Just in Time Quick Check

Standard of Learning A.EI.3

Strand: Equations and Inequalities

Standard of Learning A.EI.3

The student will represent, solve, and interpret the solution to a quadratic equation in one variable.

Students will demonstrate the following Knowledge and Skills:

a) Solve a quadratic equation in one variable over the set of real numbers with rational or irrational solutions, including those that can be used to solve contextual problems.

b) Determine and justify if a quadratic equation in one variable has no real solutions, one real solution, or two real solutions.

c) Verify possible solution(s) to a quadratic equation in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: A.EO.2, A.F.2

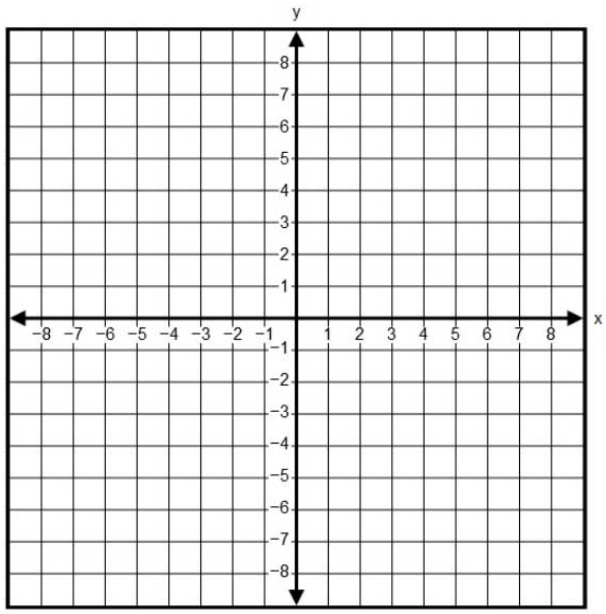
Just in Time Quick Check A.EI.3

1. Given $x^2 - 4 = 0$ and $2x^2 - 8 = 0$

   a) Solve both equations algebraically.

   b) Sketch graphs of the related quadratic functions on the coordinate plane below.

   c) Compare your solutions in part a) to solutions found in part b). What do you notice?



2. What are the solutions to the equation shown?

$$-\frac{1}{4}x^2 + x = -8$$

3. Janet and April solved the given quadratic equation in different ways and obtained different answers. Determine which student made an error. Explain the mistake and how to correct it.

$$5x^2 - 45 = 0$$

Janet	April
$5x^2 - 45 = 0$	$5x^2 - 45 = 0$
$5x^2 = 45$	$5(x^2 - 9) = 0$
$x^2 = 9$	$5(x - 3)(x + 3) = 0$
$x = \sqrt{9}$	$x = 3 \text{ or } x = -3$
$x = 3$	

4. Determine whether the quadratic equation has no real solutions, one real solution, or two real solutions. Justify your reasoning.

$$2n^2 + 32 = 0$$

5. Solve $x^2 - 6x + 10 = 0$ using the quadratic formula.

   a) Use the discriminant to identify the number of real solutions.

   b) Use technology to verify your answer.

A.EI.3 Just in Time Quick Check Teacher Notes

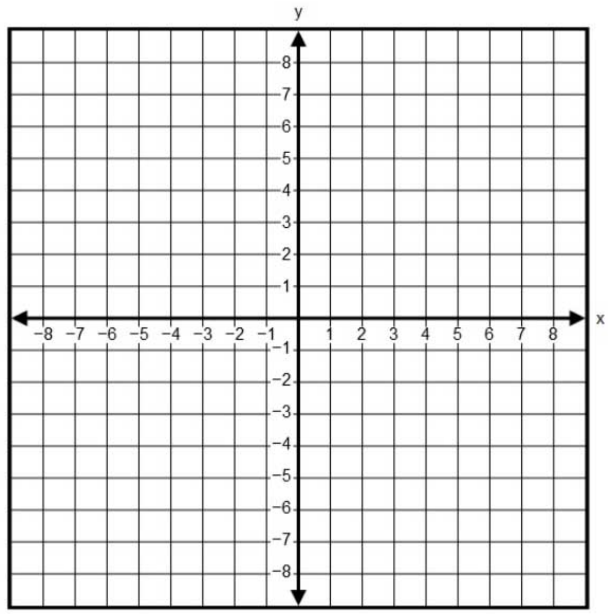
Common Errors/Misconceptions and their Possible Indications

1. Given $x^2 - 4 = 0$ and $2x^2 - 8 = 0$.

   a) Solve both equations algebraically.

   b) Sketch graphs of the related quadratic functions on the coordinate plane below.

   c) Compare your solutions in part a) to solutions found in part b). What do you notice?



Students may misinterpret the second graph thinking the x-intercepts of the graphs are different because $2x^2 - 8 = 0$ has a coefficient of 2. This may indicate that students do not recognize that the graph is a vertical stretch of $x^2 - 4 = 0$. The vertical stretch affects the shape of the graph but does not impact the x-intercepts.

Students may also have difficulty making the connection between algebraic and graphical models and may treat algebraic and graphical solutions as unrelated. Having students graph the related quadratic function of a quadratic equation can help reinforce the connections between solutions found algebraically and solutions found graphically. Additionally, some students may need additional practice reinforcing the concept that solving x^2= k means x = $\pm\sqrt{k}$.

2. What values of *x* are solutions to the equation?

$$-\frac{1}{4}x^2 + x + 8 = 0$$

If students use the quadratic formula to solve for x, they may make errors substituting rational values for a, b, and c or when performing computations with rational numbers. A strategy teachers can use is to encourage students to write an equivalent equation by multiplying all the terms of the equation *by a scalar value that will produce integer coefficients before using the quadratic formula. Care must be taken to multiply each term of the equation by the selected scalar to create an equivalent equation. Verifying solutions with a graphing utility could also help students identify when a mistake has been made and allow them the opportunity to review their work to find the error.*

3. Janet and April solved the given quadratic equation in different ways and obtained different answers. Determine which student made an error. Explain the mistake and how to correct it.

$$5x^2 - 45 = 0$$

Janet	April
$5x^2 - 45 = 0$	$5x^2 - 45 = 0$
$5x^2 = 45$	$5(x^2 - 9) = 0$
$x^2 = 9$	$5(x - 3)(x + 3) = 0$
$x = \sqrt{9}$	$x = 3 \text{ or } x = -3$
$x = 3$	

A common mistake students may make is to only provide the positive square root as the solution (e.g., x = 3 rather than x = 3, x = -3), thus identifying Janet's answer as correct. This could indicate that students do not have a well-developed understanding of positive numbers having two square roots. Teachers may want to ask follow-up questions such as "Is three the only number that when squared results in 9?" and "What is the sign of the product of two negative numbers?"

4. Determine whether the quadratic equation has no real solutions, one real solution, or two real solutions? Justify your answer.

$$2n^2 + 32 = 0$$

A common error students may make when graphing quadratic equations is to try to plot the graph as a straight line instead of recognizing the graph as a quadratic function. Students may also attempt to plot the equation without writing it as $y = 2n^2 + 32$ doing so allows students to identify the number of solutions and justify their answer using the visual model. Teachers can help by emphasizing the difference between a quadradic equation (its largest exponent is 2) and the equation of a line (its largest exponent is 1) and explain what it means graphically (quadratics produce a parabola, not a line). Teachers can provide additional practice using the discriminant to determine the number of solutions.

5. Solve $x^2 - 6x + 10 = 0$ using the quadratic formula.

   a) Use the discriminant to identify the number of real solutions.

   b) Use technology to justify the reasonableness of your answer(s).

   Common errors students make when using the quadratic formula include incorrectly identifying the coefficients by misreading the signs of the terms. They may also substitute values incorrectly *into the formula or forget the minus sign in front of b in the formula x =* $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$*.* *Additionally, students often miscalculate the discriminant* $\sqrt{b^2 - 4ac}$*. When the discriminant is negative (as in this case, 36 – 40 = −4, students sometimes conclude there is no solution instead of recognizing that there are no real solutions. (Students will be introduced to complex numbers in Algebra 2.) When using technology or graphs to justify their answers, students may misinterpret the graph. For example, if the parabola does not cross the x-axis, students may incorrectly say there are real roots—possibly confusing this with the y-intercept or fail to connect the graph's behavior with the discriminant's indication of no real solutions.*