

LESSON

1-1

Review for Mastery

Variables and Expressions

To translate words into algebraic expressions, find words like these that tell you the operation.

+	-	•	÷
add	subtract	multiply	divide
sum	difference	product	quotient
more	less	times	split
increased	decreased	per	ratio

Kenny owns v video games. Stan owns 7 more video games than Kenny. Write an expression for the number of video games Stan owns.

v represents the number of video games Kenny owns.
 $v + 7$ *Think: The word "more" indicates addition.*

Order does not matter for addition. The expression $7 + v$ is also correct.

Jenny is 12 years younger than Candy. Write an expression for Jenny's age if Candy is c years old.

c represents Candy's age.
 The word "younger" means "less," which indicates subtraction.
 $c - 12$ *Think: Candy is older, so subtract 12 from her age.*

Order does matter for subtraction. The expression $12 - c$ is incorrect.

1. Jared can type 35 words per minute. Write an expression for the number of words he can type in m minutes. _____
2. Mr. O'Brien's commute to work is 0.5 hour less than Miss Santos's commute. Write an expression for the length of Mr. O'Brien's commute if Miss Santos's commute is h hours. _____
3. Mrs. Knighten bought a box of c cookies and split them evenly between the 25 students in her classroom. Write an expression for the number of cookies each student received. _____
4. Enrique collected 152 recyclable bottles, and Latasha collected b recyclable bottles. Write an expression for the number of bottles they collected altogether. _____
5. Tammy's current rent is r dollars. Next month it will be reduced by \$50. Write an expression for next month's rent in dollars. _____

LESSON
1-1

Review for Mastery

Variables and Expressions continued

The value of $\square - 9$ depends on what number is placed in the box.

Evaluate $\square - 9$ when 20 is placed in the box.

$$\begin{array}{r} \square - 9 \\ \square - 9 \\ \boxed{20} - 9 \\ 11 \end{array}$$

In algebra, variables are used instead of boxes.

Evaluate $x \div 7$ for $x = 28$.

$$\begin{array}{r} x \div 7 \\ 28 \div 7 \\ 4 \end{array}$$

Sometimes, the expression has more than one variable.

Evaluate $x + y$ for $x = 6$ and $y = 2$.

$$\begin{array}{r} x + y \\ 6 + 2 \\ 8 \end{array}$$

Evaluate $5 + \square$ when each number is placed in the box.

6. 3

7. 5

8. 24

Evaluate each expression for $x = 4$, $y = 6$, and $z = 3$.

9. $x + 15$

10. $3y$

11. $15 - z$

Evaluate each expression for $x = 2$, $y = 18$, and $z = 9$.

12. $x \cdot z$

13. $y - x$

14. $y \div z$

15. $\frac{y}{x}$

16. xy

17. $z - x$




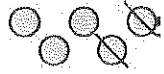




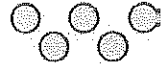
LESSON
1-2

Review for Mastery

Solving Equations by Adding or Subtracting

Use counters to model solving equations.

Solve $x + 2 = 5$.

Using counters	Using numbers
$x + $  $= $ 	$x + 2 = 5$
$x + $  $= $ 	$x + 2 = 5$ $\underline{-2} \quad \underline{-2}$
$x + 0 = $ 	$x + 0 = 3$
$x = $ 	$x = 3$
Check:  $+$  $= $ 	Check: $x + 2 = 5$ $3 + 2 \stackrel{?}{=} 5$ $5 \stackrel{?}{=} 5 \checkmark$

Solve the following by drawing counters. Check your answers.

1. $x + 1 = 5$

2. $7 = x + 2$

Solve each equation. Check your answers.

3. $x + 4 = 12$

4. $21 = x + 2$

5. $x + 3 = 8$

LESSON
1-2

Review for Mastery

Solving Equations by Adding or Subtracting *continued*

Any addition equation can be solved by adding the opposite. If the equation involves subtraction, it helps to first rewrite the subtraction as addition.

Solve $x + 4 = 10$.

$$\begin{array}{r} x + 4 = 10 \\ \underline{-4 \quad -4} \\ x = 6 \end{array}$$

Find the opposite of this number.

The opposite of 4 is -4 .
Add -4 to each side.

Check:

$$\begin{array}{l} x + 4 = 10 \\ 6 + 4 \stackrel{?}{=} 10 \\ 10 \stackrel{?}{=} 10 \checkmark \end{array}$$

Solve $-5 = x - 8$.

$$\begin{array}{r} -5 = x - 8 \\ \underline{+8 \quad +8} \\ 3 = x \end{array}$$

Find the opposite of this number.

Rewrite subtraction as addition.
The opposite of -8 is 8.
Add 8 to each side.

Check:

$$\begin{array}{l} -5 = x - 8 \\ -5 \stackrel{?}{=} 3 - 8 \\ -5 \stackrel{?}{=} -5 \checkmark \end{array}$$

Solve $x - (-6) = 2$.

$$\begin{array}{r} x + 6 = 2 \\ \underline{-6 \quad -6} \\ x = -4 \end{array}$$

Find the opposite of this number.

Rewrite subtraction as addition.
The opposite of 6 is -6 .
Add -6 to each side.

Check:

$$\begin{array}{l} x - (-6) = 2 \\ 4 - (-6) \stackrel{?}{=} 2 \\ 2 \stackrel{?}{=} 2 \checkmark \end{array}$$

Rewrite each equation with addition. Then state the number that should be added to each side.

6. $x - 7 = 12$

7. $x - (-1) = -5$

8. $-4 = x - 2$

Solve each equation. Check your answers.

9. $x + 10 = -6$

10. $-8 = x - 2$

11. $x - (-5) = -2$

LESSON

1-3

Review for Mastery

Solving Equations by Multiplying or Dividing

Solve equations involving multiplication and division by performing the inverse operation.

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

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

 x is divided by 5.

$$5 \cdot \frac{x}{5} = 4 \cdot 5$$

Multiply both sides by 5.

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

Simplify.

$$x = 20$$

Check: $\frac{x}{5} = 4$

$$\frac{20}{5} \stackrel{?}{=} 4$$

$$4 \stackrel{?}{=} 4 \checkmark$$

Solve $-3x = 27$.

$$-3x = 27$$

 x is multiplied by -3 .

$$\frac{-3x}{-3} = \frac{27}{-3}$$

Divide both sides by -3 .

$$x = -9$$

Check: $-3x = 27$

$$-3(-9) \stackrel{?}{=} 27$$

$$27 \stackrel{?}{=} 27 \checkmark$$

Circle the correct word in each sentence. Then solve the equation.

1. $\frac{x}{-2} = 7$

 x is multiplied/divided by -2 .To solve, multiply/divide both sides by -2 .

$x = \underline{\hspace{2cm}}$

2. $5m = -40$

 m is multiplied/divided by 5.To solve, multiply/divide both sides by 5.

$m = \underline{\hspace{2cm}}$

Solve each equation. Check your answers.

3. $-2x = -20$

4. $\frac{w}{5} = -7$

5. $6z = -42$

LESSON
1-3

Review for Mastery

Solving Equations by Multiplying or Dividing *continued*

Equations with fractions can be solved by multiplying by the reciprocal.

Solve $\frac{2}{3}x = 8.$

$$\frac{2}{3}x = 8$$

x is multiplied by $\frac{2}{3}$.

$$\frac{3}{2} \cdot \frac{2}{3}x = 8 \cdot \frac{3}{2}$$

Multiply both sides by $\frac{3}{2}$.

$$\frac{6}{6}x = \frac{24}{2}$$

Simplify.

$$x = 12$$

Check: $\frac{2}{3}x = 8$

$$\frac{2}{3}(12) \stackrel{?}{=} 8$$

$$\frac{24}{3} \stackrel{?}{=} 8$$

$$8 \stackrel{?}{=} 8 \checkmark$$

Solve $-\frac{3}{4}x = \frac{2}{5}.$

$$-\frac{3}{4}x = \frac{2}{5}$$

x is multiplied by $-\frac{3}{4}$.

$$-\frac{4}{3} \cdot -\frac{3}{4}x = \frac{2}{5} \cdot -\frac{4}{3}$$

x is multiplied by $-\frac{4}{3}$.

$$\frac{12}{12}x = -\frac{8}{15}$$

Simplify.

$$x = -\frac{8}{15}$$

Check: $-\frac{3}{4}x = \frac{2}{5}$

$$-\frac{3}{4}\left(-\frac{8}{15}\right) \stackrel{?}{=} \frac{2}{5}$$

$$\frac{24}{60} \stackrel{?}{=} \frac{2}{5}$$

$$\frac{2}{5} \stackrel{?}{=} \frac{2}{5} \checkmark$$

Find the reciprocal.

6. $\frac{2}{5}$

7. $-\frac{5}{7}$

8. 7

Solve each equation. Check your answers.

9. $\frac{5}{6}x = 10$

10. $6 = -\frac{3}{5}x$

11. $\frac{2}{3}x = -\frac{3}{5}$

LESSON

1-4

Review for Mastery

Solving Two-Step and Multi-Step Equations

When solving multi-step equations, first combine like terms on each side if possible. Then use inverse operations.

	Operations	Solve using Inverse Operations
$4x - 3 = 15$	<ul style="list-style-type: none"> x is multiplied by 4. Then 3 is subtracted. 	<ul style="list-style-type: none"> Add 3 to both sides. Then divide both sides by 4.
$\frac{x}{3} + 2 = 9$	<ul style="list-style-type: none"> x is divided by 3. Then 2 is added. 	<ul style="list-style-type: none"> Add -2 to both sides. Then multiply both sides by 3.

The order of the inverse operations is the order of operations in reverse.

Solve $2x - 7 + 3x = 13$.

$$2x + 3x - 7 = 13$$

$$5x - 7 = 13$$

$$5x - 7 = 13$$

$$\underline{+7} \quad \underline{+7}$$

$$5x = 20$$

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

$$x = 4$$

Group like terms together.

Add like terms.

x is multiplied by 5. Then 7 is subtracted.

Add 7 to both sides.

Divide both sides by 5.

Check:

$$2x - 7 + 3x = 13$$

$$2(4) - 7 + 3(4) \stackrel{?}{=} 13$$

$$8 - 7 + 12 \stackrel{?}{=} 13$$

$$13 \stackrel{?}{=} 13 \checkmark$$

Solve each equation. Check your answers.

1. $3x - 8 = 4$

2. $\frac{b}{2} - 4 = 26$

3. $5y + 4 - 2y = 9$

4. $14 = 3(x - 2) + 5$

LESSON

1-4

Review for Mastery

Solving Two-Step and Multi-Step Equations *continued*

A two-step equation with fractions can be simplified by multiplying each side by the LCD. This will clear the fractions.

Solve $\frac{x}{4} + \frac{2}{3} = 2$.

$$\frac{x}{4} + \frac{2}{3} = 2$$

$$12\left(\frac{x}{4} + \frac{2}{3}\right) = (12)2 \quad \text{Multiply both sides by the LCD 12.}$$

$$12\left(\frac{x}{4}\right) + 12\left(\frac{2}{3}\right) = 12(2)$$

$$3x + 8 = 24 \quad x \text{ is multiplied by 3. 8 is added.}$$

$$\underline{\quad -8 \quad -8} \quad \text{Add } -8 \text{ to both sides.}$$

$$3x = 16$$

$$\frac{3x}{3} = \frac{16}{3} \quad \text{Divide both sides by 3.}$$

$$x = \frac{16}{3}$$

Check:

$$\frac{x}{4} + \frac{2}{3} = 2$$

$$\frac{1}{4}x + \frac{2}{3} = 2$$

$$\frac{1}{4}\left(\frac{16}{3}\right) + \frac{2}{3} \stackrel{?}{=} 2$$

$$\frac{16}{12} + \frac{2}{3} \stackrel{?}{=} 2$$

$$\frac{4}{3} + \frac{2}{3} \stackrel{?}{=} 2$$

$$\frac{6}{3} \stackrel{?}{=} 2$$

$$2 \stackrel{?}{=} 2 \checkmark$$

Solve each equation. Check your answers.

5. $\frac{x}{2} + \frac{3}{8} = 1$

6. $\frac{w}{3} + \frac{2}{5} = \frac{1}{15}$

7. $3 = \frac{a}{5} + \frac{1}{2}$

LESSON
1-5**Review for Mastery****Solving Equations with Variables on Both Sides**

Variables must be collected on the same side of the equation before the equation can be solved.

Solve $10x = 2x - 16$.

$$10x = 2x - 16$$

$$\underline{-2x} \quad \underline{-2x}$$

$$8x = -16$$

$$\frac{8x}{8} = \frac{-16}{8}$$

$$x = -2$$

Add $-2x$ to both sides.

Divide both sides by 8.

Check:

$$10x = 2x - 16$$

$$10(-2) \stackrel{?}{=} 2(-2) - 16$$

$$-20 \stackrel{?}{=} -4 - 16$$

$$-20 \stackrel{?}{=} -20 \checkmark$$

Solve $3x = 5(x + 2)$.

$$3x = 5x + 10$$

$$\underline{-5x} \quad \underline{-5x}$$

$$-2x = 10$$

$$\frac{-2x}{-2} = \frac{10}{-2}$$

$$x = -5$$

Distribute.

Add $-5x$ to both sides.

Divide both sides by -2 .

Check:

$$3x = 5(x + 2)$$

$$3(-5) \stackrel{?}{=} 5(-5 + 2)$$

$$-15 \stackrel{?}{=} 5(-3)$$

$$-15 \stackrel{?}{=} -15 \checkmark$$

Write the first step you would take to solve each equation.

1. $3x + 2 = 7x$ _____

2. $-4x - 6 = -10x$ _____

3. $15x + 7 = -3x$ _____

Solve each equation. Check your answers.

4. $4x + 2 = 5(x + 10)$

5. $-10 + y + 3 = 4y - 13$

6. $3(t + 7) + 2 = 6t - 2 + 2t$

LESSON

1-5

Review for Mastery**Solving Equations with Variables on Both Sides** *continued*

Some equations have infinitely many solutions. These equations are true for all values of the variable. Some equations have no solutions. There is no value of the variable that will make the equation true.

Solve $-3x + 9 = 4x + 9 - 7x$.

$$-3x + 9 = -3x + 9$$

$$\begin{array}{r} -3x \quad +3x \\ \hline \end{array}$$

$$9 = 9 \checkmark$$

Combine like terms.

Add 3x to each side.

True statement.

Check any value of x:

Try $x = 4$.

$$-3x + 9 = 4x + 9 - 7x$$

$$-3(4) + 9 \stackrel{?}{=} 4(4) + 9 - 7(4)$$

$$-12 + 9 \stackrel{?}{=} 16 + 9 - 28$$

$$-3 \stackrel{?}{=} -3 \checkmark$$

The solution is the set of all real numbers.

Solve $2x + 6 + 3x = 5x - 10$.

$$2x + 6 + 3x = 5x - 10$$

$$5x + 6 = 5x - 10$$

$$\begin{array}{r} -5x \quad -5x \\ \hline \end{array}$$

$$6 = -10 \times$$

Combine like terms.

Add -5x to each side.

False statement.

Check any value of x:

Try $x = 1$.

$$2x + 6 + 3x = 5x - 10$$

$$2(1) + 6 + 3(1) \stackrel{?}{=} 5(1) - 10$$

$$2 + 6 + 3 \stackrel{?}{=} 5 - 10$$

$$11 \stackrel{?}{=} -5 \times$$

There is no solution.

Solve each equation.

7. $x + 2 = x + 4$

8. $-2x + 8 = 2x + 4$

9. $5 + 3g = 3g + 5$

10. $5x - 1 - 4x = x + 7$

11. $2(f + 3) + 4f = 6 + 6f$

12. $3x + 7 - 2x = 4x + 10$

LESSON
1-4

Practice A

Solving Two-Step and Multi-Step Equations

Fill in the blanks to solve each equation.

1. $8 = 5n - 2$
 $+ 2 \quad + \underline{\hspace{1cm}}$
 $\underline{\hspace{1cm}} = 5n$
 $\underline{\hspace{1cm}} = n$

2. $2d + 3 = 11$
 $- \underline{\hspace{1cm}} - 3$
 $2d = \underline{\hspace{1cm}}$
 $d = \underline{\hspace{1cm}}$

3. $3(b + 7) = 30$
 $3b + \underline{\hspace{1cm}} = 30$
 $- 21 \quad - 21$
 $3b = \underline{\hspace{1cm}}$
 $b = \underline{\hspace{1cm}}$

Solve each equation. Check your answers.

4. $4t + 13 = 5$

5. $6.3 = 2x - 4.5$

6. $12 = -r - 11$

7. $-5y + 6 = -9$

8. $-1 = \frac{b}{4} - 7$

9. $\frac{5}{8} = 2m + \frac{3}{8}$

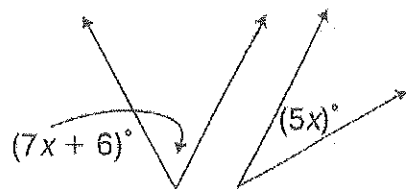
10. $x + -4 + 2x = 14$

11. $4(y + 1) = -8$

12. $-2(d + 6) = -10$

13. If $7x + 5 = -2$, find the value of $8x$.

The sum of the measures of the angles shown is 90° .



14. Write an equation to determine the value of x .

15. Find the value of x .

LESSON
1-4

Practice B
Solving Two-Step and Multi-Step Equations

Solve each equation. Check your answers.

1. $-4x + 7 = 11$

2. $17 = 5y - 3$

3. $-4 = 2p + 10$

4. $3m + 4 = 1$

5. $12.5 = 2g - 3.5$

6. $-13 = -h - 7$

7. $-6 = \frac{y}{5} + 4$

8. $\frac{7}{9} = 2n + \frac{1}{9}$

9. $-\frac{4}{5}t + \frac{2}{5} = \frac{2}{3}$

10. $-(x - 10) = 7$

11. $-2(b + 5) = -6$

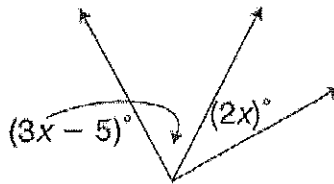
12. $8 = 4(q - 2) + 4$

13. If $3x - 8 = -2$, find the value of $x - 6$.

14. If $-2(3y + 5) = -4$, find the value of $5y$.

Answer each of the following.

15. The two angles shown form a right angle. Write and solve an equation to find the value of x .



16. For her cellular phone service, Vera pays \$32 a month, plus \$0.75 for each minute over the allowed minutes in her plan. Vera received a bill for \$47 last month. For how many minutes did she use her phone beyond the allowed minutes?

LESSON
1-4

Practice C

Solving Two-Step and Multi-Step Equations

Solve each equation. Check your answers.

1. $5r + 2 = 17$

2. $25 = -2w - 3$

3. $-7 = 4y + 9$

4. $-3f + 19 = 4$

5. $-22 = -p - 12$

6. $6.5 = 2.5r - 11$

7. $\frac{y}{3} - 8 = 1$

8. $\frac{2h}{3} - \frac{1}{4} = \frac{1}{3}$

9. $-\frac{2}{5} = -\frac{1}{3}m + \frac{3}{5}$

10. $-5v = 6v + 5 - v$

11. $-3(b + 9) = -6$

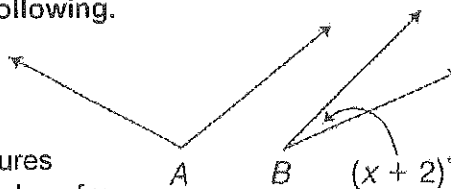
12. $6\frac{1}{2} = -4(n - 1)$

13. If $9x - 13 = -31$, find the value of $x - 8$.

14. If $4\left(y + \frac{3}{2}\right) = -18$, find the value of $2y$.

Answer each of the following.

15. Angle A is three times the size of angle B. The sum of the angle measures is 128° . Find the value of x .



16. Tina sold cookies at her club's bake sale. She spent \$18.50 on supplies. She sold her cookies for \$0.75 each and made a profit of \$24.25. Write and solve an equation to find how many cookies Tina sold.

LESSON
1-5

Practice A

Solving Equations with Variables on Both Sides

Fill in the blanks to solve each equation.

1. $4a - 3 = 2a + 7$
 $-2a \quad - \quad \underline{\hspace{1cm}}$
 $2a - 3 = 7$
 $+ \underline{\hspace{1cm}} + 3$
 $2a = \underline{\hspace{1cm}}$
 $a = \underline{\hspace{1cm}}$

2. $-3r + 9 = -4r + 5$
 $+ \underline{\hspace{1cm}} + 4r$
 $r + 9 = 5$
 $-9 \quad - \quad \underline{\hspace{1cm}}$
 $r = \underline{\hspace{1cm}}$

3. $-2b = -5(b - 6)$
 $-2b = \underline{\hspace{1cm}} + \underline{\hspace{1cm}}$
 $+5b = + \underline{\hspace{1cm}}$
 $\underline{\hspace{1cm}} = 30$
 $b = \underline{\hspace{1cm}}$

Solve each equation.

4. $2(c + 3) = c - 13$

5. $5p - 8 = 1 + 5p - 9$

6. $3(2v - 1) = 6v - 4$

Answer each of the following.

7. Gretchen lives in Florida, where the current temperature is **69°F and rising at a rate of 2°F per hour**. She is talking on the phone to her friend in Indiana where the temperature is now 84°F and falling at a rate of 3°F per hour.

a. If the temperatures continue changing at the same rates, how many hours would Gretchen and her friend have to talk before the temperatures become equal?

b. What would that temperature be?

8. Marlo wants to rent and ride a bike at a state park. There are two parks in his area. One has an entrance fee of \$8 and charges \$2 per hour for bike rentals. The other park has an entrance fee of \$2 and charges \$5 per hour for bike rentals.

a. After how many hours would the cost of renting and riding a bike be the same at both parks?

b. What would that cost be?

LESSON
1-5

Practice B

Solving Equations with Variables on Both Sides

Solve each equation. Check your answers.

1. $3d + 8 = 2d - 17$

2. $2n - 7 = 5n - 10$

3. $p - 15 = 13 - 6p$

4. $-t + 5 = t - 19$

5. $15x - 10 = -9x + 2$

6. $1.8r + 9 = -5.7r - 6$

7. $2y + 3 = 3(y + 7)$

8. $4n + 6 - 2n = 2(n + 3)$

9. $6m - 8 = 2 + 9m - 1$

10. $-v + 5 + 6v = 1 + 5v + 3$

11. $2(3b - 4) = 8b - 11$

12. $5(r - 1) = 2(r - 4) - 6$

Answer each of the following.

13. Janine has job offers at two companies. One company offers a starting salary of \$28,000 with a raise of \$3000 each year. The other company offers a starting salary of \$36,000 with a raise of \$2000 each year.

a. After how many years would Janine's salary be the same with both companies?

b. What would that salary be?

14. Xian and his cousin both collect stamps. Xian has 56 stamps, and his cousin has 80 stamps. Both have recently joined different stamp-collecting clubs. Xian's club will send him 12 new stamps per month, and his cousin's club will send him 8 new stamps per month.

a. After how many months will Xian and his cousin have the same number of stamps?

b. How many stamps will that be?

LESSON
1-5
Practice C
Solving Equations with Variables on Both Sides

Solve each equation. Check your answers.

1. $9x - 2 = 2x + 12$

2. $2a - 11 = -8a + 19$

3. $2c + 6 = 1 - 3c$

4. $-y - 22 = y - 16$

5. $5d - 8 = 3 + 7d$

6. $9 + 2.7t = -4.8t - 6$

7. $-5m + 2 + 8m = 2m + 11$

8. $-y - 8 + 6y = -9 + 5y + 1$

9. $4(2x - 3) = 3 + 8x - 11$

10. $2\left(n + \frac{1}{3}\right) = \frac{3}{2}n + 1 + \frac{1}{2}n - \frac{1}{3}$

Answer each of the following.

11. The table at right shows the costs of ordering T-shirts from two different companies. With how many T-shirts would the cost of the order be the same with both companies? What would that cost be?

Company	Price Per Shirt	Shipping
Crazy Shirts	\$8.00	\$13.00
T's for All	\$7.50	\$16.00

12. Brenn has \$60 in his savings account. His brother Chris has \$135 in his. Brenn decides to save \$5 of his allowance each week, while Chris decides to spend his whole allowance along with \$10 of his savings each week. After how many weeks will Brenn and Chris have the same amount of money in their savings accounts? How much money will that be?
