Section:	**1 – 8 Use Quadratic Formula and the Discriminant**
Essential Question	How do you use the quadratic formula and the discriminant?

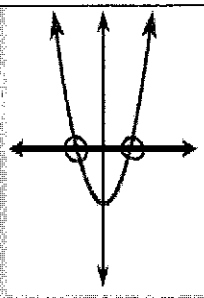
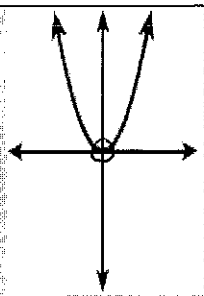
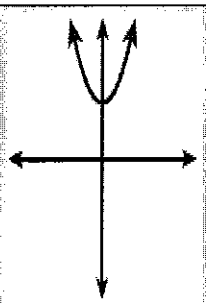
Key Vocab:

Quadratic Formula	Let a, b, and c be real numbers such that $a \neq 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ can be used to solve ANY quadratic equation in standard form $ax^2 + bx + c = 0$. **(Sing the song "Pop Goes the Weasel" to remember the quadratic formula!)**
Discriminant	Radicand of the quadratic formula: $b^2 - 4ac$.

Using the Discriminant:

Discriminant

The discriminant of the quadratic equation $ax^2 + bx + c = 0 \ (a \neq 0)$ is $b^2 - 4ac$.

$b^2 - 4ac > 0$	$b^2 - 4ac = 0$	$b^2 - 4ac < 0$
Discriminant is positive TWO REAL ROOTS	Discriminant is zero ONE REAL ROOT	Discriminant is negative TWO IMAGINARY ROOTS
		

Show:

Ex 1: Use the quadratic formula to solve.

a. $x^2-5x=7$

$a=1$, $b=-5$, $c=-7$

$x^2-5x-7=0$

Quad. Formula

$$x=\frac{-(-5)\pm\sqrt{(-5)^2-4(1)(-7)}}{2(1)}$$

$$x=\frac{5\pm\sqrt{25+28}}{2}$$

$$x=\boxed{\frac{5\pm\sqrt{53}}{2}}$$

b. $x^2-6x+10=0$

$a=1$, $b=-6$, $c=10$

Quad. Formula

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4(1)(10)}}{2(1)}$$

$$x=\frac{6\pm\sqrt{36-40}}{2}$$

$$x=\frac{6\pm\sqrt{-4}}{2}=\frac{6\pm\sqrt{4}i}{2}$$

$$x=\frac{6\pm 2i}{2}=\boxed{3\pm i}$$

c. $16x^2-23x=17x-25$

$+25 \quad -17x \quad -17x \quad +25$

$16x^2-40x+25=0$

$a=16$, $b=-40$, $c=25$

Quad. Formula

$$x=\frac{-(-40)\pm\sqrt{(-40)^2-4(16)(25)}}{2(16)}$$

$$x=\frac{40\pm\sqrt{1600-1600}}{32}=\frac{40\pm 0}{32}$$

$$x=\frac{40}{32}=\boxed{\frac{5}{4}}$$

Ex 2: Find the discriminant of the quadratic equation. Use the discriminant to determine the number of solutions for the equation.

a. $x^2+10x+23=0$

$a=1$, $b=10$, $c=23$

$D=b^2-4ac$

$D=(10)^2-4(1)(23)$

$D=100-92$

$\boxed{D=8}$

(positive)

TWO REAL ROOTS

b. $x^2+10x+25=0$

$a=1$, $b=10$, $c=25$

$D=b^2-4ac$

$D=(10)^2-4(1)(25)$

$D=100-100$

$\boxed{D=0}$

(zero)

ONE REAL ROOTS

c. $x^2+10x+27=0$

$a=1$, $b=10$, $c=27$

$D=b^2-4ac$

$D=(10)^2-4(1)(27)$

$D=100-108$

$\boxed{D=-8}$

(negative)

TWO IMAGINARY ROOTS

Ex 3: For an object that is launched or thrown the equation $h = -16t^2 + v_0 t + h_0$, where v_0 stands for an initial velocity and h_0 stands for the initial height. A basketball player passes the ball to a teammate. The ball leaves the player's hand 5 feet above the ground and has an initial vertical velocity of 55 feet per second. The teammate catches the ball when it returns to a height of 5 feet. How long is the ball in the air?

$h = -16t^2 + V_0 t + h_0$

$5 = -16t^2 + 55t + 5$

$-5 \qquad\qquad -5$

$0 = -16t^2 + 55t + 0$

$a = -16$

$b = 55$

$c = 0$

Quad. Formula

$$x = \frac{-(55) \pm \sqrt{(55)^2 - 4(-16)(0)}}{2(-16)}$$

$$x = \frac{-55 \pm \sqrt{3025 - 0}}{-32} = \frac{-55 \pm \sqrt{3025}}{-32}$$

$$x = \frac{-55 \pm 55}{-32}$$

$$x = \frac{-55 + 55}{-32} = \frac{0}{-32} = 0 \text{ seconds}$$

$$x = \frac{-55 - 55}{-32} = \frac{-110}{-32} = \boxed{3.4 \text{ seconds}}$$