

LESSON
14

Solving for One Variable in Terms of Another Variable

Review It!

When you solve for one variable in terms of another variable, remember this word:

term a number, variable, or product of a number and one or more variables

$$-2x - 3y + 4$$

↑ ↑ ↑
three terms

To solve an equation for y , get y by itself.

Solve the equation $3x + 8y = 24$ for y .

Step 1 Decide how to get the y -term by itself.
 $8y$ is on the left side.
 To get $8y$ by itself, remove $3x$.
 What operation removes $3x$? _____

REMEMBER Subtraction undoes addition.

Step 2 Get the y -term by itself.

$$3x + 8y = 24$$

$$3x \quad 3x + 8y = 24 \quad -3x \quad \leftarrow$$

$$8y = 24 - 3x$$

REMEMBER Do the same thing to both sides of the equation.

Step 3 Decide how to get y by itself.
 Multiplication "glues" the 8 and the y together.
 What operation will get y by itself? _____

REMEMBER Multiplication and division are inverse operations.

Step 4 Get y by itself.

$$8y = 24 - 3x$$

$$\frac{8y}{8} = \frac{24 - 3x}{8}$$

$$y = \frac{24 - 3x}{8}$$

THINK $\frac{8y}{8} = y$

So, $3x + 8y = 24$ is the same equation as $y = \frac{24 - 3x}{8}$

$$-3x + 8y = 24$$

$$+3x \qquad +3x$$

$$8y = 24 + 3x$$

$$\frac{8y}{8} = \frac{24 + 3x}{8}$$

$$y = 3 + \frac{3x}{8}$$

Lesson 14: Solving for One Variable in Terms of Another Variable

Try It!

Get the y -term alone on one side.

Ask Yourself

1. $-3x + 8y = 24$

$$+3x \quad +3x$$

$$8y = 24 + 3x$$

2. $10x + 5y = 45$

$$-10x \quad -10x$$

$$5y = 45 - 10x$$

1. Do you need to move the y -term? yes, or no?

Solve for y .

3. $-3x + 8y = 24$

$$+3x \quad +3x$$

$$8y = 24 + 3x$$

$$y = 3 + \frac{3x}{8}$$

4. $10x + 5y = 45$

$$-10x \quad -10x$$

$$5y = 45 - 10x$$

$$y = 9 - 2x$$

3. Add which term to both sides? $-3x$, or $3x$?

5. $2x - 11y = 4$

$$-2x \quad -2x$$

$$-11y = 4 - 2x$$

$$y = \frac{2x - 4}{11}$$

6. $6x + 12y = 1$

$$-6x \quad -6x$$

$$12y = 1 - 6x$$

$$y = \frac{1 - 6x}{12}$$

7. $-10x + 7y = 10$

$$+10x \quad +10x$$

$$7y = 10 + 10x$$

$$y = \frac{10x + 10}{7}$$

8. $4x - 3y = -12$

$$-4x \quad -4x$$

$$-3y = -12 - 4x$$

$$y = \frac{4x + 12}{3} \text{ or } y = \frac{4x}{3} + 4$$

Solve.

9. The area of a rectangle can be found using the formula $A = lw$, where l represents the length and w represents the width of the rectangle. Solve $A = lw$ for l .

$$l = \frac{A}{w}$$

9. What does lw mean? $l \times w$, or $l + w$?

10. The cost of a repair job can be found using the equation $2x + 3y = 15$. Solve the equation for y .

$$2x + 3y = 15$$

$$-2x \quad -2x$$

$$3y = 15 - 2x$$

$$y = \frac{15 - 2x}{3} \text{ or } y = 5 - \frac{2x}{3}$$

On Your Own!

Circle the best answer for each question.

1. Solve $V = lwh$ for h .

A. $h = \frac{lw}{V}$

B. $h = \frac{Vw}{l}$

C. $h = \frac{V}{lw}$

D. $h = \frac{V}{w}$

$V = lwh$
 $h = \frac{V}{lw}$

2. Solve $3a - 18b = 15$ for a .

A. $a = 6b - 5$

B. $a = 5b + 6$

C. $a = 5 - 6b$

D. $a = 6b + 5$

$3a = 15 + 18b$
 $a = \frac{15 + 18b}{3}$
 $a = 5 + 6b$

3. Solve $4m + 3n = 12$ for n .

A. $n = 3 - \frac{3m}{4}$

B. $n = 4 - \frac{4m}{3}$

C. $n = \frac{4m}{3 + 12}$

D. $n = \frac{4m}{3 + 4}$

$3n = -4m + 12$
 $n = \frac{-4m + 12}{3}$
 $n = -\frac{4}{3}m + 4$

4. Solve $5x + 2y = 5$ for y .

A. $y = 5 - \frac{5x}{2}$

B. $y = \frac{5 + 5x}{2}$

C. $y = 5 + \frac{5x}{2}$

D. $y = \frac{5 - 5x}{2}$

$2y = -5x + 5$
 $y = \frac{-5x + 5}{2}$
 $y = \frac{5 - 5x}{2}$

5. Solve $\frac{1}{5}a - \frac{4}{5}b = -6$ for a .

A. $a = \frac{4}{5}b - 6$

B. $a = \frac{4}{5}b - 30$

C. $a = 4b - 30$

D. $a = 4b - 6$

$\frac{1}{5}a = -\frac{4}{5}b - 6$
 $a = -4b - 30$
 $a = 4b - 30$

6. The distance Daniel travels is given by the formula $d = rt$, where d is distance traveled, r is rate of speed, and t is time. Solve the equation $d = rt$ for t .

A. $t = \frac{d}{r}$

B. $t = \frac{r}{d}$

C. $t = dr$

D. $t = d - r$

$d = rt$
 $\frac{d}{r} = \frac{r}{r}t$
 $t = \frac{d}{r}$

7. A craft store sells stamps for \$4 and ink pads for \$3. The cost of x stamps and y ink pads is given by the expression $4x + 3y$. Elizabeth spends \$20 for stamps and ink pads. Solve the equation $4x + 3y = 20$ for x .

A. $x = 5 - 3y$

B. $x = 5 - \frac{3y}{4}$

C. $x = 20 - 3y$

D. $x = 20 - \frac{3y}{4}$

$4x + 3y = 20$
 $4x = 20 - 3y$
 $x = \frac{20 - 3y}{4}$
 $x = 5 - \frac{3}{4}y$

8. The distance around Fred's triangular field can be represented by the equation $3x + 4y + 5z = 20$.

Part A Solve the equation $3x + 4y + 5z = 20$ for y .

Show your work.

$3x + 4y + 5z = 20$
 $4y = 20 - 3x - 5z$
 $y = \frac{20 - 3x - 5z}{4}$
 $y = \frac{20}{4} - \frac{3}{4}x - \frac{5}{4}z$
ANS: $y = -\frac{3}{4}x - \frac{5}{4}z + 5$

Part B Solve the equation $3x + 4y + 5z = 20$ for z .

Show your work.

$3x + 4y + 5z = 20$
 $5z = -3x - 4y + 20$
ANS: $z = -\frac{3}{5}x - \frac{4}{5}y + 4$

Math Words

Fill in the blanks.

9. A number, variable, or product of a number and one or more variables is a

term

10. $3x$ and $9x$ are terms.

11. If you add a term to one side of an equation, you must also

ADD

the term to the other side of the equation.