The Quadratic Formula

Name: _____	Date: _____	Score: _____ / 24

Quick Review

The **quadratic formula** solves any quadratic equation in standard form $ax^2 + bx + c = 0$: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. First identify a, b, and c carefully, including signs. Then compute the discriminant, substitute into the formula, and simplify. The formula is especially useful when factoring is not quick or when answers are irrational.

PRACTICE

Solve each quadratic using the quadratic formula.

1. $x^2 - 5x + 6 = 0$ _____

2. $x^2 + 4x + 4 = 0$ _____

3. $x^2 + x - 6 = 0$ _____

4. $2x^2 - 3x - 2 = 0$ _____

5. $x^2 - 2x - 1 = 0$ _____

6. $3x^2 + 2x - 1 = 0$ _____

7. $x^2 - 9 = 0$ _____

8. $2x^2 + 7x + 3 = 0$ _____

9. $x^2 + 6x + 5 = 0$ _____

10. $x^2 + 2x - 3 = 0$ _____

11. $4x^2 + 4x + 1 = 0$ _____

12. $3x^2 - 10x + 2 = 0$ _____

13. $7x^2 + 2x - 1 = 0$ _____

14. $x^2 + 5x + 8 = 0$ _____

15. $5x^2 - x - 1 = 0$ _____

16. $2x^2 + 4x + 7 = 0$ _____

17. $x^2 - 8x + 16 = 0$ _____

18. $6x^2 + x - 2 = 0$ _____

19. $9x^2 - 6x + 1 = 0$ _____

20. $x^2 + 3x + 1 = 0$ _____

Word Problems

21. A rectangle has area 45 square feet and length 4 feet more than its width. Use the quadratic formula to find the width.

_____

22. A ball's height is $h(t) = -16t^2 + 40t + 6$. Use the quadratic formula to estimate when it hits the ground.

_____

23. A business models profit by $P(x) = -2x^2 + 30x - 90$. Use the quadratic formula to find the break-even values.

_____

24. A square patio is enlarged so each side is 3 feet longer. The new area is 100 square feet. Use a quadratic equation to find the original side length.

_____

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Answer Keys

1. $x = 2, 3$
2. $x = -2$
3. $x = 2, -3$
4. $x = 2, -\frac{1}{2}$
5. $x = 1 \pm \sqrt{2}$
6. $x = \frac{1}{3}, -1$
7. $x = \pm 3$
8. $x = -\frac{1}{2}, -3$
9. $x = -1, -5$
10. $x = 1, -3$
11. $x = -\frac{1}{2}$
12. $x = \frac{5 \pm \sqrt{19}}{3}$
13. $x = \frac{-1 \pm 2\sqrt{2}}{7}$
14. no real solution
15. $x = \frac{1 \pm \sqrt{21}}{10}$
16. no real solution
17. $x = 4$
18. $x = \frac{1}{2}, -\frac{2}{3}$
19. $x = \frac{1}{3}$
20. $x = \frac{-3 \pm \sqrt{5}}{2}$
21. 5 ft
22. $t \approx 2.64$ sec
23. $x = \frac{15 \pm 3\sqrt{5}}{2}$
24. 7 ft

Step-by-Step Tutor Notes

1. Take it one clear step at a time and keep the original question in mind. Here $a = 1, b = -5, c = 6$; the formula gives $\frac{5 \pm 1}{2}$. So the answer is $x = 2, 3$.
2. Take it one clear step at a time and keep the original question in mind. The discriminant is 0, so the formula gives one solution. So the answer is $x = -2$.
3. Start with the definition the problem is testing, then apply it directly. Use $a = 1, b = 1, c = -6$; the square root part is 5. So the answer is $x = 2, -3$.
4. Focus on the main idea of the problem, then simplify carefully. The formula gives $\frac{3 \pm 5}{4}$. So the answer is $x = 2, -\frac{1}{2}$.
5. This is a good place to slow down, check the notation, and simplify cleanly. The formula gives $\frac{2 \pm \sqrt{8}}{2} = 1 \pm \sqrt{2}$. So the answer is $x = 1 \pm \sqrt{2}$.
6. Focus on the main idea of the problem, then simplify carefully. The formula gives $\frac{-2 \pm 4}{6}$. So the answer is $x = \frac{1}{3}, -1$.
7. This is a good place to slow down, check the notation, and simplify cleanly. With $b = 0$, the formula gives $\pm 6/2$. So the answer is $x = \pm 3$.
8. Focus on the main idea of the problem, then simplify carefully. The formula gives $\frac{-7 \pm 5}{4}$. So the answer is $x = -\frac{1}{2}, -3$.
9. Start with the definition the problem is testing, then apply it directly. The formula gives $\frac{-6 \pm 4}{2}$. So the answer is $x = -1, -5$.
10. This is a good place to slow down, check the notation, and simplify cleanly. The formula gives $\frac{-2 \pm 4}{2}$. So the answer is $x = 1, -3$.
11. Focus on the main idea of the problem, then simplify carefully. The discriminant is 0, so there is one repeated solution. So the answer is $x = -\frac{1}{2}$.
12. Focus on the main idea of the problem, then simplify carefully. Use $D = 76 = 4 \cdot 19$ and simplify. So the answer is $x = \frac{5 \pm \sqrt{19}}{3}$.
13. This is a good place to slow down, check the notation, and simplify cleanly. Use $D = 32$ and simplify the square root. So the answer is $x = \frac{-1 \pm 2\sqrt{2}}{7}$.
14. Focus on the main idea of the problem, then simplify carefully. The discriminant is negative, so there are no real roots. So the answer is no real solution.
15. The safest move is to replace the variable, keep the arithmetic organized, and simplify one step at a time. Substitute $a = 5, b = -1, c = -1$. That confirms the final answer is $x = \frac{1 \pm \sqrt{21}}{10}$.
16. Focus on the main idea of the problem, then simplify carefully. The discriminant is -40, which is negative. So the answer is no real solution.
17. Take it one clear step at a time and keep the original question in mind. The formula gives $\frac{8}{2} = 4$. So the answer is $x = 4$.
18. Start with the definition the problem is testing, then apply it directly. The formula gives $\frac{-1 \pm 7}{12}$. So the answer is $x = \frac{1}{2}, -\frac{2}{3}$.
19. Focus on the main idea of the problem, then simplify carefully. The discriminant is 0, giving one solution. So the answer is $x = \frac{1}{3}$.
20. Use the clue in the question first, then let the arithmetic finish the job. The discriminant is 5, so leave the radical simplified. So the answer is $x = \frac{-3 \pm \sqrt{5}}{2}$.
21. Let width be w. Then $w(w + 4) = 45$, so $w^2 + 4w - 45 = 0$. The formula gives $w = 5$ or -9, and only 5 fits the context.
22. Set $h = 0$ and use $a = -16, b = 40, c = 6$. The positive solution is about 2.64 seconds.
23. Set $P(x) = 0$. Dividing by -2 gives $x^2 - 15x + 45 = 0$, then apply the formula.
24. If the original side is s, then $(s + 3)^2 = 100$. Written as $s^2 + 6s - 91 = 0$, the positive formula solution is 7.

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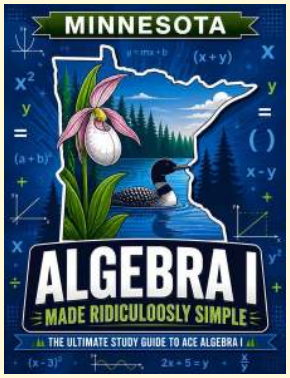

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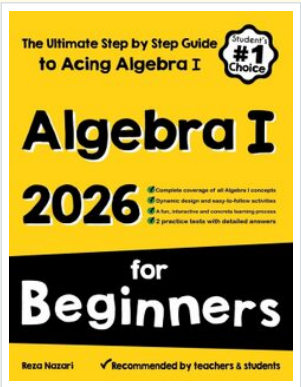

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