# Literal Equations

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| ☰ | WHAT'S COVERED |
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In this lesson, you will learn how to use inverse operations to rewrite a literal equation. Specifically, this lesson will cover:

# 1. Definition of Literal Equation

A **literal equation** is an equation that has more than one variable. In math, we work with literal equations all the time. For example, the slope–intercept form of a line is a literal equation: $y = mx + b$. This is because it has more than one variable.

| 📄 | TERM TO KNOW |
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**Literal Equation**

An equation with more than one variable.

# 2. Rewriting Literal Equations

Formulas are common literal equations. Formulas relate variables together. For example, we can use a formula to relate the length and width of a rectangle to its area. We can rewrite formulas to create expressions for other variables in the equation.

↗ EXAMPLE

$A = lw$    Formula for the area of a rectangle

$l = \dfrac{A}{w}$    Divide by $w$, expression for length

$w = \dfrac{A}{l}$    Divide by $l$, expression for width

We can rewrite literal equations to express other variables by applying inverse operations. More specifically, we look at what operations are being applied to the variable we wish to isolate, as well as in what order they are being applied. To isolate the variable, we apply the inverse operations in reverse order. This is shown below with several common formulas:

↗ EXAMPLE   Use the formula for the area of a circle and solve for the radius, $r$.

$$A = \pi r^2$$ Formula for the area of a circle

$$\frac{A}{\pi} = r^2$$ Divide both sides by $\pi$

$$\sqrt{\frac{A}{\pi}} = r$$ Take square root of both sides

→ **EXAMPLE** Use the formula for the distance and solve for rate, *r*.

$$D = rt$$ Formula for distance, rate, and time

$$\frac{D}{t} = r$$ Divide both sides by *t*

→ **EXAMPLE** Use the formula for the distance and solve for time, *t*.

$$D = rt$$ Formula for distance, rate, and time

$$\frac{D}{r} = t$$ Divide both sides by *r*

→ **EXAMPLE** Use the Pythagorean Theorem and solve for one side length, $a$.

$$a^2 + b^2 = c^2$$ Pythagorean Theorem

$$a^2 = c^2 - b^2$$ Subtract $b^2$ from both sides

$$a = \sqrt{c^2 - b^2}$$ Take square root of both sides

→ **EXAMPLE** Use the Pythagorean Theorem and solve for the second side length, *b*.

$$a^2 + b^2 = c^2$$ Pythagorean Theorem

$$b^2 = c^2 - a^2$$ Subtract $a^2$ from both sides

$$b = \sqrt{c^2 - a^2}$$ Take square root of both sides

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## ☑ SUMMARY

The **definition of literal equations** are equations that have more than one variable. **Formulas are literal equations** and are used often in mathematics. Depending on what kind of information you are given, you may wish to **rewrite literal equations**, or express the equations and formulas in different ways.

**Literal Equation**

An equation with more than one variable.