

Solving Quadratics by Square Roots

Name: _____

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Q Quick Review

When a quadratic is in the form $x^2 = k$ (or $(x - h)^2 = k$), **the fastest solution method is taking square roots**. Steps: **(1)** isolate the squared expression; **(2)** take the square root of both sides, writing \pm on the right; **(3)** solve. If $k > 0$, two real solutions. If $k = 0$, one solution (the value that makes the squared expression zero). If $k < 0$, no real solutions (square roots of negatives aren't real). Works only when there's no middle term — otherwise factor or use the quadratic formula. Don't forget the \pm — it's the most common mistake in this method.

PRACTICE

Solve by square roots.

- | | | | |
|---------------------|-------|-------------------------|-------|
| 1. $x^2 = 16$ | _____ | 11. $x^2 = -4$ | _____ |
| 2. $x^2 = 25$ | _____ | 12. $3x^2 = 27$ | _____ |
| 3. $x^2 = 49$ | _____ | 13. $x^2 - 7 = 0$ | _____ |
| 4. $x^2 = 81$ | _____ | 14. $(2x + 1)^2 = 25$ | _____ |
| 5. $(x - 2)^2 = 9$ | _____ | 15. $x^2 + 4 = 20$ | _____ |
| 6. $(x + 3)^2 = 16$ | _____ | 16. $(x - 4)^2 = 2$ | _____ |
| 7. $x^2 - 100 = 0$ | _____ | 17. $5x^2 - 20 = 0$ | _____ |
| 8. $x^2 = 12$ | _____ | 18. $(x + 2)^2 = 64$ | _____ |
| 9. $x^2 = 50$ | _____ | 19. $x^2 = \frac{9}{4}$ | _____ |
| 10. $(x - 1)^2 = 0$ | _____ | 20. $(3x)^2 = 36$ | _____ |

◆ Word Problems

21. A square garden has area 50 square meters. Use a square-root equation to find the side length.
- _____
22. An object falls according to $h = 16t^2$, where h is the distance fallen in feet after t seconds. How long does it take to fall 144 feet?
- _____
23. A square fountain model uses the side expression $x + 1$. If the area equation is $(x + 1)^2 = 20$, solve for the possible model values of x .
- _____
24. The kinetic energy formula $K = \frac{1}{2}mv^2$ gives $K = 400$ joules when $m = 8$ kilograms. Use square roots to find the speed v .
- _____



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Answer Keys

- | | |
|---|---|
| <p>1. $x = \pm 4$</p> <p>2. $x = \pm 5$</p> <p>3. $x = \pm 7$</p> <p>4. $x = \pm 9$</p> <p>5. $x = 5, -1$</p> <p>6. $x = 1, -7$</p> <p>7. $x = \pm 10$</p> <p>8. $x = \pm 2\sqrt{3}$</p> <p>9. $x = \pm 5\sqrt{2}$</p> <p>10. $x = 1$</p> <p>11. no real solution</p> <p>12. $x = \pm 3$</p> | <p>13. $x = \pm\sqrt{7}$</p> <p>14. $x = 2, -3$</p> <p>15. $x = \pm 4$</p> <p>16. $x = 4 \pm \sqrt{2}$</p> <p>17. $x = \pm 2$</p> <p>18. $x = 6, -10$</p> <p>19. $x = \pm\frac{3}{2}$</p> <p>20. $x = \pm 2$</p> <p>21. $5\sqrt{2} \approx 7.07$ m</p> <p>22. $t = 3$ sec</p> <p>23. $x = -1 \pm 2\sqrt{5}$</p> <p>24. $v = 10$ m/s</p> |
|---|---|

Step-by-Step Tutor Notes

1. Focus on the main idea of the problem, then simplify carefully. $\sqrt{16} = 4$, \pm both ways. So the answer is $x = \pm 4$.
2. Take it one clear step at a time and keep the original question in mind. ± 5 . So the answer is $x = \pm 5$.
3. Start with the definition the problem is testing, then apply it directly. ± 7 . So the answer is $x = \pm 7$.
4. This is a good place to slow down, check the notation, and simplify cleanly. ± 9 . So the answer is $x = \pm 9$.
5. Use the clue in the question first, then let the arithmetic finish the job. $x - 2 = \pm 3$. So the answer is $x = 5, -1$.
6. Start with the definition the problem is testing, then apply it directly. $x + 3 = \pm 4$. So the answer is $x = 1, -7$.
7. Start with the definition the problem is testing, then apply it directly. $x^2 = 100$. So the answer is $x = \pm 10$.
8. Take it one clear step at a time and keep the original question in mind. $\sqrt{12} = 2\sqrt{3}$. So the answer is $x = \pm 2\sqrt{3}$.
9. Focus on the main idea of the problem, then simplify carefully. $\sqrt{50} = 5\sqrt{2}$. So the answer is $x = \pm 5\sqrt{2}$.
10. Take it one clear step at a time and keep the original question in mind. Only one solution (double root). So the answer is $x = 1$.
11. This is a good place to slow down, check the notation, and simplify cleanly. Can't take $\sqrt{-4}$. So the answer is no real solution.
12. Take it one clear step at a time and keep the original question in mind. $x^2 = 9$. So the answer is $x = \pm 3$.
13. This is a good place to slow down, check the notation, and simplify cleanly. Irrational. So the answer is $x = \pm\sqrt{7}$.
14. For a table question, slow down and locate the exact row, column, or cell before calculating. $2x + 1 = \pm 5 \Rightarrow 2x = 4$ or -6 . This gives $x = 2, -3$.
15. Use the clue in the question first, then let the arithmetic finish the job. $x^2 = 16$. So the answer is $x = \pm 4$.
16. Focus on the main idea of the problem, then simplify carefully. $x - 4 = \pm\sqrt{2}$. So the answer is $x = 4 \pm \sqrt{2}$.
17. Start with the definition the problem is testing, then apply it directly. $x^2 = 4$. So the answer is $x = \pm 2$.
18. Start with the definition the problem is testing, then apply it directly. $x + 2 = \pm 8$. So the answer is $x = 6, -10$.
19. This is a good place to slow down, check the notation, and simplify cleanly. $\sqrt{\frac{9}{4}} = \frac{3}{2}$. So the answer is $x = \pm\frac{3}{2}$.
20. Take it one clear step at a time and keep the original question in mind. $3x = \pm 6$. So the answer is $x = \pm 2$.
21. For a table question, slow down and locate the exact row, column, or cell before calculating. $s^2 = 50 \Rightarrow s = \sqrt{50} = 5\sqrt{2}$. Negative side doesn't make sense physically. This gives $5\sqrt{2} \approx 7.07$ m.
22. For a table question, slow down and locate the exact row, column, or cell before calculating. $16t^2 = 144 \Rightarrow t^2 = 9 \Rightarrow t = 3$ (positive only). This gives $t = 3$ sec.
23. Name the quantities first so the model is easy to read. $x + 1 = \pm 2\sqrt{5} = \pm 2\sqrt{5}$. So $x = -1 \pm 2\sqrt{5}$.
24. For a table question, slow down and locate the exact row, column, or cell before calculating. $400 = \frac{1}{2}(8)v^2 = 4v^2 \Rightarrow v^2 = 100 \Rightarrow v = 10$ (positive speed). This gives $v = 10$ m/s.



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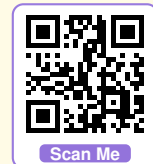
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