

Name:

Date:

Period:

The Quadratic Formula

The general form of any quadratic equation is $ax^2 + bx + c = 0$ where $a \neq 0$. The quadratic formula can be used for finding the roots of any quadratic equation.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- (1) Always make sure your equation is in standard form
- (2) Identify a, b and c.
- (3) Substitute into the formula and solve. (Be careful of integer signs AND **USE PARENTHESIS!!!!!!!**)
- (4) Write the two roots as **separate** answers (Not as an ordered pair).

**For irrational answers, leaving the \pm is acceptable. For example, $x = \frac{5 \pm \sqrt{7}}{6}$ would be an accepted answer.

Solve each example on the back using the quadratic formula. Write your answers in simplest radical form.

1. Solve $x^2 + 2x - 1 = 0$ by using the quadratic formula.

2. Solve $x^2 - 5x - 36 = 0$ by using the quadratic formula.

3. Solve $3x^2 + 2x - 3 = 0$ by using the quadratic formula.

4. Solve $2x^2 + 7x = 9$ by using the quadratic formula.

The Discriminant

By evaluating the part of the quadratic formula under the radical sign, $b^2 - 4ac$, called the discriminant, you can determine the number of real solutions a quadratic equation will have. A quadratic can have two, one or no real solutions.

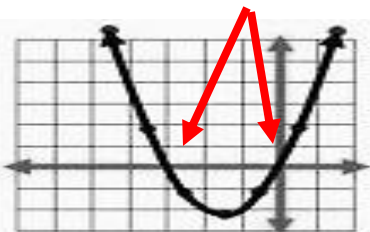
If $b^2 - 4ac > 0$,
the equation has **2** real solutions

$$x^2 - 4x + 3 = 0$$

$a = 1 \quad b = -4 \quad c = 3$

$$b^2 - 4ac$$
$$(-4)^2 - 4(1)(3)$$
$$16 - 12 = 4$$

Since $b^2 - 4ac > 0$, the equation will have 2 real solutions (2 real solutions means the parabola will intercept the x-axis at **2 different points**)



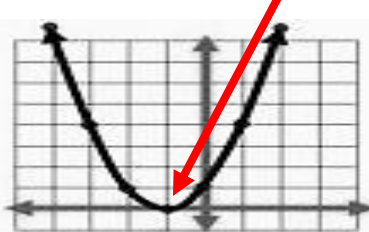
If $b^2 - 4ac = 0$,
the equation has **1** real solution

$$x^2 + 2x + 1 = 0$$

$a = 1 \quad b = 2 \quad c = 1$

$$b^2 - 4ac$$
$$(2)^2 - 4(1)(1)$$
$$4 - 4 = 0$$

Since $b^2 - 4ac = 0$, the equation will have 1 real solution. (1 real solution means the parabola will intercept the x-axis only **ONCE**)



If $b^2 - 4ac < 0$,
the equation has **no** real solutions

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

$a = 1 \quad b = -2 \quad c = 2$

$$b^2 - 4ac$$
$$(-2)^2 - 4(1)(2)$$
$$4 - 8 = -4$$

Since $b^2 - 4ac < 0$, the equation will have no real solutions. (0 real solution means the parabola will **NOT** intercept the x-axis)

