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| |  | | --- | |  |   ***Solving Literal Equations (page 1 of 2)***  *Sections: Solving for a given variable,* [*Solving for "y="*](http://www.purplemath.com/modules/solvelit2.htm)  Sometimes you have a formula, such as something from [geometry](http://www.purplemath.com/modules/geoform.htm), and you need to solve for some variable other than the "standard" one. For instance, the formula for the perimeter *P* of a square with sides of length *s* is *P* = 4*s*. You might need to solve this equation for *s*, so you can plug in a perimeter and figure out the side length.  This process of solving a formula for a given variable is called "solving literal equations". One of the dictionary definitions of "literal" is "related to or being comprised of letters", and variables are sometimes referred to as literals. So "solving literal equations" seems to be another way of saying "taking an equation with lots of letters, and solving for one letter in particular."  At first glance, these exercises appear to be much worse than your usual solving exercises, but they really aren't that bad. You pretty much do what you've done all along for [solving linear equations](http://www.purplemath.com/modules/solvelin.htm) and other sorts of equation; the only substantial difference is that, due to all the variables, you won't be able to simplify your answers as much as you're used to. Here's how "solving literal equations" works:   * **Solve *A = bh* for *b***   If they'd asked me to solve 3 = 2*b* for *b*, I'd have divided both sides by 2. Following the same reasoning, I get:  b = A/h   * **Solve *d = rt* for *r*** Copyright © Elizabeth Stapel 2006-2008 All Rights Reserved   d/t = r   * **Solve *P* = 2*l* + 2*w* for *w***   If they'd asked me to solve 3 = 2 + 2*w* for *w*, I'd have moved the "free" 2 to the other side, and then divided through by the 2 on the variable. Following the same reasoning, I get:  (P - 2L)/2 = w   * **Solve *Q* = (*c + d*)/2 for *d***   2Q = (2/1)[(c + d)/2]  2*Q* = *c* + *d*  2*Q* – *c* = *c* + *d* – *c*  **2*Q* – *c* = *d***   * **Solve *V* = 3*k*/*t* for *t***   If they'd asked me to solve 5 = 3 / *t* for *t*, I'd have multiplied through by *t*, and then divided both sides by 5. Following the same reasoning, I get:  t = 3k/V  This next exercise requires a little "trick" to solve it:   * **Solve *Q* = 3*a* + 5*ac* for *a***   Q/(3 + 5c) = a  The "trick" came in the second line, where I factored out the *a*. This technique doesn't come up often, but it's just about guaranteed to come up in your homework once or twice, and almost-certainly on your next test, precisely because so many students *don't* see the "trick". So keep in mind: When you can't isolate the desired variable because it is a factor in two or more terms, collect those terms together on one side of the "equals" sign, factor out the desired variable, and then divide off whatever is left.   * **Solve *A* = ( 1/2 )*ah* – ( 1/2 )*bh* for *h***   2A/(a - b) = h  This example used the same "trick" as the previous one. In the fourth line, I factored out the *h*. You should *expect* to need to know how to do this!   * **The area *A* of a sector (a pie-wedge-shaped section) of a circle is given by:**   A = (pi)(r^2)(S)/360  **...where *r* is the radius of the circle and *S* is the angle measure (in degrees) of the sector. Solve this equation for *S*.**  360A/(pi)(r^2) = S |