MATHEMATICS 101

SOLVING QUADRATIC EQUATION

1) Factor and use the zero product rule

• if $ab = 0$, then $a = 0$ or $b = 0$

• simplest method but works only if you can factor

2) Use the square root property

• if $x^2 = k$ then $x = \sqrt{k}$ or $x = -\sqrt{k}$

• if the equation is of the form $ax^2 + c = 0$, use the square root property directly.

• if the equation is of the form $ax^2 + bx + c = 0$, you may complete the square by:
—divide both sides by a to make the leading coefficient 1
—isolate the variable terms on one side of the equation
—complete the square (add the square of one-half the linear term coefficient to both sides of the equation. Then factor the resulting square trinomial)

• this technique is simple if $a = 1$ and b is even

3) Use the quadratic formula

- for a quadratic equation of the form $ax^2 + bx + c = 0$ $(a \neq 0)$ the solutions are
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
- $b^2 - 4ac$ is called the discriminant

- if $b^2 - 4ac > 0$, there will be two real solutions
- if $b^2 - 4ac < 0$, there will be no real solution (only two imaginary solutions)
- if $b^2 - 4ac = 0$, there will be one real solution

- the quadratic formula can be used in all cases