Please write the following in you notebook.

We just learned factoring and one of the purposes of factoring is to solve equations that have $\boldsymbol{x^2}$ or $\boldsymbol{x}$ to a higher power. Equations with a higher exponent than one require factoring or some other method to obtain a solution. We will spend the next few sessions solving quadratic equations. These are equations with an x^2 in them. Read over section 8.1 put each of the purple boxes in your notes and study other boxes and examples very carefully. Please write all of these notes in your notebook.

General Form of a Quadratic Equation
$\mathbf{a}x^2 + \mathbf{b}x + \mathbf{c} = \mathbf{0}$, where **a, b** and **c** are real numbers and $a \neq 0$.

We will learn three methods to solve a quadratic equation:
1. Factoring Method
2. Square Root Method
3. Quadratic Formula Method

Steps to Solve Equations by Factoring
1. Write out problem.
2. If all terms are not on the left side of equation, use properties of equality to make sure all terms are on left side.
3. Factor left side if not factored or if partially factored.
4. On line after factoring, take each factor with a variable and set it = to 0 and make little equations.
5. Put the word **or** between the equations and solve each equation.
6. Check all values and if they check write, "Solution: { ___ , ___ }."
7. If values do not check find errors.

Example 1: for Solve by Factoring:

$x^2 + 13x = -36$	All terms not on left side so add 36 to each side.
$x^2 + 13x + 36 = -36 + 36$	
$x^2 + 13x + 36 = 0$	All terms now on left side so factor.
$(x + 9)(x + 4) = 0$	
	Make "little" equations with each factor and set each factor
$x + 9 = 0$ or $x + 4 = 0$	equal to zero. We can do this based on Zero-Product Principle
$x + 9 - 9 = 0 - 9$ or $x + 4 - 4 = 0 - 4$	found in the book.
$x = -9$ or $x = -4$	
	Solve each of these little equations.

Check: $x^2 + 13x = -36$ for $x = -9$, and $x = -4$.

$(-9)^2 + 13(-9) \stackrel{?}{=} -36$
$81 - 117 \stackrel{?}{=} -36$
$-36 = -36$

$(-4)^2 + 13(-4) \stackrel{?}{=} -36$
$16 - 52 \stackrel{?}{=} -36$
$-36 = -36$

Solution: {– 9, – 4}.

For worded problems in this chapter there will now be quadratic equations. Here is an example.

A rectangle has a length that is 3ft longer than its width. The area of the rectangle is 18ft. Find the width and length.

We will first define the variable information and start with the information which is the most unknown. The width is the most unknown..

Let x = the width of the rectangle in ft.
Let $x + 3$ = the length of the rectangle in ft.

(Note: Area of a rectangle is length times width so we will set up an equation.)

length width area

$(x + 3)(x) = 18$

Now we will solve the equation.

$(x + 3)\ x) = 18$
$x^2 + 3x = 18$
$x^2 + 3x - 18 = 0$
$(x + 6)(x - 3) = 0$

$x + 6 = 0$	or	$x - 3 = 0$
$x + 6 - 6 = 0 - 6$	or	$x - 3 + 3 = 0 + 3$
$x = -6$	or	$x = 3$

We are finding a dimension so the negative value is not used. We only use the positive 3.

Since x is 3, that is the width in feet, then the length is $x + 3$ which will be 6, the length in feet.

We will summarize with a sentence.

The width of the rectangle is three feet and the length of the rectangle is six feet.