 = 3g - 2(-5 + g)$

7. $6(k + 2) + 2(2k - 5) = 22$

8. $-2 = 7(q + 2) + 3(2q - 1)$

9. $5(d - 4) + 2 = 2(d + 2) - 4$

10. $2b + 6(2 - b) = -b$

11. $6(n - 1) = 4.4n - 2$

12. $2(s + 1.6) - 5(2 - s) = -1.9$

13. $4(y + 2) + 1.3 = 3(y + 2.1)$

14. $8(e + 2.5) = 2(4e - 2)$

15. $7 - \frac{1}{4}(j - 8) = 6$

16. $\frac{1}{3}(x + 9) + 5 = \frac{x}{3} + 8$

17. $\frac{3(a + 4)}{9} = 2a - 12$

18. $1 + \frac{1}{6}p = 2(p - 5)$

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Enrichment

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Using Equations

Use what you have learned about equations to solve each problem.

1. In many universities, grade point averages are figured out using a table like this.

grade	A	B	C	D	F
point value	4	3	2	1	0

Different classes often meet for a different number of hours each week. If you had the following schedule and grades, your average would be 2.45.

Course	Hours	Grade
Chemistry	3	C
Chemistry Lab	2	F
Calculus	5	A
Phys. Ed.	1	C
Total	11	

$$\frac{3(2) + 2(0) + 5(4) + 1(2)}{11} = \frac{28}{11} = 2.54$$

Suppose you are taking the following courses and you know all your grades but your math grade. What is the lowest math grade you could receive and still have a grade point average of over 3.00?

Course	Hours	Grade
Biology	5	A
Spanish	3	B
Math	4	?
English	4	B
Phys. Ed.	1	D
Total	17	

2. Read the information below the soccer standings at the right to understand how a team's points are determined. A shootout is a form of tie-breaker used when the score is still tied after an overtime period.

a. A team had 5 wins, 2 shootout victories and 23 bonus points. Show that the number of points must be 61.

b. To find the number of shootout victories for Golden Bay, let x = number of shootout victories. Then, $5 - x$ = number of regulation or overtime wins.

$6(5 - x) + 4x + 32 = 60$

Solve this equation.

c. Find the number of shootout victories for Chicago.

Soccer

NASL

Eastern Division	W	L	GF	GA	BP	Pts.
Chicago	10	9	42	40	42	94
Cosmos	10	6	31	27	29	89
Toronto	8	8	33	22	29	71
Tampa Bay	7	12	31	49	27	67
Western Division	**W**	**L**	**GF**	**GA**	**BP**	**Pts.**
Vancouver	11	6	39	33	32	96
Minnesota	10	6	30	30	26	82
San Diego	9	9	33	38	27	75
Tulsa	7	10	31	32	29	71
Golden Bay	5	11	43	42	32	60

Six points are awarded for a regulation or overtime win, four points for a shootout victory, and one bonus point for every goal scored with a maximum of three per game. No bonus point is awarded for overtime or shootout goals.

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School-to-Workplace

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Diets (Nutritionist)

Many Americans feel the need to lose weight. They turn to nutrition counselors for advice on diets. These specialists plan meal programs with their clients. They also help patients stay motivated while on a diet.

Suppose a man 6 feet 1 inch tall weighs 250 pounds. How many weeks will it take for the patient to reach the top of his normal weight range if a nutrition counselor recommends that he lose 3.5 pounds each week?

Male Height: 6 feet 1 inch
Normal Weight Range 158 pounds–188 pounds

The patient's present weight is 250 pounds and his target weight is 188 pounds. Let w represent the number of weeks needed to reach the target weight. Write and solve an equation.

Target Weight		*Present Weight*	*Loss per Week*		*Number of Weeks*
↓		↓	↓		↓
188	=	250	-3.5	·	w

$$188 = 250 - 3.5w$$

$$188 - 250 = 250 - 3.5w - 250 \quad \textit{Subtract 250 from each side.}$$

$$-62 = -3.5w$$

$$\frac{-62}{-3.5} = \frac{-3.5w}{-3.5} \quad \textit{Divide each side by } -3.5.$$

$$w \approx 17.7$$

It will take the patient 18 weeks to reach his target weight.

Solve.

1. A woman 5 feet 1 inch tall weighs 150 pounds. How many weeks will it take to lose enough weight to reach the top of her normal weight range (104 pounds to 121 pounds) if she loses 3 pounds each week?

2. A man 6 feet 2 inch tall weighs 260 pounds. How many weeks will it take to lose enough weight to reach the top of his normal weight range (162 pounds to 192 pounds) if he loses 2.5 pounds each week?

3. How many weeks will it take the man in Exercise 2 to lose the weight if he loses 5 pounds each week?