Put the following notes in your notebook:

Methods to solve a quadratic equation:

1. Factoring [Limited because it can only be used on polynomials that can be factored.]
2. Square Root Property [Limited to only equations in the form of $\boldsymbol{ax^2 = c}$ or $\boldsymbol{(px + h)^2 = k}$]
3. Quadratic Formula [Can be used to solve any quadratic equation.]

Steps to Solve a Quadratic Equation using the Quadratic Formula Method

1. Write out original problem.

2. Set up equation in general form of:
   $ax^2 + bx + c = 0$. Use zeros as placeholders if needed so that there are always three terms on the left side.

3. Write down the quadratic formula and the constants to be substituted:

   $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$; $a =$ __, $b =$ __, $c =$ __.

4. Substitute using ( ) for the variables ***a***, ***b*** and ***c***.

5. Simplify fraction and the square root term.

6. Once the fraction is simplified and a $\sqrt{\ }$ remains in the fraction, see if you can factor and cancel.

7. If there is a perfect square and the $\sqrt{\ }$ **<u>does not</u>** remain in the fraction, split up fraction into two fractions by splitting at the <u>±</u> sign and then simplify each fraction.

Example 1: Solve $3x^2 + 2x - 6 = 0$, using the quadratic formula.

$3x^2 + 2x - 6 = 0$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$; $a = 3,\ b = 2,\ c = -6$

$x = \dfrac{-(2) \pm \sqrt{(2)^2 - 4(3)(-6)}}{2(3)}$

$x = \dfrac{-2 \pm \sqrt{4 + 72}}{6}$

$x = \dfrac{-2 \pm \sqrt{76}}{6}$

$x = \dfrac{-2 \pm \sqrt{4}\sqrt{19}}{6}$

$x = \dfrac{-2 \pm 2\sqrt{19}}{6}$

$x = \dfrac{\cancel{(2)}(-1 \pm 1\sqrt{19})}{\cancel{(2)}(3)}$

$x = \dfrac{-1 \pm \sqrt{19}}{3}$

Note: We do similar factoring to GCF method in numerator. You can view the numerator as:

-2 + 2x

And we would factor as:

2(-1 + x)

The solution set is $\left\{\dfrac{-1 \pm \sqrt{19}}{3}\right\}$.

Example 2: Solve $3x^2 + 10x = 8$, using the quadratic formula.

Steps for Solving	**Notes**
$3x^2 - 10x = 8$	Equation is not in standard form of $ax^2 + bx + c = 0$, so it has to be modified.
$3x^2 - 10x - 8 = 8 - 8$	
$3x^2 - 10x - 8 = 0$	
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$; $a = 3,\ b = -10,\ c = -8$	
$x = \dfrac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(-8)}}{2(3)}$	
$x = \dfrac{10 \pm \sqrt{100 - 12(-8)}}{6}$	
$x = \dfrac{10 \pm \sqrt{100 + 96}}{6}$	
$x = \dfrac{10 \pm \sqrt{196}}{6}$	
$x = \dfrac{10 \pm 14}{6}$	There is a perfect square so the square root can be simplified. The fraction can be split into two fractions.
$x = \dfrac{10 + 14}{6}$ or $x = \dfrac{10 - 14}{6}$	
$x = \dfrac{24}{6}$ or $x = \dfrac{-4}{6}$	
$x = 4$ or $x = -\dfrac{4}{6}$	
$x = 4$ or $x = -\dfrac{2}{3}$	

The solution set is $\left\{4, \dfrac{2}{3}\right\}$.