Solving Quadratics by Quadratic Formula

MGSE9-12.A.REI.4 Solve quadratic equations in one variable.

MGSE9–12.A.REI.4b Solve quadratic equations by inspection (e.g., for x 2 = 49), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions). Build a function that models a relationship between two quantities.

What am I learning today?

How to solve a quadratic using the quadratic formula and square-roots

How will I show that I learned it?

Use factoring, the quadratic formula, or square-roots to solve a quadratic

$$x^2 + 5x + 8 = 0$$

$a = 1 \quad b = 5 \quad c = 8$

$b^2 - 4ac$

$(5)^2 - 4(1)(8) = -7$

$$x^2+5x+4=0$$

$$(x+4)(x+1)=0$$

$x+4=0$ $x+1=0$

$x=-4$ $-1\ -1$

$x=-1$

M	A
4	5
$4\cdot1$	$4+1$

$$x^2 + 5x + 4 = 0$$

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

$b^2 - 4ac =$
$(5)^2 - 4(1)(4) = 9$

2 ℝ rational roots

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

$$\frac{-b \pm \sqrt{9}}{2a} = \frac{-5 \pm \sqrt{9}}{2(1)}$$

$$= \frac{-5 \pm \sqrt{9}}{2}$$

$$\frac{-5+\sqrt{9}}{2} \qquad \frac{-5-\sqrt{9}}{2}$$

$$\frac{-5+3}{2} = \frac{-2}{2} \qquad \frac{-5-3}{2} = \frac{-8}{2}$$

$= -1$ $\qquad -4$

The Quadratic Formula is...

The answer to ALL my problems!

discriminant

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

Disclosure: Let a, b, and c be real numbers where $a \neq 0$ in an equation: $ax^2 + bx + c = 0$

Steps to using the Quadratic Formula

1. Rewrite equation in standard form.
2. Identify a, b, and c.
3. Plug a, b, and c into the formula.
4. Simplify COMPLETELY.

Ex 1. $x^2 - 5x = 4$

$-4 \quad -4$

$x^2 - 5x - 4 = 0$ 1) ✓

$a=1$
$b=-5$
$c=-4$

$(-5)^2 - 4(1)(-4) = 41$ dis. 2) ✓

3) 2 ℝ Irrational Roots

4) $\dfrac{-b \pm \sqrt{dis}}{2a}$

$\dfrac{-(-5) \pm \sqrt{41}}{2(1)}$

$\dfrac{5+\sqrt{41}}{2}$ $\qquad$ $\dfrac{5-\sqrt{41}}{2}$

ck 5.70 $\qquad$ ck −.70

$\dfrac{5 \pm \sqrt{41}}{2}$

Ex 2. $4x^2 + 10x = -10x - 25$

$+25$ $+10x$ $+10x+25$

$4x^2+20x+25=0$

$a=4$
$b=20$
$c=25$

$(20)^2-4(4)(25)=0$ dis

IR rational Root

$$\frac{-b\pm\sqrt{0}}{2a}=\frac{-20\pm\sqrt{0}}{2(4)}$$

$$\frac{-20+0}{8}=\frac{-20}{8} \qquad \frac{-20-0}{8}=\frac{-20}{8}$$

Reduce

$-\frac{5}{2}=2.5$

Ex 3. $x^2 - 6x = -10$

$+10 \quad +10$

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

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

$(-6)^2 - 4(1)(10) = -4$

No Real Solutions

Ex. 4 $4x^2 + 4x + 6 = x^2 - 2x + 1$

$-x^2 + 2x - 1 \quad -x^2 + 2x - 1$

$3x^2 + 6x + 5 = 0$

$a = 3$
$b = 6$
$c = 5$

$(6)^2 - 4(3)(5) = -24$

no Real Solutions

4. $3x^2+12x+10=0$

$a=3$
$b=12$
$c=10$

$(12)^2-4(3)(10)=24$ Dis

2 IR irrational roots

$$\frac{-b\pm\sqrt{24}}{2a}$$

$$=\frac{-12\pm2\sqrt{24}}{6}$$ 4.6

$$\frac{-12\pm2\sqrt{6}}{6}$$

$$\frac{-12+2\sqrt{6}}{6}$$

$$\frac{-6+\sqrt{6}}{3}$$

$$\frac{-12-2\sqrt{6}}{6}$$

$$\frac{-6-\sqrt{6}}{3}$$

Divide by 2 to simplify

You Try: For the following, use the discriminant to find the nature of the roots. Then, solve for any real roots. **Don't forget to set = 0!!!**

1. $x^2 - 3x + 2 = 0$
2. $2x^2 - 4x = -3$
3. $5x = 3x^2 + 1$
4. $x^2 = x + 4$
5. $8x^2 + 8 = 2x^2 + 2x + 4$
6. $3x^2 + 4 = 6x + 1$