Warm Up (2/26/18) PARCC Practice

Determine all real roots of the equation $(x+7)(x^2-49)=0$.

Set factors equal to zero.

$$\begin{aligned} x+7 &= 0 \\ -7 \quad & \; -7 \\ \hline \boxed{x = -7} \end{aligned}$$

$$\begin{aligned} x^2 - 49 &= 0 \\ +49 \quad & \; +49 \\ \hline \sqrt{x^2} &= \sqrt{49} \\ \boxed{x = \pm 7} \end{aligned}$$

Module 4: Lessons 14 and 15

The Quadratic Formula

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Solve the following quadratic equation by factoring:

$f(x) = ax^2 + bx + c$

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

$1 \cdot 5$

-5

-1 5

3

$5 - 1 = 4 \neq 3$

Non Factorable

The Quadratic Formula

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

Solve the following quadratic equation by using the quadratic formula:

$$1x^2 + 3x - 5 = 0$$

$a = 1$ $b = 3$ $c = -5$

1. Identify the values for a, b, and c.

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

$$x = \frac{-(3) \pm \sqrt{(3)^2 - 4(1)(-5)}}{2(1)}$$

2. Substitute your values for a, b, and c into the quadratic formula.

$$= \frac{-3 \pm \sqrt{9 + 20}}{2} = \frac{-3 \pm \sqrt{29}}{2}$$

3. Simplify

$$\boxed{x = \frac{-3 + \sqrt{29}}{2} \qquad x = \frac{-3 - \sqrt{29}}{2}}$$

Exercises

Solve Exercises 1–5 using the quadratic formula.

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

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

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

$= \dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(1)}}{2(1)} = \dfrac{2 \pm \sqrt{4-4}}{2}$

$= \dfrac{2 \pm \sqrt{0}}{2} \Rightarrow x = \dfrac{2 + \sqrt{0}}{2} \qquad x = \dfrac{2 - \sqrt{0}}{2}$

$= \dfrac{2}{2} = 1 \qquad \boxed{x = 1} \qquad = \dfrac{2}{2} = 1$

2. $3b^2 + 4b + 8 = 0$

$a=3 \quad b=4 \quad c=8$

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

$x = \dfrac{-(4) \pm \sqrt{(4)^2 - 4(3)(8)}}{2(3)} = \dfrac{-4 \pm \sqrt{16-96}}{6} = \dfrac{-4 \pm \sqrt{-80}}{6}$

Since we have a negative under a square root, we have no real solutions

3. $2t^2 + 7t - 4 = 0$

$a=2 \quad b=7 \quad c=-4$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \dfrac{-(7) \pm \sqrt{(7)^2 - 4(2)(-4)}}{2(2)} = \dfrac{-7 \pm \sqrt{49+32}}{4}$

$= \dfrac{-7 \pm \sqrt{81}}{4} = \dfrac{-7 \pm 9}{4} \rightarrow x = \dfrac{-7+9}{4}$ and $x = \dfrac{-7-9}{4}$

$x = \dfrac{2}{4}$ and $x = \dfrac{-16}{4}$

$\boxed{x = \frac{1}{2}}$ and $\boxed{x = -4}$

4. $q^2 - 2q - 1 = 0$

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

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)} = \dfrac{2 \pm \sqrt{4+4}}{2}$

$= \dfrac{2 \pm \sqrt{8}}{2} \Rightarrow \boxed{x = \dfrac{2 + \sqrt{8}}{2} \text{ and } x = \dfrac{2 - \sqrt{8}}{2}}$

5. $m^2 - 4 = 3$

$-3 \quad -3$

$m^2 - 7 = 0$

$1m^2 + 0m - 7 = 0$

Pg. 88 $\quad a = 1 \quad b = 0 \quad c = -7$

$ax^2 + bx + c = 0$

$m = \dfrac{-(0) \pm \sqrt{(0)^2 - 4(1)(-7)}}{2(1)}$

$x = \pm\sqrt{7}$

$= \boxed{\dfrac{\pm\sqrt{28}}{2}}$

The Discriminant

$$D = b^2 - 4ac$$

What the discriminant tells us about a quadratic...

- If the value of the discriminant is positive (+) then the quadratic will have TWO real solutions.
- If the value of the discriminant is zero (0) then the quadratic will have exactly ONE real solution.
- If the value of the discriminant is negative (-) then the quadratic will have NO real solutions.

For Exercises 6–9, determine the number of real solutions for each quadratic equation without solving.

6. $p^2 + 7p + 33 = 8 - 3p$

$+3p \quad -8 \quad -8 \quad +3p$

$p^2 + 10p + 25 = 0$

$a = 1$

$b = 10$

$c = 25$

$b^2 - 4ac$

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

$= 100 - 100$

$= 0$

One solution

7. $7x^2 + 2x + 5 = 0$

$a = 7$

$b = 2$

$c = 5$

$b^2 - 4ac$

$(2)^2 - 4(7)(5)$

$= 4 - 140 = -136$

No Solution

8. $2y^2 + 10y = \cancel{y^2} + \cancel{4y} - \cancel{3}$

$-y^2 \quad -4y \quad +3 \quad -y^2 \quad -4y \quad +3$

$y^2 + 6y + 3 = 0$

$a = 1$

$b = 6$

$c = 3$

$b^2 - 4ac$

$= (6)^2 - 4(1)(3)$

$= 36 - 12 = +24$

Two Solutions

9. $4z^2 + 9 = -4z$

$+4z \quad +4z$

$4z^2 + 4z + 9 = 0$

$a = 4$

$b = 4$

$c = 9$

$b^2 - 4ac$

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

$= 16 - 144 = -128$

No solution