Solving Quadratics by Completing the Square

Algebra 1 •Section 9.4

Name: _____	Date: _____	Score: _____ / 12

Quick Review and Helpful Hints

Quadratic functions can be read through their zeros, vertex, axis of symmetry, and opening direction. Choose factoring, square roots, completing the square, or the quadratic formula based on the form you see.

▷ **Example:** Solve $x^2 - 5x + 6 = 0$.
Work: Factor the quadratic: $x^2 - 5x + 6 = (x - 2)(x - 3)$. Set each factor equal to zero.
★ **Answer:** $x = 2$ or $x = 3$

Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Solve $x^2 + 6x + 5 = 0$ by completing the square.

2. Solve $x^2 - 8x + 7 = 0$.

3. Complete the square: $x^2 + 10x + \_\_$.

4. Complete the square: $x^2 - 14x + \_\_$.

5. Rewrite $x^2 + 4x + 9$ in vertex form.

6. Rewrite $x^2 - 6x + 2$ in vertex form.

7. Solve $x^2 + 2x - 3 = 0$.

8. Solve $x^2 - 4x - 12 = 0$.

9. Find the vertex of $y = x^2 + 8x + 1$.

10. Find the vertex of $y = x^2 - 10x + 30$.

Word Problems

11. A path is $h = -t^2 + 8t + 1$. Find the time of maximum height.

12. A square model is $x^2 + 12x$. What number completes the square?

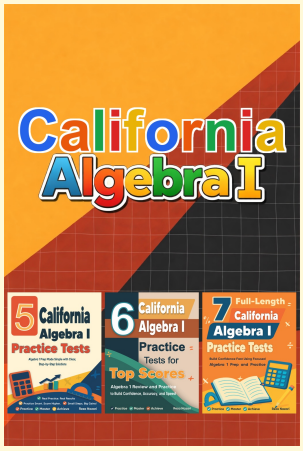
Answer Keys

1. $\boxed{x = -1, -5}$
2. $\boxed{x = 1, 7}$
3. $\boxed{25}$
4. $\boxed{49}$
5. $\boxed{(x+2)^2 + 5}$
6. $\boxed{(x-3)^2 - 7}$
7. $\boxed{x = 1, -3}$
8. $\boxed{x = 6, -2}$
9. $\boxed{(-4, -15)}$
10. $\boxed{(5, 5)}$
11. $\boxed{t = 4}$
12. $\boxed{36}$

Step-by-Step Explanations

1. Shift the 5 over, then add 9 to build a perfect square: $(x+3)^2 = 4$, so $x + 3 = \pm 2$.
2. Move the 7, then add 16 — half of -8, squared — to get $(x-4)^2 = 9$, which unlocks both answers.
3. The trick is always half the middle coefficient, squared. Half of 10 is 5, and $5^2 = 25$.
4. Take half of -14 to get -7, then square it. The minus disappears, leaving 49.
5. Half of 4 squared is 4, so regroup as $(x^2 + 4x + 4) + 5$ — the leftover 5 stays outside.
6. Sneak in a 9 to complete the square, then subtract it back: $(x-3)^2 - 9 + 2$ becomes $(x-3)^2 - 7$.
7. Half of 2 squared is 1, so completing the square turns this into $(x+1)^2 = 4$ — then take roots.
8. Adding 4 to both sides builds the square $(x-2)^2 = 16$, and the ± 4 leads straight to both solutions.
9. Completing the square rewrites this as $(x+4)^2 - 15$, and vertex form hands you the vertex directly.
10. Once you reshape it as $(x-5)^2 + 5$, the h and k values are just sitting there for you to read off.
11. The peak of a parabola sits at $t = -b/(2a)$. Here that's $-8/(-2) = 4$ seconds.
12. Halve the 12 to get 6, then square it — adding 36 makes a perfect square.

Want Even More Algebra 1 Practice?



California CAASPP Algebra I Preparation Bundle

18 full-length practice tests across three books
Fresh test practice, detailed explanations, and organized review

18 Tests
3 Books
One Bundle

Important: These Algebra 1 resources are made for extra practice after the worksheet. Use the QR code for the state or program bundle connected with this worksheet.

Skill Review

- ✓ Strengthens equations, functions, systems, and modeling
- ✓ Supports steady review before tests
- ✓ Good for tutoring, homework, and independent practice

Build the foundation.

Test Practice

- ✓ Full-length practice tests for realistic pacing
- ✓ Detailed answer explanations for every test
- ✓ Useful after students finish topic worksheets

Practice with purpose.

Confidence

- ✓ Turns mistakes into targeted review
- ✓ Helps students see progress over time
- ✓ Keeps preparation organized and calm

Move forward prepared.