Technology Integrated Mathematics
Class Notes
Algebra: Solving One-Step Equations (Section 7.3)

If I added 4 to an unknown number and ended up with 12, what number did I start with?

Think over the problem in the thought bubble if you have not already. The equation that would symbolize this problem is $x + 4 = 12$ (where x is the unknown number).

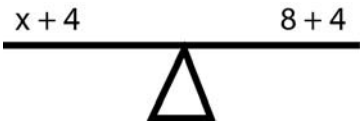
Our gut tells us that if we *subtract* 4 from 12, we should get the unknown number. We will see that algebra backs up our gut nicely. **We undo addition with subtraction.** The details of exactly what is happening is given here. I highly suggest you write it this way.

$$\begin{array}{r} x+4=12 \\ -4\quad -4 \\ \hline x\quad =8 \end{array}$$

To *undo the addition* of 4 on the left to isolate x, we *subtract* 4.

Below, we have a very simply drawn scale. We can imagine taking away the 4 from the left. But that would leave the scale out of balance and we don't want that! We must subtract the same from the right side too.

Think of an equation as a scale. If you do something on one side, you must do it on the other too.

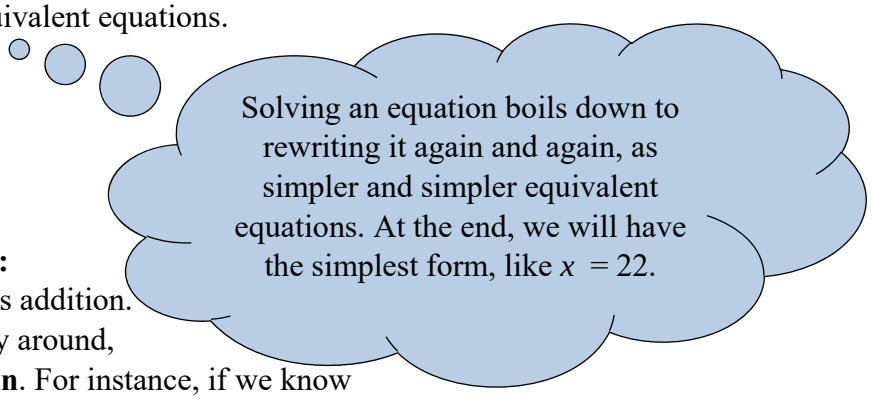


Definition: Solution: the value(s) of the variable in an equation that would make the equation true.

expl 1: Show that $x = 8$ is the solution to the equation $x + 4 = 12$.

expl 2: Solve. Check your solution.
$5 + x = 27$

Definition: Equivalent Equations: Equations that have the exact same solutions. For instance, $5 + x = 27$ and $x = 22$ are equivalent equations.



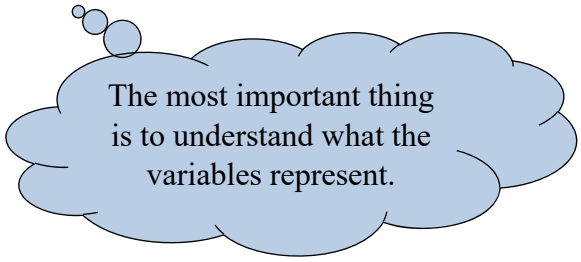
Undoing what was done to x:
We saw that subtraction undoes addition. Thinking about it the other way around, **addition will undo subtraction**. For instance, if we know $x - 4 = 10$, we'll add 4 to the left to undo the subtraction. Don't forget to also add 4 to the right. What is the solution to $x - 4 = 10$?

What undoes multiplication? If I tell you I multiplied 6 by some number and got 30, what must the number be? What operation helps you undo the multiplication to end back up at this unknown number? Can you write the algebra for this problem?

What undoes division? An equation like $\frac{x}{3} = 12$ could be solved by doing what operation?

expl 3: Solve. Check your solution.
$-6y = -39$

expl 4: For a particular transformer, the voltage E in the circuits is related to the number of windings W of wire around the core by the equation $E = 40W$. How many windings will produce a voltage of 840 V?



expl 5: The amount of lumber in board feet (bf) can be expressed by the formula $bf = \frac{TWL}{12}$ where T is the thickness of a board in inches, W is its width in inches, and L is its length in feet. What total length of 1-in. by 6-in. boards is needed for a total of 16 bf?