



NAME:

DATE:

Formulas

Formulas

IN THIS SECTION students will explore common mathematical formulas. Students will recognize that in a formula the relationship between the quantities remains the same.

THE PURPOSE OF THIS SECTION IS TO:

- Understand a formula as a specific type of equation
- Manipulate formulas using the Properties of Equality to solve for specific values.

What's a Formula?

A **formula** is a mathematical rule expressed in symbols.

Here are some common formulas.

If you know the names of any of the formulas listed below, write those names on the lines. Share your list with a partner.

1. $P = 2(l + w)$ Perimeter of a rectangle
2. $d = rt$ _____
3. $C = \pi d$ _____
4. $V = lwh$ _____
5. $A = bh$ _____
6. $A = \frac{1}{2}bh$ _____
7. $A = \pi r^2$ _____
8. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ _____

A formula can help you to solve real-life situations.

Working with Formulas

A formula describes a consistent mathematical relationship among several quantities.

The formula for the relationship between distance traveled, constant rate of travel, and time is:

$$\text{distance} = \text{rate} \cdot \text{time} \quad \text{or} \quad d = rt$$

If we know the distance traveled is 100 miles and the constant rate of travel is 50 miles per hour, we can use the formula to find the time in hours it will take to travel that distance.

First write the formula:

$$d = rt$$

Then substitute the known values:

$$100 = 50t$$

Use the inverse operation to isolate the variable:

$$\frac{100}{50} = \frac{50t}{50}$$

Simplify:

$$2 = t$$

Interpret the solution:

It takes 2 hours to travel 100 miles at 50 miles per hour.

distance = 100 miles
rate = 50 miles per hour.

The space satellite launched to explore the planet Mars traveled about 300 million miles. If the satellite traveled at a speed of 60,000 miles per hour, how many hours did it take for the satellite to reach Mars? How many days is that number of hours?



First write the formula:

$$d = rt$$

Then substitute the known values:

Use inverse operations to isolate the variable:

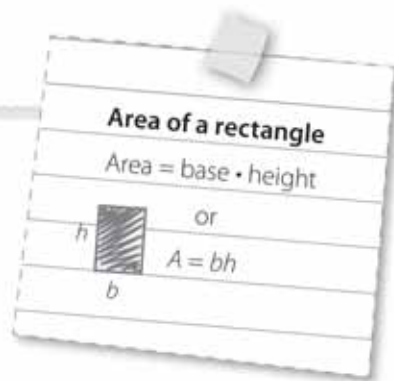
Simplify:

Interpret the solution:

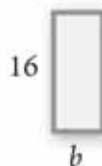


Area

In each situation below, substitute the known values into the formula and solve the equation for the unknown value.



1. If the area of the rectangle is 64 square units and the height is 16 units, find the measure of the base.



First write the formula:

$$A = bh$$

Then substitute the known values:

$$\underline{\hspace{2cm}} = b(\underline{\hspace{2cm}})$$

Now use inverse operations to solve for the unknown value:

$$\frac{\underline{\hspace{2cm}}}{16} = \frac{b \underline{\hspace{2cm}}}{16}$$

Simplify:

$$4 = b$$

Interpret the solution:

The measure of the base of this rectangle is 4 units.

2. Ian wants to put a pool cover over his rectangular pool to conserve heat. He swims laps, so he knows the length of the pool is 30 feet. If the area of the pool is 360 square feet, what is the width of the pool?

Sketch a picture of the pool. Use the area formula to find the width of the pool.

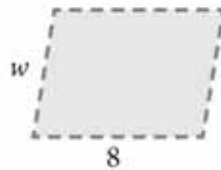
The length of the pool can be called the height. The width of the pool can be called the base. Or the length of the pool can be the base, and the width of the pool can be the height.

Perimeter



Substitute the known values and solve these formulas for the unknown value.

1. Find the measure of the width of a parallelogram whose perimeter is 36 units and whose length measures 8 units.



First write the formula:

$$P = 2(l + w)$$

Then substitute the known values:

$$36 = 2(8 + w)$$

Simplify:

$$36 = \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

First use the Distributive Property.

Use inverse operations to isolate the variable term:

Simplify:

Interpret the solution:

2. Rose wants to put a fence around a portion of her yard for her new puppy. She has 50 feet of fencing. She wants the width of the fenced space to be 7 feet. Sketch the fencing. Use the perimeter formula to find the length of the fenced space.

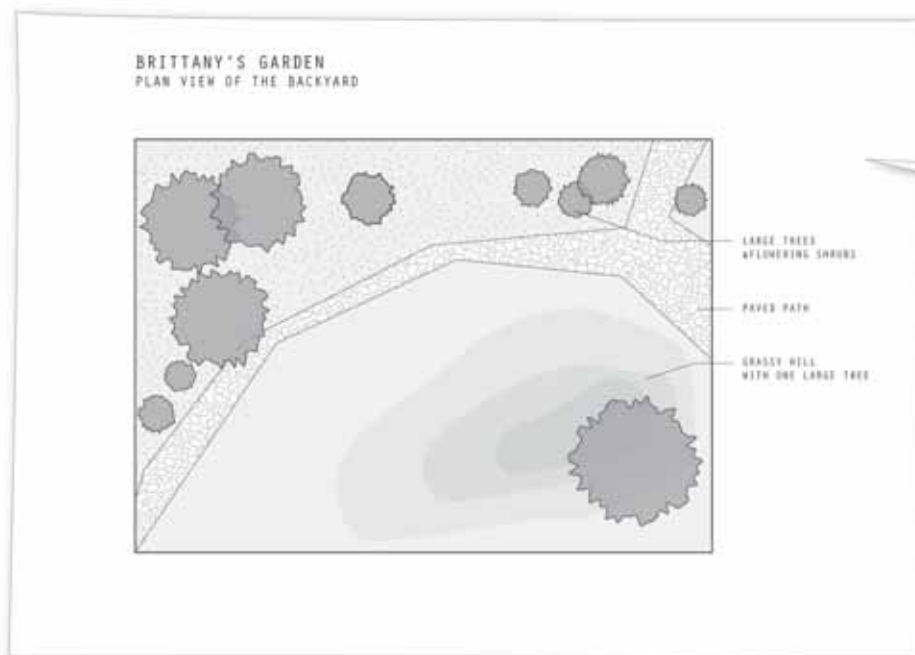
Perimeter and Area



Brittany's backyard is a beautiful, large, rectangular garden. The length of the garden is 35 yards, and the perimeter is 120 yards. She needs to know the area but cannot measure the width.



Use the perimeter of Brittany's garden to find the area of the garden. Show your steps for finding the solution.



Label the picture.

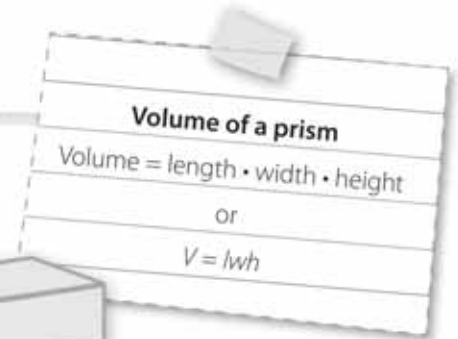
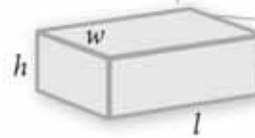
Practice Solving Formulas Using Substitution

Use the given formula to solve the following items.

EXAMPLE

- The volume of a prism is equal to the product of the length times the width times the height of the shape.

$$V = lwh$$



Find the height of a figure that has a volume of 144 cubic units, a length of 6 units, and a width of 3 units.

First write the formula.

$$\begin{array}{r} V \\ \downarrow \\ 144 \end{array} = \begin{array}{r} lwh \\ \downarrow \downarrow \downarrow \\ 6(3)h \end{array}$$

Then substitute the known values.

Use inverse operations to isolate the variable:

$$\begin{aligned} 144 &= 18h \\ \frac{144}{18} &= \frac{18h}{18} \end{aligned}$$

Simplify:

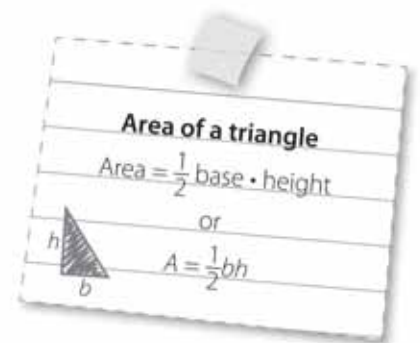
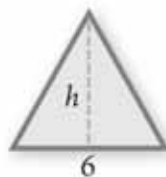
$$8 = h$$

Interpret the solution:

The height of the prism is 8 units.



- Find the height of a triangle with an area of 36 square units and a base of 6 units.



First write the formula.

$$A = \frac{1}{2}bh$$

Then substitute the known values:

Use inverse operations to isolate the variable:

Simplify:

Interpret the solution:

Practice Solving Formulas Using Substitution, continued



Volume is the measure, in cubic units, of the space inside a three-dimensional shape.

For example, if you fill a box with beans, you can measure how much space is filled with the beans by using the volume formula.

3. Use the volume formula to solve for the height of the box.



The volume is 128 cubic units,
the length of the box is 8 units,
and the width is 4 units.

