Unit 9 Student Diagnostic Answer Key

These materials, when encountered before the denoted lesson, support access to the lesson and identify potential areas where additional support may be required. Note that the content in these lesson diagnostics represents prerequisite skills and does not address the required rigor for full mastery of the on-grade level standards.

Your students may benefit from using these materials in conjunction with the Unit Overview and Readiness page (quiz and mini-lessons).

Lesson 9.1: What Are Perfect Squares? Check-in Answers

Q#	Standard
ALL	ALG.10(E) Factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two.

Determine if each number or expression is a perfect square. Then, explain how you know.

Answers:

	Yes	No	Explanation
$\frac{1}{16}$	☑	☐	**Answer:** Yes, because $(\frac{1}{4})^2 = \frac{1}{16}$.
9	☑	☐	**Answer:** Yes, because $3^2 = 9$.
39	☐	☑	**Answer:** No, because there is no whole number or fraction that can be squared to get 39.
121	☑	☐	**Answer:** Yes, because $11^2 = 121$.
324	☑	☐	**Answer:** Yes, because $18^2 = 324$.
x^2	☑	☐	**Answer:** Yes, because it is the square of x.
$100t$	☐	☑	**Answer:** No, because t is not squared.
$49a^2$	☑	☐	**Answer:** Yes, because $(7a)^2 = 49a^2$.

	Yes	No	Explanation
$3c^2$	☐	☑	**Answer:** No, because there is no whole number or fraction that can be squared to get 3.
$(x - 1)^2$	☑	☐	**Answer:** Yes, because it is the square of $x - 1$.

Lesson 9.2: Completing the Square, Part 1 Check-in Answers

Q#	Standard
ALL	ALG.8(A) Solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula.

For each of the functions written in standard form, identify the coefficient of the quadratic term, the coefficient of the linear term, and the constant term.

Answers:

Function	Coefficient of Quadratic Term	Coefficient of Linear Term	Constant Term
$f(x) = x^2 + 2x + 1$	**Answer:** 1	**Answer:** 2	**Answer:** 1
$g(x) = x^2 - 6x + 9$	**Answer:** 1	**Answer:** -6	**Answer:** 9
$h(x) = x^2 + 16x + 64$	**Answer:** 1	**Answer:** 16	**Answer:** 64
$j(x) = x^2 + 10x + 25$	**Answer:** 1	**Answer:** 10	**Answer:** 25
$k(x) = x^2 - 8x + 16$	**Answer:** 1	**Answer:** -8	**Answer:** 16
$m(x) = x^2 + 18x + 81$	**Answer:** 1	**Answer:** 18	**Answer:** 81
$n(x) = 9x^2 + 6x + 1$	**Answer:** 9	**Answer:** 6	**Answer:** 1
$p(x) = x^2 - 2x + 1$	**Answer:** 1	**Answer:** -2	**Answer:** 1

Lesson 9.3: Completing the Square, Part 2 Check-in Answers

Q#	Standard
1-4	MATH.6.7(A) Generate equivalent numerical expressions using order of operations, including whole number exponents and prime factorization.

For each value of b, find $(\frac{b}{2})^2$.

1. $b = 6$

Answer: 9

2. $b = \frac{1}{2}$

Answer: $\frac{1}{16}$

3. $b = \frac{2}{5}$

Answer: $\frac{1}{25}$

4. $b = 0.8$

Answer: 0.16

Lesson 9.4: Completing the Square, Part 3 Check-in Answers

Q#	Standard
1-4	ALG.10(D) Rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property.

Use any method you prefer to rewrite these expressions into standard form.

1. $(2x + 1)(2x - 3)$

Answer: $4x^2 - 4x - 3$

2. $(4x - 1)(\frac{1}{2}x - 3)$

Answer: $2x^2 - \frac{25}{2}x + 3$

3. $(3x - 5)^2$

Answer: $9x^2 - 30x + 25$

4. $(2x + 1)^2$

Answer: $4x^2 + 4x + 1$

Lesson 9.5: Quadratic Equations with Irrational Solutions Check-in Answers

Q#	Standard
1-4	ALG.8(A) Solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula.

Solve each of these equations. Represent the solutions exactly. If the solution is not a whole number, what 2 whole numbers does each solution lie between?

1. $(x + 1)^2 = 64$

Answer: -9, 7

2. $(x - 3)^2 - 4 = 0$

Answer: 1, 5

3. $x^2 = 10$

Answer: $\pm \sqrt{10}$; $\sqrt{10}$ is between 3 and 4; $-\sqrt{10}$ is between -4 and -3

4. $(x + 3)^2 = 24 + 4$

Answer: $-3 \pm \sqrt{28}$; $\sqrt{28}$ is between 5 and 6 - so $-3 + \sqrt{28}$ is between 2 and 3 while $-3 - \sqrt{28}$ is between -9 and -8.

Lesson 9.6: The Quadratic Formula Check-in Answers

Q#	Standard
1-6	ALG.11(A) Simplify numerical radical expressions involving square roots.

Find the value of these expressions.

1. $\sqrt{9} + 2$

Answer: 5

2. $\frac{\sqrt{16}}{2}$

Answer: 2

3. $(\sqrt{25})^2 + 6.2$

Answer: 31.2

4. $\frac{\sqrt{100}}{4} - \frac{\sqrt{64}}{2}$

Answer: -1.5 or equivalent

5. $\sqrt{1 + 15}$

Answer: 4

6. $\sqrt{4^2 + 3^2}$

Answer: 5

Lesson 9.7: Applying the Quadratic Formula Check-in Answers

Q#	Standard
ALL	ALG.8(A) Solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula.

For each equation below, identify a, b, and c as needed for use in the quadratic formula. Then, compute $b^2 - 4ac$. Note, some equations may need to be rewritten into standard form.

Answers:

Function	a	b	c	$b^2 - 4ac$
$0 = x^2 - 3x + 5$	**Answer:** 1	**Answer:** -3	**Answer:** 5	**Answer:** -11
$3x^2 - 4 + x = 0$	**Answer:** 3	**Answer:** 1	**Answer:** -4	**Answer:** 49
$-2x^2 + 5x = 11$	**Answer:** -2	**Answer:** 5	**Answer:** -11	**Answer:** -63
$3x^2 + 5x = 9 - 4x$	**Answer:** 3	**Answer:** 9	**Answer:** -9	**Answer:** 189

Lesson 9.8: Deriving the Quadratic Formula Check-in Answers

Q#	Standard
1	ALG.11(A) Simplify numerical radical expressions involving square roots.

Here is Jose's work to solve an equation. Determine the error he made and explain the correct way to solve it.

$x = -3 + \sqrt{3^2 - 4 \cdot 1 \cdot 2}$

$x = -3 + 3 - 2 \cdot 1 \cdot 2$

$x = -4$

Answer: Answers will vary, but here is a sample.

The error is between the first and second line when taking the square root of the difference rather than evaluating the expression under the square root before finding the square root. The second line should be $x = -3 + \sqrt{9 - 8}$ then $x = -3 + \sqrt{1}$ then $x = -3 + 1$ and finally, $x = -2$.

Lesson 9.9: Writing Quadratics in Different Forms Check-in Answers

Q#	Standard
1	ALG.8(A) Solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula.

For the solution given below, explain what happened in each step and why that step is taken.

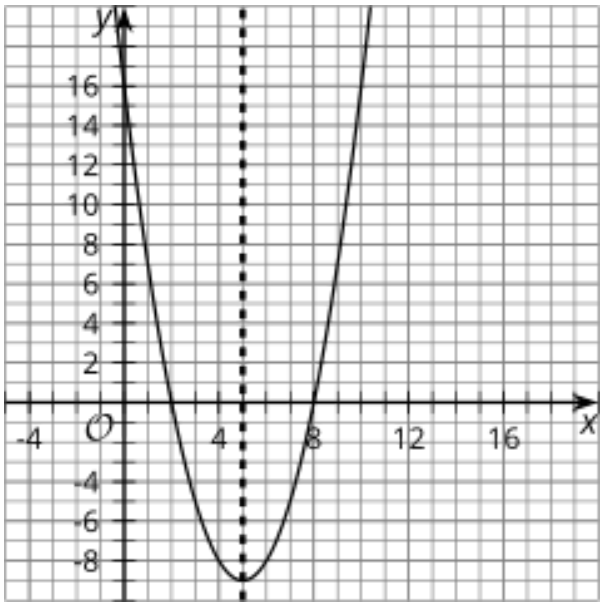
Answers:

Solve $x^2 + 8x - 3 = 6$.	**Explanation**
$x^2 + 8x = 6 + 3$	**Answer:** Add 3 to both sides of the equation to have the constants on one side of the equation.
$x^2 + 8x + 16 = 9 + 16$	**Answer:** Combine the 6 and 3, then add 16 to both sides of the equation to make the left side of the equation a perfect square.
$(x + 4)^2 = 25$	**Answer:** Combine the 9 and 16, then rewrite the left side of the equation in its factored form so that the square is completed.
$x + 4 = \pm 5$	**Answer:** Find the square roots of each side of the equation to make the equation linear.
$x = -4 \pm 5$	**Answer:** Subtract 4 from each side of the equation to isolate the variable.
$x = 1$ and $x = -9$	**Answer:** Combine -4 + 5 and -4 – 5 to find the solutions.

Lesson 9.10: Rewriting Quadratic Expressions in Vertex Form Check-in Answers

Q#	Standard
1	ALG.7(A) Graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry.

1. Sketch a graph of the function $f(x) = x^2 - 10x + 16$.



Answer: (see right)

2. Find the coordinates of the x-intercept(s).

Answer: (2,0) and (8,0)

3. Find the coordinates of the y-intercept.

Answer: (0,16)

4. Find the coordinates of the vertex.

Answer: (5, -9)

5. Draw a dashed line along the line of symmetry for the graph.

Answer: (see graph). The line is along x = 5.

6. What do you notice about the line of symmetry as it relates to the vertex?

Answer: The line goes through the vertex.

7. What do you notice about the line of symmetry as it relates to the x-intercept(s)?

Answer: The line is halfway between the x-intercepts.

8. Use the line of symmetry and the y-intercept to find another point on the parabola.

Answer: (10, 16)

Lesson 9.11: Using Quadratic Expressions in Vertex Form to Solve Problems Check-in Answers

Q#	Standard
1-4	ALG.12(B) Evaluate functions, expressed in function notation, given one or more elements in their domains.

Evaluate each function for $x = 3$.

1. $f(x) = x^2 - 4x + 1$

   Answer: $f(3) = -2$

2. $g(x) = 6x - 2x^2$

   Answer: $g(3) = 0$

3. $h(x) = (x - 4)(x - 3)$

   Answer: $h(3) = 0$

4. $j(x) = 2(x - 1)(x + 2)$

   Answer: $j(3) = 20$