Equations Review

The language of MATH is Equations!!!

Every step in solving a problem for an unknown variable should have a equation sign in it.
General concept: get the variable on one side and the numbers on the other side.

<u>Properties of Equality</u> (commonly used to solve problems)

Property	Result	Example
Distributive	Removes parentheses	$3(x + 2) = 3x + 3\times2$ $= 3x + 6$
Addition	Adds same value to both sides	$3x - 6 = 21$ $+6 = +6$ $3x = 27$
Subtraction	Subtracts same value from both sides	$4x + 7 = 23$ $-7 = -7$ $4x = 16$
Multiplication	Multiplies both sides by the same value	$\frac{1}{2} x = 8$ $2(\frac{1}{2} x = 8)$ $x = 16$
Division	Divides both sides by the same value	$4x = 16$ $\frac{4x}{4} = \frac{16}{4}$ $x = 4$
Before you can use the properties of equality (except for distribution), we may need to combine like terms (CLT):		
CLT	Group variables and numbers on each side of equation together	$3x - 9 + 2x - 8 = 23$ $5x - 17 = 23$

Find the unknown variable usually involves application of several of the properties of above to get the solution.

<u>Common mistakes:</u>
Combine variables and numbers
Not using the opposite to eliminate a term:
add to remove negative;
subtract to remove positive;
divide to remove the coefficient in front of the variable)

Equation Review

Basic Concept:

We want to work the equation by canceling out things on both sides (by using the properties of equality) until we get it into the final form:

variable = number (our final answer!!)

Example:

$\frac{1}{2}x^2 + 3x - 9 = 3x - 1$	Original Equation
$2(\frac{1}{2}x^2 + 3x - 9 = 3x - 1)$	Get rid of fraction (×2 both sides)
$x^2 + 6x - 18 = 6x - 2$	Result
$-6x \quad -6x$	Subtract 6x from both sides
$x^2 - 18 = -2$	Result
$+18 \quad +18$	Add 18 to both sides
$x^2 = 16$	Result
$\sqrt{x^2} = \sqrt{16}$	Take square root of both sides
$x = 4$	Final answer

Properties of Equality:

We can add the same thing to both sides of the "=" sign: (x below)

$2x^2 - x = 8 - x \rightarrow 2x^2 - x + x = 8 - x + x \rightarrow 2x^2 = 8$

We can subtract the same thing from both side of the "=" sign: (3x below)

$5x^2 + 3x = 5 + 3x \rightarrow 5x^2 + 3x - 3x = 5 + 3x - 3x \rightarrow 5x^2 = 5$

We can multiply both sides of the "=" sign by the same thing: (2 below)

$\frac{1}{2}x + 5 = 9 \rightarrow 2\times(\frac{1}{2}x + 5 = 9) \rightarrow x + 10 = 18$

We can divide both sides of the "=" sign by the same thing: (12x below)

$12x^2 + 24x = 48x \rightarrow (12x^2 + 24x = 48x) \div 2x \rightarrow x + 2 = 4$

Advanced Equality Concepts (seen later in AFDA):

We can take the square root of both sides of the "=" sign:

$x^2 = 4 \rightarrow \sqrt{x^2} = \sqrt{4} \rightarrow x = 2$

We can take the logarithm of both sides of the "=" sign:

$y = x^2 \rightarrow \log y = \log (x^2)$

We can make both sides of the "=" sign an exponent of the same base:

$y = x - 2 \rightarrow e^y = e^{(x-2)}$

We can "undo" all of the above as well:

We can square both sides of the "=" sign:

$\sqrt{x} = 3 \rightarrow (\sqrt{x})^2 = (3)^2 \rightarrow x = 9$

We can get rid of the logarithms on both sides of the "=" sign: [Caution]

$\log 3 = \log x \rightarrow 3 = x$

We can get rid of the same base on both sides of the "=" sign: [Caution]

$e^{2x-1} = e^x \rightarrow 2x - 1 = x$