3-4 Solving Multi-Steppers

What happens when a have the variable on both sides of the equation?

$$8x + 2 = 3x - 13$$
$$-3x \qquad -3x$$
$$5x + 2 = -13$$
$$-2 \quad -2$$
$$\frac{5x}{5} = \frac{-15}{5}$$
$$x = -3$$

I decided to move my variables all to the left side of the equal sign, but you could have moved them to the right side instead.

We need to isolate the variable, but first they need to be on the same side.

Let's move the $3x$ to the left side

How? By subtracting it from both sides.

Then the equation becomes a two-stepper.

How do we handle fractions? Well we can deal with them as we go along or we can deal with them in the very beginning

Here's what I mean

Example: $\frac{x}{8} + \frac{3}{4} = 6 + \frac{x}{2}$

$2 = 2, 4, 6, (8), 10$
$4 = 4, (8), 12, 16$
$8 = (8), 16, 24, 32$

Let's x both sides by 8.

I was finding the LCM of the denominators here.

$$8\left(\frac{x}{8} + \frac{3}{4}\right) = 8\left(6 + \frac{x}{2}\right)$$

Distribute

$$8\left(\frac{x}{8}\right) + 8\left(\frac{3}{4}\right) = 8(6) + 8\left(\frac{x}{2}\right)$$

Sometimes it's easier to multiply both sides by the same thing to eliminate the fractions. What is that number? It's the LCM

$$x + 6 = 48 + 4x$$
$$-4x \qquad -4x$$

← now we have an equation that's easy

$$-3x + 6 = 48$$
$$-6 \quad -6$$
$$\frac{-3x}{-3} = \frac{42}{-3}$$
$$\boxed{x = -14}$$

Book examples
pg 139
30, 31, 32

3-5 Solving Equations with the distributive Property and Combining Like terms

At times an equation will have the distributive Property in it that needs to be dealt with first.

Remember the distributive property:

$$a(b+c) = ab + ac$$

Well another equation might look like this

$$3(x-8) = 24$$

There are actually two ways to deal with this problem

I prefer this method, but you use the one you're most comfortable with.

Option #1

$3(x-8) = 24$

$3x - 24 = 24$

$+24 \quad +24$

$\frac{3x}{3} = \frac{48}{3}$

$\boxed{x = 16}$

Option #2

$\frac{3(x-8)}{3} = \frac{24}{3}$

$x - 8 = 8$

$+8 \quad +8$

$\boxed{x = 16}$

★Notice in option #2 I divided both sides by 3 first. I can do that because technically $3(x-8)$ is the same as $3 \cdot (x-8)$

Some equations will require you to <u>combine like terms</u> first. Remember that we can only combine terms that are on the same side of the equal sign.

Example: $8x - 2 + x + 4 = 29$

$9x + 2 = 29$

$-2 \quad -2$

$\frac{9x}{9} = \frac{27}{9}$

$x = 3$

3.6 Using Formulas and Literal Equations

Definitely know this secion well.

An equation that involves two or more variables is a literal equation. Your job, usually, will be to solve the equation for one of the variables.

All other variables must move to the other side of the equal sign. The methods used to solve these equations are the same methods you use to solve all equations.

To me, formulas and literal equations are the most important part of Algebra.

Here is an example(s).

#1. $ax + b = c$ Solve for x

$-b \quad -b$ First move b

$\frac{ax}{a} = \frac{c-b}{a}$ Divide both sides by a

$x = \frac{c-b}{a}$

#2 $A = \frac{1}{2}bh$ ← recognize ??

$\frac{A}{b} \quad \frac{A}{b}$ Solve for h.

$\frac{2}{1}\left(\frac{A}{b}\right) = \left(\frac{1}{2}h\right)\frac{2}{1}$ Multiply by $\frac{2}{1}$ or divide by $\frac{1}{2}$

$\frac{2A}{b} = h$

#3 Shoe size and foot length are related by the formula:

$S = 3F - 24$ where S = Shoe size, F = foot length (inches)

Solve for F

$S = 3F - 24$

$+24 \quad +24$

$\frac{S+24}{3} = \frac{3F}{3}$

$\boxed{\frac{S+24}{3} = F}$