The Quadratic Formula and the Discriminant

Algebra 1 •Section 9.5

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. Find the discriminant of $x^2 - 5x + 6 = 0$.

2. How many real solutions if $D = 0$?

3. Solve $x^2 - 3x - 10 = 0$ using any method.

4. Solve $2x^2 - 8x + 6 = 0$.

5. Find the discriminant of $3x^2 + 2x + 5 = 0$.

6. Solve $x^2 + 4x + 1 = 0$.

7. How many real solutions for $x^2 - 6x + 9 = 0$?

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

9. Find D for $4x^2 - 4x + 1 = 0$.

10. Solve $x^2 + 2x + 5 = 0$ over the reals.

♦ Word Problems

11. A ball equation gives $-t^2 + 6t + 7 = 0$. Which positive time solves it?

12. A designer checks $D = 25$ for a quadratic. What does that tell about roots?

Answer Keys

1. 1
2. One repeated real solution
3. $x = 5, -2$
4. $x = 1, 3$
5. -56
6. $x = -2 \pm \sqrt{3}$
7. One
8. $x = 4, -2$
9. 0
10. No real solutions
11. $t = 7$
12. Two distinct real roots

Step-by-Step Explanations

1. The discriminant is just $b^2 - 4ac$. Plug in carefully: $25 - 24 = 1$, a tidy positive number.
2. When $D = 0$ there's nothing under the root to give a plus-or-minus, so the parabola just grazes the x-axis once.
3. Factoring is quickest here: $(x - 5)(x + 2) = 0$, and the quadratic formula would land on the exact same answers.
4. Every term divides by 2, so simplify first to $x^2 - 4x + 3 = 0$ — much easier to factor as $(x - 1)(x - 3)$.
5. Computing $b^2 - 4ac$ gives $4 - 60 = -56$. A negative result is your signal that no real solutions exist.
6. This one won't factor nicely, so lean on the formula: $\frac{-4 \pm \sqrt{12}}{2}$ tidies up to $-2 \pm \sqrt{3}$.
7. Check the discriminant: $36 - 36 = 0$. A zero there always means a single, repeated solution.
8. Spot the pair that multiplies to -8 and adds to -2, and you've got $(x-4)(x+2) = 0$.
9. Running $b^2 - 4ac$ gives $16 - 16 = 0$ — a hint this is actually a perfect-square trinomial.
10. The discriminant comes out to $4 - 20 = -16$. Since you can't take a real square root of a negative, there's no real answer.
11. Multiply through by -1 to clean it up, then $t^2 - 6t - 7 = (t - 7)(t + 1)$ — and only $t = 7$ makes sense for time.
12. Any positive discriminant means the square root gives a real plus-and-minus, so you land on two separate roots.

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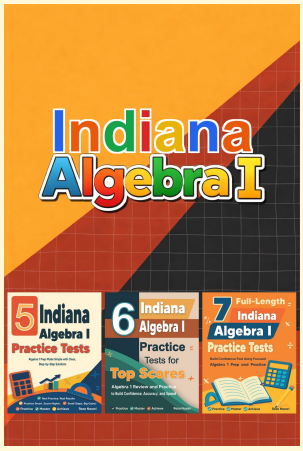

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