Chapter 1.1
Linear Equations

When solving an equation, the goal is to get the variable, or letter on one side, and everything else on the other side.

1.) Solve the following equation.

$2x + 4 = 0$

$2x + 4 = 0$
$-4 \quad -4$
$\frac{2x}{2} = \frac{-4}{2}$
$x = -2$

* First, we move the number on the left side of the equal sign to the right, by doing the opposite.
* Since the 4 is added, we will do the opposite, so we will subtract it from both sides.
* Then to get X by itself, we will divide both sides by the number in front of X.

2.) Solve the equation.

$3x - 2 = 0$

$3x - 2 = 0$
$+2 \quad +2$
$\frac{3x}{3} = \frac{2}{3}$
$x = \frac{2}{3}$

* First, we will move the number on the left side to the right side. Since the number on the left is subtraction, we will do the opposite and add the number to both sides.
*. Then to get the X by itself, we will divide both sides by the number in front of X.

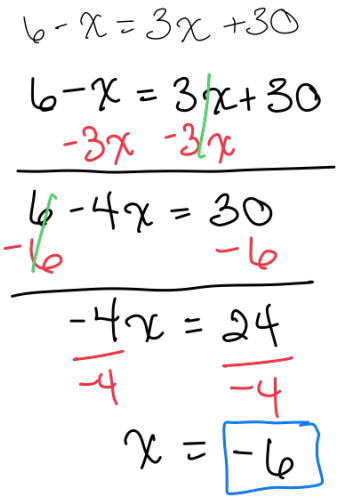
3.) Solve the equation.

$5t - 8 = 34 - t$

$5t - 8 = 34 - t$
$+t \qquad +t$
$6t - 8 = 34$
$+8 \quad +8$
$\frac{6t}{6} = \frac{42}{6}$
$t = 7$

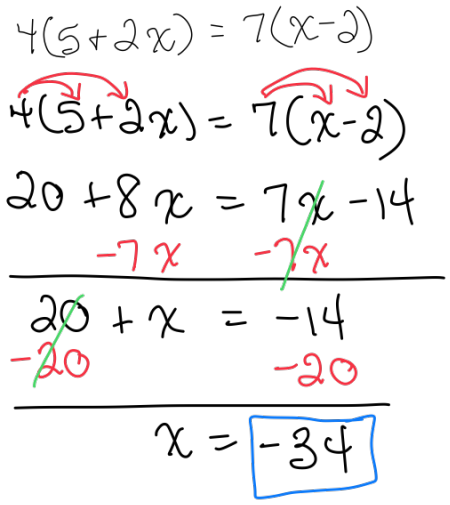
* The goal is to get the letter on one side and every thing else on the other side.
* First we will move the t's on the right side to the left. Since it is subtraction, we will do the opposite and add it to both sides.
* Then we will move the number on the left side to the right by doing the opposite. Since it is subtraction. We will do the opposite and add it to both sides.
* Then to get X by itself, we will divide both sides by the number in front of X.

4.) Solve the following equation.



* The goal is to get the X on one side and everything else on the other side.
* First, we move the X's on the right side to the left by doing the opposite. Since it is addition, we will subtract it from both sides.
* Next we will move the number on the left side to the right side by doing the opposite. Since it is additions, we will do the opposite and subtract it from both sides.
* Then to get X by itself, we divide both sides by the number in front of X.

5.) Solve the equation.



* First we must use the distributive property to get rid of the parentheses. To do this, on the left side, we multiply the term outside the parentheses by both terms inside the parentheses. Then we do the same thing on the right side of the parentheses.
* Now we will move the X 's to the left side by doing the opposite, so we will subtract it from both sides.
* Then to get X by itself on the left side, we will move the number to the right side by doing the opposite. Since it is added, we will subtract it from both sides.

6.) Solve the equation.

$2x-(3x+4)=5x-16$

$2x-(3x+4)=5x-16$

$2x+(-3x)-4=5x-16$

$-1x-4=5x-16$

$-5x \quad -5x$

$-6x-4=-16$

$+4 \quad +4$

$-6x=-12$

$\div 6 \quad \div 6$

$x=2$

* First, because there is a minus sign outside the set of parentheses, we must distribute that to each term inside the parentheses. To do this, we will change the sign of each term inside the parentheses to its opposite.
* Then we will combine like terms on the left side. (Here it is the X's.)
* Then we will move the X's from the right side to the left, by doing the opposite. It was addition, so we will subtract the X's on both sides.
* Then we will move the number on the left to the right by doing the opposite. Since it was subtraction, we will add it to both sides.
* Then to get X by itself, we will divide both sides by the number in front of X.

7.) Solve the equation.

$(x+7)(x-2)=(x+1)^2$

$(x+7)(x-2)=(x+1)^2$

$x^2-2x+7x-14=(x+1)^2$

$x^2+5x-14=(x+1)^2$

$x^2+5x-14=(x+1)(x+1)$

$x^2+5x-14=x^2+1x+1x+1$

$x^2+5x-14=x^2+2x+1$

$-x^2 \quad -x^2$

$5x-14=2x+1$

$-2x \quad -2x$

$3x-14=1$

$+14 \quad +14$

$3x=15$

$\div 3 \quad \div 3$

$x=5$

* First we must use the distributive property to get rid of the parentheses on the left side. To do this, we multiply the 1st term in the 1st set of parentheses by each term in the 2nd set of parentheses. Then you multiply the 2nd term in the 1st set of parentheses by each term in the 2nd set of parentheses.
* Now we will combine like terms on the left side. In this case it is the X's.
* Now on the right side. When you see something in ( ) that is squared, that just means to write down exactly what is in the ( ) 2 times and multiply them together.
* You will again use the distributive property to multiply the two together per previous instructions.
* Then combine like terms on the right side.
* Now we will move the ~~3~~X 's on the right side to the left side by doing the opposite. Here it was added so we subtract it from both sides. This will actually cancel out both sides.
* Then we move the X's on the right to the left by doing the opposite. Since they were add, we will subtract from both sides.
* Then we will move the number to the left to the right by doing the opposite. Since it was subtraction, we will add it to both sides.
* Then to get X by itself, we will divide both sides by the number in front of X.

8.) Solve the equation.

$x(3x-9) = (3x+9)(x-9)$

$x(3x-9) = (3x+9)(x-9)$

$3x^2 - 9x = 3x^2 - 27x + 9x - 81$

$3x^2 - 9x = 3x^2 - 18x - 81$

$-3x^2 \quad -3x^2$

$-9x = -18x - 81$

$+18x \quad +18x$

$9x = -81$

$\frac{9x}{9} = \frac{-81}{9}$

$x = \boxed{-9}$

* First we must use the distributive property to get rid of the parentheses. To do this, on the left side, we multiply the term outside the parentheses by both terms inside the parentheses. On the right side, we multiply the 1st term in the 1st set of parentheses by each term in the 2nd set of parentheses. Then you multiply the 2nd term in the 1st set of parentheses by each term in the 2nd set of parentheses
* Now we combine any like terms on each side of the equal sign.
* Now we will move the X^2s to the left side by doing the opposite, so we will subtract it from both sides. This will actually cause them to cancel out on both sides.
* Then we move the X's on the left to the right by doing the opposite, so we will add it to both sides.
* Then to get X by itself, we will divide both sides by the number in front of X.

9. Solve the equation.

$\frac{7}{4x-1} = \frac{2}{x+4}$

$\frac{7}{4x-1} = \frac{2}{x+4}$

$7 \cdot (x+4) = 2 \cdot (4x-1)$

$7x + 28 = 8x - 2$

$-8x \quad -8x$

$-1x + 28 = -2$

$-28 \quad -28$

$-1x = -30$

$\frac{-1x}{-1} = \frac{-30}{-1}$

$x = \boxed{30}$

* Since we have 2 fractions equal to each other, we can cross multiply.
* To do this, we multiply the top number on the left side by the bottom number on the right side.
* Then we multiply the top number on the right side by the bottom number on the left side.
* Now we will use the distributive property on both sides to get rid of the parentheses. We do this my multiplying the term outside the parentheses by each term inside the parentheses.
* Then we will move the X's to the left side by doing the opposite, so we will subtract them from both sides.
* Then we will move the numbers to the right side by doing the opposite, so we will subtract them from both sides.
* Then, since we still have a -1 in front of the X, we will divide both sides by that -1

10.) Solve the equation.

$$\frac{6t+4}{6t-5} = \frac{2t+7}{2t-3}$$

$$\frac{6t+4}{6t-5} = \frac{2t+7}{2t-3}$$

$$(6t+4)(2t-3) = (2t+7)(6t-5)$$

$$12t^2 - 18t + 8t - 12 = 12t^2 - 10t + 42t - 35$$

$$12t^2 - 10t - 12 = 12t^2 + 32t - 35$$

$$-12t^2 \qquad -12t^2$$

$$-10t - 12 = +32t - 35$$

$$-32t \qquad -32t$$

$$-42t - 12 = -35$$

$$+12 \qquad +12$$

$$-42t = -23$$

$$-42 \qquad -42$$

$$t = \boxed{\frac{23}{42}}$$

* Since we have 2 fractions equal to each other, we can cross multiply.
* To do this, we multiply the expression on the top on the left side by the bottom expression on the right side.
* Then we multiply the expression on the top on the right side by the expression on the bottom on the left side.
* Now we will use the distributive property on both sides of the equation.

* We multiply the 1st term in the 1st set of parentheses by each term in the 2nd set of parentheses. Then you multiply the 2nd term in the 1st set of parentheses by each term in the 2nd set of parentheses
* Then we will combine like terms on both sides of the equal sign.
* Now we move the t^2's to the left side by doing opposite. This will cause them to cancel put on both sides.
* Now we move the t's from the right to the left by doing the opposite. So we subtract them from both sides.
* Now we move the number on the left to the right by doing the opposite. So we add it to both sides.
* Now to get t by itself, we will divide both sides by the number in front of t.
* Now sine you have a negative divided by a negative, the answer will be positive.