Warm Up:

Solve $\frac{3x^2 + 10x + 21}{3} = \frac{0}{3}$ by *completing the square.*

$\frac{1}{2}\left(\frac{10}{3}\right) = \frac{5}{3}$

$\left(\frac{5}{3}\right)^2 = \frac{25}{9}$

$x^2 + \frac{10}{3}x + 7 = 0$

$x^2 + \frac{10}{3}x + \frac{25}{9} = -7 + \frac{25}{9}$

$\sqrt{\left(x + \frac{5}{3}\right)^2} = \pm\sqrt{-\frac{38}{9}}$

$x + \frac{5}{3} = \pm\frac{\sqrt{38}}{3}i$

$x = -\frac{5}{3} \pm \frac{\sqrt{38}}{3}i$

Quadratic Formula ✳

- used to solve any quadratic equation (factorable or not)
- required to solve for imaginary & irrational solutions

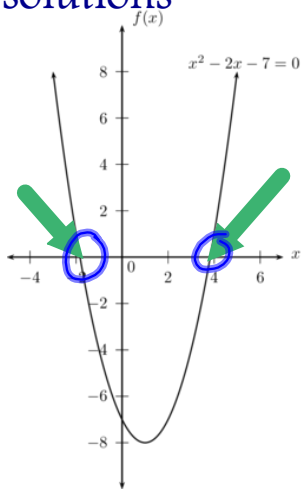
When asked to solve a quadratic, you're being asked to find the **roots/ x- intercepts/ zeros of the function**

Quadratic Formula:

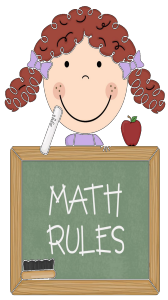
For $ax^2 + bx + c = 0$,

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

MathBits.com



As you may recall from Algebra, the **Quadratic Formula** can be found on your reference sheet...



With a partner, solve for x:

$x^2 - 2x = 7$

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

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

$a = 1 \quad b = -2 \quad c = -7$

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

$x = \frac{2 \pm \sqrt{32}}{2}$

$\sqrt{32}$
$\sqrt{16 \cdot 2}$
$4\sqrt{2}$

$x = \frac{2 \pm 4\sqrt{2}}{2}$

$x = \frac{2}{2} \pm \frac{4\sqrt{2}}{2}$

$= 1 \pm 2\sqrt{2}$

Determing the Nature of the Roots

discriminant - part under Radical

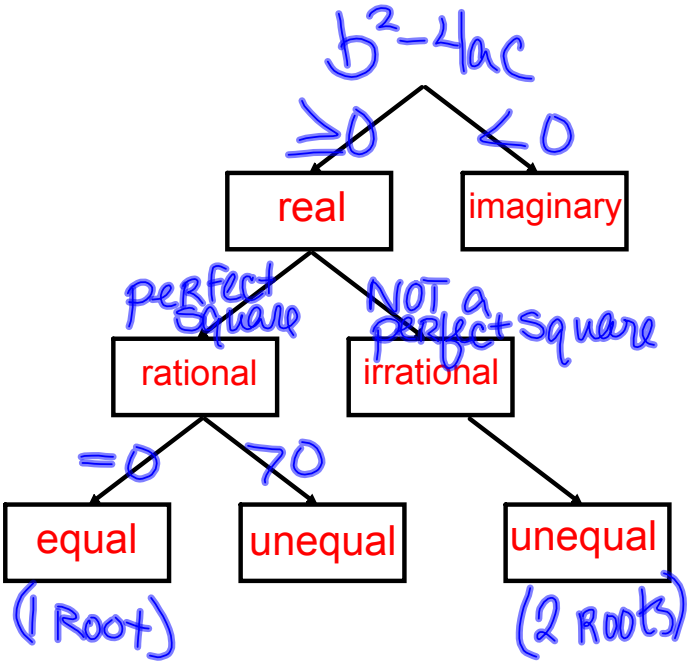
b^2-4ac

nature of the roots

Real vs. complex
Rational vs. irRational
one vs. two Roots

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

When the discriminant is:	The roots are:	The number of roots is:	Picture:	~~Example:~~
>0 (pos) + perfect square	• Real • Rational • unequal	2		
>0 NOT a perfect square	• Real • irRational • unequal	2		
=0	• Real • Rational • equal	1		$x^2+6x+9=0$ $(x+3)(x+3)$
<0 (neg)	imaginary (complex)	0		



Homework: p. 196 #11-12, p. 219 #11-12

Developing Skills

In 3–14, use the quadratic formula to find the roots of each equation. Irrational roots should be written in simplest radical form.

11. $3x^2 - 5x + 2 = 0$

12. $4x^2 - x - 1 = 0$

Developing Skills

In 3–14, use the quadratic formula to find the imaginary roots of each equation.

11. $4x^2 + 4x + 17 = 0$

12. $x^2 + 5 = 4x$

$X^2-4X+5=0$