

Literal Equations

Literal equations are equations with 2 or more variables that can each be solved for in terms of the other variables (like $A = lw$ and $P = 2l + 2w$ for example).

Literal equations are typically taught in Algebra 1 to help students understand the steps needed to solve equations. Practice will definitely help!

Examples:

1) $P = 2l + 2w$ Solve for w

The first step is to try to ISOLATE the variable we are trying to solve.

In this problem, we need to subtract $2l$ from both sides to get the term with w by itself.

$$\begin{array}{rcl} P & = & 2l + 2w \\ - 2l & & - 2l \\ \hline P - 2l & = & 2w \end{array}$$

Now divide by the coefficient attached to w to get w by itself.

$$\begin{aligned} \frac{P - 2l}{2} &= \frac{2w}{2} \\ w &= \frac{P - 2l}{2} \text{ or } \frac{P}{2} - l \end{aligned}$$

Why can the answer to the last problem be written 2 ways?

$$\frac{P - 2l}{2} = w$$

If we split up the combined fraction into 2 separate fractions with the same denominator, we get

$$\frac{P}{2} - \frac{2l}{2} = w$$

We can cancel out the 2 in the numerator and denominator of the 2nd fraction to get

$$\frac{P}{2} - l = w \quad \text{as our final answer}$$

2) $g = \frac{6h}{b}$ solve for b.

The first step to solving these types of literal equations is to ALWAYS GET RID OF THE DENOMINATOR, even if it does not solve for the variable right away. It makes the problem easier!

$$b \left(g \right) = \frac{(6h)}{(b)} \quad b \quad \text{becomes} \quad bg = 6h$$

Finally, divide both sides by g to get the answer

$$\frac{bg}{g} = \frac{6h}{g} \quad \text{becomes} \quad b = \frac{6h}{g}$$

$$3) g = \frac{4x - a}{x} \text{ solve for } x$$

These kinds of literal equations are the hardest ones you will encounter in Algebra 1 but they can be done. Use this process and it will help you!

The first step is to always get rid of the denominator. Multiply both sides by x to do that.

$$x(g) = \frac{(4x - a)x}{x} \text{ becomes } gx = 4x - a$$

Now, we want to solve for x , so the next step we do should be to get all the x terms on one side.

$$gx = 4x - a$$

$$\begin{array}{r} -4x \\ -4x \end{array}$$

$$gx - 4x = -a$$

We want to isolate x , which is currently in 2 terms, so we should factor out an x from the left side of the equation.

$$x(g - 4) = -a$$

To finish off this problem, divide both sides by $g - 4$ to get x by itself.

$$\frac{x(g - 4)}{(g - 4)} = \frac{-a}{(g - 4)} \text{ becomes } x = \frac{-a}{(g - 4)}$$

Tips for Solving Problems:

1. Make sure to know what variable you are solving for before starting to manipulate the given equation.

2. Once you know the variable you are solving for, try to manipulate the equation so the variable you are trying to solve is on one side of the equation and the other variables/constants are on the other side. Keep in mind that it might take more than 1-2 steps to solve for the indicated variable.

3. Do not panic when doing literal equations! Remember that even on the harder ones, we still followed the same idea of isolating our indicated variable using algebraic manipulation. With more practice, even the hard literal equations will not seem that bad!