The Discriminant and the Quadratic Formula with

Main Ideas/Questions	Notes/Examples
THE DISCRIMINANT	$$b^2 - 4ac$$ The expression under the radial symbol in the quadratic formula. It is used to determine the number of solutions for a quadratic equation. If $b^2 - 4ac > 0$, then there are __2__ solutions. If $b^2 - 4ac = 0$, then there are __1__ solutions. If $b^2 - 4ac < 0$, then there are __0__ solutions.
EXAMPLES	**Directions:** Use the discriminant to determine the number of solutions.

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1. $x^2 + 5x + 4$

   $a = 1,\ b = 5,\ c = 4$

   $5^2 - 4(1)(4)$

   $25 - 16 = +9$

   Number of Solutions __2__

2. $x^2 - 3x + 10$

   $a = 1,\ b = -3,\ c = 10$

   $(-3)^2 - 4(1)(10)$

   $9 - 40 = -31$

   Number of Solutions __0__

3. $4x^2 - 12x + 9$

   $a = 4,\ b = -12,\ c = 9$

   $(-12)^2 - 4(4)(9)$

   $144 - 144 = 0$

   Number of Solutions __1__

4. $2x^2 - 4x - 3$

   $a = 2,\ b = -4,\ c = -3$

   $(-4)^2 - 4(2)(-3)$

   $16 + 24 = +40$

   Number of Solutions __2__

5. $-x^2 - 5$

   $a = -1,\ b = 0,\ c = -5$

   $0^2 - 4(-1)(-5)$

   $0 - 20 = -20$

   Number of Solutions __0__

6. $2x^2 + 9x$

   $a = 2,\ b = 9,\ c = 0$

   $9^2 - 4(2)(0)$

   $+81$

   Number of Solutions __2__

THE QUADRATIC FORMULA	Directions: Solve each equation using the quadratic formula. Write the solutions in simplest radical form.	
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ **PRACTICE WITH RADICAL SOLUTIONS**	**1.** $x^2 + 2x = 3 - 2x$ $x^2 + 4x - 3 = 0$ $a = 1, \ b = 4, \ c = -3$ $x = \dfrac{-4 \pm \sqrt{4^2 - 4(1)(-3)}}{2(1)}$ $x = \dfrac{-4 \pm \sqrt{28}}{2} = \dfrac{-4 \pm 2\sqrt{7}}{2}$ $x = \dfrac{-4 + 2\sqrt{7}}{2}, \quad x = \dfrac{-4 - 2\sqrt{7}}{2}$ $\quad = -2 + \sqrt{7} \qquad\quad = -2 - \sqrt{7}$	**2.** $-x^2 + 7x - 18 = 0$ $a = -1, \ b = 7, \ c = -18$ $x = \dfrac{-7 \pm \sqrt{7^2 - 4(-1)(-18)}}{2(-1)}$ $x = \dfrac{-7 \pm \sqrt{-23}}{-2}$ No real solution
	3. $2x^2 - 8x - 2 = 3$ $2x^2 - 8x - 5 = 0$ $a = 2, \ b = -8, \ c = -5$ $x = \dfrac{8 \pm \sqrt{(-8)^2 - 4(2)(-5)}}{2(2)}$ $x = \dfrac{8 \pm \sqrt{104}}{4} = \dfrac{8 \pm 2\sqrt{26}}{4}$ $x = \dfrac{4 + \sqrt{26}}{2}, \quad x = \dfrac{4 - \sqrt{26}}{2}$	**4.** $10x^2 - 19 = 5$ $a = 10, \ b = 0, \ c = -24$ $x = \dfrac{0 \pm \sqrt{0 - 4(10)(-24)}}{2(10)}$ $x = \dfrac{\pm \sqrt{960}}{20} = \dfrac{\pm 8\sqrt{15}}{20}$ $x = \pm \dfrac{2\sqrt{15}}{5}$
	5. $4x^2 - 1 = 6x$ $4x^2 - 6x - 1 = 0$ $a = 4, \ b = -6, \ c = -1$ $x = \dfrac{6 \pm \sqrt{(-6)^2 - 4(4)(-1)}}{2(4)}$ $x = \dfrac{6 \pm \sqrt{52}}{8} = \dfrac{6 \pm 2\sqrt{13}}{8}$ $x = \dfrac{3 + \sqrt{13}}{4}, \quad x = \dfrac{3 - \sqrt{13}}{4}$	**6.** $2x^2 + 12x = 4 - x^2$ $a = 3, \ b = 12, \ c = -4$ $x = \dfrac{-12 \pm \sqrt{12^2 - 4(3)(-4)}}{2(3)}$ $x = \dfrac{-12 \pm \sqrt{192}}{6} = \dfrac{-12 \pm 8\sqrt{3}}{6}$ $x = \dfrac{-6 + 4\sqrt{3}}{3}, \quad x = \dfrac{-6 - 4\sqrt{3}}{3}$