Just In Time Quick Check

Standard of Learning (SOL) AII.3b

Strand: Equations and Inequalities

Standard of Learning (SOL) AII.3b

The student will solve quadratic equations over the set of complex numbers.

Grade Level Skills:

- Solve a quadratic equation over the set of complex numbers algebraically.
- Calculate the discriminant of a quadratic equation to determine the number and type of solutions.
- Solve equations and verify algebraic solutions using a graphing utility.

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Just in Time Quick Check Teacher Notes

Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - AII.3b – Methods for solving Quadratic Equations (Word)/PDF Version
- VDOE Word Wall Cards: Algebra II (Word) | (PDF)
  - Complex Numbers
  - Complex Numbers Examples
  - Quadratic Equation (number of solutions)

Supporting and Prerequisite SOL: AII.2, AII.6a, AII.6b, A.4b, 8.3b, 8.17

SOL AII.3b - Just in Time Quick Check

1. Find the solution(s) of the equation $x^2 + 36 = 0$. Show your work/thinking.

2. What is the solution set for $(x - 16)^2$ + 13 = 0?

3. What are the roots of $2 - 4x = -3x^2$? Show your work/thinking.

4. The value of the discriminant of a quadratic equation is -7. Describe the nature of the roots of this quadratic equation.

5. Donelle and Susan are trying to determine the number and type of solutions for the equation $2x^2 - 3x - 5 = 0$ by using the discriminant. Their work is shown below.

Donelle's Work	Susan's Work
$D = b^2 - 4ac$ $D = (-3)^2 - 4(2)(-5)$ $D = -31$ Since the discriminant is less than zero, there are two imaginary solutions.	$D = b^2 - 4ac$ $D = (-3)^2 - 4(2)(-5)$ $D = 49$ Since the discriminant is greater than zero, there are two real solutions.

Describe and correct the errors made.

6. A quadratic equation with real coefficients has $x = -6 + 5i\sqrt{2}$ as one solution. What other value of x must also be a solution of this quadratic equation?

SOL AII.3b - Just in Time Quick Check Teachers Notes

Common Errors/Misconceptions and their Possible Indications

1. Find the solution(s) of the equation $x^2 + 36 = 0$. Show your work/thinking.

A common error some students may make is to only find the positive imaginary solution when solving $x^2 = \sqrt{-36}$. This may indicate that a student does not understand that a quadratic equation has two solutions. Teachers may wish to model solving this equation using the quadratic formula: $x = \frac{-b \pm\sqrt{b^2-4ac}}{2a}$. In addition, it may be beneficial for teachers to review simplifying square roots involving imaginary numbers to help students correctly find the two solutions. Teachers could also have students compare the solutions of $x^2 = 36$ and $x^2 = -36$ by graphing and solving algebraically.

2. What is the solution set for $(x - 16)^2$ + 13 = 0?

A common error some students may make is to state the solution set as $\{4 - i\sqrt{13},\ 4 + i\sqrt{13}\}$. This may indicate that some students during the solving process believe that simplifying $\sqrt{(x-16)^2}$ results in x – 4. A strategy that might help students avoid this mistake is to have them write $\sqrt{(x-16)^2}$ as $\sqrt{(x-16)(x-16)}$. This may elicit prior knowledge from Algebra 1 when students may have used pairs of prime factors to simplify square roots of monomial expressions.

3. What are the roots of $2 - 4x = -3x^2$? Show your work/thinking.

A common error some students may make is to determine that a = -3, b= -4, and c =2 when identifying the values of a, b, and c. This may indicate that some students do not realize that they should write all of the terms on one side of the equation before applying the quadratic formula. Students may also benefit from creating a graphic organizer to help identify a common first step when solving quadratic equations.

4. The value of the discriminant of a quadratic equation is -7. Describe the nature of the roots of this quadratic equation.

A common error some students may make is to state that this quadratic equation has two irrational roots. This may indicate that a student misunderstands that the discriminant of -7 represents the radicand of the quadratic formula and yields two nonreal solutions. Teachers may find it beneficial to have students create a graphic organizer demonstrating the value of the discriminant, the graphical representation that is associated with the discriminant value, and a description of the nature of the roots.

5. Donelle and Susan are trying to determine the number and type of solutions for the equation $2x^2 - 3x - 5 = 0$ by using the discriminant. Their work is shown below.

Donelle's Work	Susan's Work
$D = b^2 - 4ac$ $D = (-3)^2 - 4(2)(-5)$ $D = -31$ Since the discriminant is less than zero, there are two imaginary solutions.	$D = b^2 - 4ac$ $D = (-3)^2 - 4(2)(-5)$ $D = 49$ Since the discriminant is greater than zero, there are two real solutions.

Describe and correct the errors made.

A common error some students may make is not recognizing that Donelle's work is not simplified correctly. Some students may simplify the discriminant as $(-3)^2 - 40$ instead of $(-3)^2 + 40$. This may indicate that some students do not recognize that the product of –(4)(2)(-5) yields +40. Teachers may encourage students to use Desmos to graph the equation to verify the number of solutions, which would support their algebraic thinking.

6. A quadratic equation with real coefficients has $x = -6 + 5i\sqrt{2}$ as one solution. What other value of x must also be a solution of this quadratic equation?

A common error some students may make is to state the other solution as $x = 6 - 5i\sqrt{2}$. This may indicate that a student believes the conjugate is found by taking the opposite of the real number and the imaginary portion of the given solution. Teachers may wish to remind students when solving quadratic equations, each complex solution will always have a conjugate pair such as a + bi and a - bi. Teachers may find it helpful to have students first write their solutions in complex form and then circle the operations as a way to show they are opposites.