Solving Literal Equations Methods

Definition: A literal equation is, simply put, an equation that has a lot of letters or variables. For example,

$$A = lw$$

(The formula for finding the area of a rectangle)

and

$$E = mc^2$$

(Einstein's Theory of Relativity)

are both literal equations.

When given a literal equation, you will often be asked to solve the equation for a given variable. The goal is to isolate that given variable. The process is the same process that you use to solve linear equations; the only difference is that you will be working with a lot more letters, and you may not be able to simplify as much as you can with linear equations. This packet will hopefully show you the process in a simple manner so that you will be able to solve literal equations yourself. See examples before for the method to solving literal equations for a given variable:

- Solve A = bh for b.

Since h is multiplied times b, you must divide both sides by h in order to isolate b.

$$A = bh$$

$$\frac{A}{h} = \frac{b\cancel{h}}{\cancel{h}}$$

$$\frac{A}{h} = b$$

- Solve P = 2l + 2w for w.

First, you subtract 2l from both sides, then divide both sides by 2 to isolate w.

$$P = 2l + 2w$$

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

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

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

- Solve $Q = \frac{(c+d)}{2}$ for d.

Since (c+d) is divided by 2, you must first multiply both sides of the equation by 2. Then you have to subtract c from both sides in order to isolate d.

$$Q = \frac{(c+d)}{2}$$

$$2 \cdot Q = \frac{(c+d)}{2} \cdot 2$$

$$2Q = c + d$$

$$\begin{array}{rcl} 2Q & = & c + d \\ -c & & -c \\ \hline 2Q - c & = & d \end{array}$$

$$2Q - c = d$$

- Solve $V = \frac{3k}{t}$ for t.

Since t is in the denominator, you must first multiply both sides by t to get it out of the denominator. Then you need to divide both sides by V in order to isolate t.

$$V = \frac{3k}{t}$$

$$V \cdot t = \frac{3k}{\cancel{t}} \cdot \cancel{t}$$

$$\frac{\cancel{V}t}{\cancel{V}} = \frac{3k}{V}$$

$$t = \frac{3k}{V}$$

- Solve $Q = 3a + 5ac$ for a

This one's tricky! Initially, it seems hard to isolate the a, since it's split up between two unlike terms, but as you see, if you simply factor the *a* out of the two terms, then you are left with a(3+5c). Then you just need to divide both sides by (3+5c) in order to isolate a.

$$Q = 3a + 5ac$$

$$Q = a(3 + 5c)$$

$$\frac{Q}{(3+5c)} = \frac{a\cancel{(3+5c)}}{\cancel{(3+5c)}}$$

$$\frac{Q}{3+5c} = a$$