

2-5

Reteaching

Literal Equations and Formulas

A literal equation is an equation that involves two or more variables. When you work with literal equations, you can use the methods you have learned in this chapter to isolate any particular variable. To solve for specific values of a variable, simply substitute the values into your equation and simplify.

Problem

What is the solution of $4x - 5y = 3$ for y ? What is the value of y when $x = 10$?

$$4x - 5y - 4x = 3 - 4x$$

$$-5y = -4x + 3$$

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

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

$$y = \frac{4}{5}(10) - \frac{3}{5}$$

$$y = 7\frac{2}{5}$$

To get the y -term by itself on the left side, subtract $4x$ from each side.

Simplify.

Divide each side by -5 since y is being multiplied by -5 on the left side. This isolates y .

Simplify by dividing each term by -5 . Notice, this changes the sign of each term.

To find the value of y when $x = 10$, substitute 10 in for x .

Simplify by multiplying first, then subtracting.

When you rewrite literal equations, you may have to divide by a variable or variable expression. When you do so in this lesson, assume that the variable or variable expression is not equal to zero because division by zero is not defined.

Problem

Solve the equation $ab - bc = cd$ for b .

$$b(a - c) = cd$$

$$\frac{b(a - c)}{a - c} = \frac{cd}{a - c}$$

$$b = \frac{cd}{a - c}$$

Since b is a factor of each term on the left side, it can be factored out using the Distributive Property.

To get b by itself, divide each side by $a - c$ since b is being multiplied by $a - c$. Remember $a - c \neq 0$.

Simplify.

Solve each equation for y . Then find the value of y for each value of x .

1. $y + 5x = 2$; $-1, 0, 1$

2. $6x = 2y - 4$; $1, 2, 4$

3. $6x - 3y = -9$; $-2, 0, 2$

4. $4y = 5x - 8$; $-2, -1, 0$

5. $3y + 2x = -5$; $0, 2, 3$

6. $5x = 8y - 6$; $-1, 0, 1$

7. $3(y - 2) + x = 1$; $-1, 0, 1$

8. $\frac{x+2}{y-3} = 1$; $-1, 0, 1$

9. $\frac{y+4}{x-5} = -3$; $-2, 2, 4$

A formula is an equation that states a relationship among quantities. Formulas are special types of literal equations. Some common formulas are shown below. Notice that some of the formulas use the same variables, but the definitions of the variables are different. For instance, r is the radius in the area and circumference of a circle and the rate in the distance formula.

Formula Name	Formula
Perimeter of a rectangle	$P = 2l + 2w$
Circumference of a circle	$C = 2\pi r$
Area of a rectangle	$A = lw$
Area of a triangle	$A = \frac{1}{2}bh$
Area of a circle	$A = \pi r^2$
Distance traveled	$d = rt$

Each of the formulas can be solved for any of the other unknowns in the equation to produce a new formula. For example, $r = \frac{C}{2\pi}$ is a formula for the radius of a circle in terms of its circumference.

Problem

What is the length of a rectangle with width 24 cm and area 624 cm²?

$$A = lw \quad \text{Formula for the area of a rectangle.}$$

$$\frac{A}{w} = \frac{lw}{w} \quad \text{Since you are trying to get } l \text{ by itself, divide each side by } w.$$

$$l = \frac{A}{w} \quad \text{Simplify.}$$

$$l = \frac{624}{24} \quad \text{Substitute 624 for } A \text{ and 24 for } w.$$

$$l = 26 \text{ cm} \quad \text{Simplify.}$$

Solve each problem. Round to the nearest tenth, if necessary. Use 3.14 for π .

10. A triangle has base 6 cm and area 42 cm². What is the height of the triangle?

11. What is the radius of a circle with circumference 56 in.?

12. A rectangle has perimeter 80 m and length 27 m. What is the width?

13. What is the length of a rectangle with area 402 ft² and width 12 ft?

14. What is the radius of a circle with circumference 27 in.?

Lesson 2-5

Solve each equation for y . Then find the value of y for each value of x .

1. $y + 3x = 8$; $x = -2, 0, 2$

2. $4x - 2y = 14$; $x = 2, 4, 6$

3. $x = 9 - 3y$; $x = -3, 6, 12$

Solve each equation for x .

4. $c = b - bx$

5. $\frac{x-3}{y} = \frac{1}{2}$

6. $px + qx = r$

Solve each problem. Round to the nearest tenth, if necessary. Use 3.14 for π .

7. What is the radius of a circle with a circumference of 15 cm?

8. What is the height of a triangle that has a base of 8 in. and an area of 28 in.^2 ?

9. How long does it take to travel 150 miles at a rate of 60 mi/h?

Answers: $y = -3x + 8$ {14, 8, 2}, $y = 2x - 7$ {-3, 1, 5}, $y = 3 - \frac{1}{3}x$ {4, 1, -1}, $x = 1 - \frac{c}{b}$, $x = \frac{1}{2}x + 3$, $x = \frac{r}{p+q}$, 2.4 cm, 7 in., 2.5 hr