Unit 7 Lesson 18: Applying the Quadratic Formula (Part 2)

1 Bits and Pieces (Warm up)

Student Task Statement

Evaluate each expression for $a = 9$, $b = -5$, and $c = -2$

1. $-b$

2. b^2

3. $b^2 - 4ac$

4. $-b \pm \sqrt{a}$

2 Using the Formula with Care

Student Task Statement

Here are four equations, followed by attempts to solve them using the quadratic formula. Each attempt contains at least one error.

- Solve 1–2 equations by using the quadratic formula.

- Then, find and describe the error(s) in the worked solutions of the same equations as the ones you solved.

Equation 1: $2x^2 + 3 = 8x$ Equation 2: $x^2 + 3x = 10$

Equation 3: $9x^2 - 2x - 1 = 0$ Equation 4: $x^2 - 10x + 23 = 0$

Here are the worked solutions with errors:

Equation 1: $2x^2 + 3 = 8x$ Equation 2: $x^2 + 3x = 10$

$a = 2,\ b = \text{-}8,\ c = 3$ $a = 1,\ b = 3,\ c = 10$

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

$$x = \frac{\text{-}(\text{-}8) \pm \sqrt{(\text{-}8)^2 - 4(2)(3)}}{2(2)}$$

$$x = \frac{8 \pm \sqrt{64 - 24}}{4}$$

$$x = \frac{8 \pm \sqrt{40}}{4}$$

$$x = 2 \pm \sqrt{10}$$

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

$$x = \frac{\text{-}3 \pm \sqrt{3^2 - 4(1)(10)}}{2(1)}$$

$$x = \frac{\text{-}3 \pm \sqrt{9 - 40}}{2}$$

$$x = \frac{\text{-}3 \pm \sqrt{\text{-}31}}{2}$$

No solutions

Equation 3: $9x^2 - 2x - 1 = 0$

$a = 9,\ b = -2,\ c = -1$

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

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(9)(-1)}}{2}$$

$$x = \frac{2 \pm \sqrt{4 + 36}}{2}$$

$$x = \frac{2 \pm \sqrt{40}}{2}$$

Equation 4: $x^2 - 10x + 23 = 0$

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

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

$$x = \frac{-10 \pm \sqrt{(-10)^2 - 4(1)(23)}}{2}$$

$$x = \frac{-10 \pm \sqrt{-100 - 92}}{2}$$

$$x = \frac{-10 \pm \sqrt{-192}}{2}$$

No solutions

3 Sure About That?

Student Task Statement

1. The equation $h(t) = 2 + 30t - 5t^2$ represents the height, as a function of time, of a pumpkin that was catapulted up in the air. Height is measured in meters and time is measured in seconds.

   a. The pumpkin reached a maximum height of 47 meters. How many seconds after launch did that happen? Show your reasoning.

   b. Suppose someone was unconvinced by your solution. Find another way (besides the steps you already took) to show your solution is correct.

2. The equation $r(p) = 80p - p^2$ models the revenue a band expects to collect as a function of the price of one concert ticket. Ticket prices and revenues are in dollars.

   A band member says that a ticket price of either $15.50 or $74.50 would generate approximately $1,000 in revenue. Do you agree? Show your reasoning.

Activity Synthesis