

Solving Quadratic Equations Four Ways

Grade 9 – Algebra 1 math · Test Answer Key · Standards: A-REI.B.4a, A-REI.B.4b, A-APR.B.3, A-CED.A.1

Use this answer key to score the test out of 20 points. Each solution lists where the points are earned. Accept exact answers or correctly rounded decimals, and give partial credit for a correct method with an arithmetic slip.

Standards: A-REI.B.4a, A-REI.B.4b, A-APR.B.3, A-CED.A.1 · **Level:** Grade 9 Algebra 1

Question 1 Square Roots (2 points)

$$(x + 3)^2 = 25, \text{ so } x + 3 = \pm 5.$$

$$x = 2 \text{ or } x = -8$$

Scoring: 1 point for isolating the square, 1 point for both solutions.

Question 2 Factoring (2 points)

a. $(x + 4)(x + 7) = 0$: $x = -4$ or $x = -7$.

b. $3x(x - 4) = 0$: $x = 0$ or $x = 4$.

Scoring: 1 point per part; both solutions are needed.

Question 3 Complete the Square (3 points)

$$x^2 + 10x = -7. \text{ Add 25: } (x + 5)^2 = 18.$$

$$x = -5 \pm \sqrt{18} = -5 \pm 3\sqrt{2} \approx -5 \pm 4.243.$$

$$x \approx -0.76 \text{ or } x \approx -9.24$$

Scoring: 1 point for adding 25 to both sides, 1 point for the square root step, 1 point for both decimals.

Question 4 Quadratic Formula (3 points)

$$a = 2, b = -3, c = -7. \text{ Discriminant: } 9 + 56 = 65.$$

$$x = \frac{(3 \pm \sqrt{65})}{4} \approx \frac{(3 \pm 8.062)}{4}.$$

$x \approx 2.77$ or $x \approx -1.27$

Scoring: 1 point for the discriminant, 1 point for the setup, 1 point for both decimals.

Question 5 Discriminant (2 points)

- a. $36 - 48 = -12 < 0$: **no real solutions.**
- b. $36 - 36 = 0$: **exactly one real solution** ($x = -3$).

Scoring: 1 point per part for the discriminant and the conclusion.

Question 6 Garden Dimensions (3 points)

$w(w + 7) = 144$, so $w^2 + 7w - 144 = 0$. Discriminant: $49 + 576 = 625$, $\sqrt{625} = 25$.

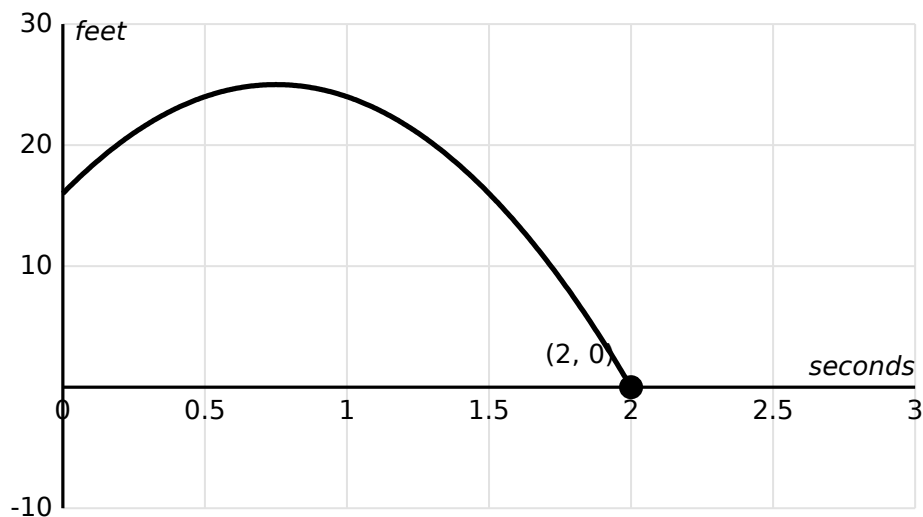
$w = \frac{-7 \pm 25}{2}$: 9 or -16 . Width cannot be negative.

Width 9 ft, length 16 ft ($9 \times 16 = 144$).

Scoring: 1 point for the equation, 1 point for solving, 1 point for rejecting the negative width and giving both dimensions.

Question 7 When Does the Ball Land? (3 points)

- a. $-16t^2 + 24t + 16 = 0$, or $2t^2 - 3t - 2 = 0$ after dividing by -8 .
- b. $(2t + 1)(t - 2) = 0$, so $t = -\frac{1}{2}$ or $t = 2$.
- c. Time cannot be negative, so the ball lands after **2 seconds**.



The ball lands at 2 seconds.

Scoring: 1 point per part.

Question 8 Zero-Product Property (2 points)

If a product of two numbers is 0, at least one of the numbers is 0. So $2x - 5 = 0$ or $x + 8 = 0$.

$x = \frac{5}{2}$ or $x = -8$

Scoring: 1 point for the explanation, 1 point for both solutions.