

## Unit 2 - Rearranging Formulas

### Introduction

**Literal equations** are equations that involve two or more variables. Sometimes it is useful to rearrange or solve literal equations for a specific variable in order to find a solution to a given problem. In this lesson, literal equations and **formulas**, or literal equations that state specific rules or relationships among quantities, will be examined.

### Key Concepts

- It is important to remember that both literal equations and formulas contain an equal sign indicating that both sides of the equation must remain equal.
- Literal equations and formulas can be solved for a specific variable by isolating that variable.
- To isolate the specified variable, use inverse operations. When coefficients are fractions, multiply both sides of the equation by the **reciprocal**. The reciprocal of a number, also known as the **inverse** of a number, can be found by flipping a number. Think of an integer as a fraction with a denominator of 1. To find the reciprocal of the number, flip the fraction. The number 2 can be thought of as the fraction  $\frac{2}{1}$ . To find the reciprocal, flip the fraction:  $\frac{2}{1}$  becomes  $\frac{1}{2}$ . You can check if you have the correct reciprocal because the product of a number and its reciprocal is always 1.

### Example 1

Solve  $6y - 12x = 18$  for  $y$ .

### Example 2

Solve  $15x - 5y = 25$  for  $y$ .

### Example 3

Solve  $4y + 3x = 16$  for  $y$ .

### Example 4

The formula for finding the area of a triangle is  $A = \frac{1}{2}bh$ , where  $b$  is the length of the base and  $h$  is the height of the triangle. Suppose you know the area and height of the triangle, but need to find the length of the base. In this case, solving the formula for  $b$  would be helpful.

### Example 5

The distance,  $d$ , that a train can travel is found by multiplying the rate of speed,  $r$ , by the amount of time that it is travelling,  $t$ , or  $d = rt$ . Solve this formula for  $t$  to find the amount of time the train will travel given a specific distance and rate of speed.

### Practice 1.5.1: Rearranging Equations and Formulas

For problems 1–4, solve each equation for  $y$ .

1.  $9y + 18 = 27x$

2.  $6y + 24x = 66$

3.  $10x - 77 = 7y$

4.  $44 - 4y = 20x$

Read each scenario and solve for the given variable.

5. To convert degrees Celsius to Kelvin, the formula  $K = C + 273.15$  is used. Solve this formula for  $C$ .

6. The formula  $C = 2\pi r$  is used to calculate the circumference of a circle. Solve this formula for  $r$ .

7. The formula  $V = lwh$  is used to calculate the volume of a prism. Solve this formula for  $w$ .

8. The formula  $S = 2\pi r^2 + 2\pi rh$  is used to find the surface area of a cylinder. Solve this formula for  $h$ .

9. The formula for converting degrees Celsius to degrees Fahrenheit is  $F = \frac{9}{5}C + 32$ . Solve this formula for  $C$ .

10. The formula for calculating the volume of a cone is  $V = \frac{1}{3}\pi r^2 h$ . Solve this formula for  $h$ .