MATHEMATICS · GRADES 10-12

Radical equations

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you solve for a number trapped under a square root, like working out how long a playground swing needs to be to swing once per second. A playground designer sets the swing length to get the timing right, and a clockmaker sets a pendulum the same way. A longer swing takes longer to come back, and the length that gives exactly one second is a number hidden under a square root. Working it out means getting that number out from under the root and onto its own.



Rule

To solve a radical equation, isolate the square root first, then square both sides.

Always check your answer in the original equation, because squaring can introduce a solution that does not work.

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Worked examples

EXAMPLE 1

Q Solve $\sqrt{(x+5)} = 4$

SOLUTION

The root is already isolated.

Square both sides: $x + 5 = 16$.

Subtract 5: $x = 11$. Check: $\sqrt{(16)} = 4$, so it works.

EXAMPLE 2

Q Solve $\sqrt{(2x-1)} = 5$

SOLUTION

The root is already isolated.

Square both sides: $2x - 1 = 25$.

Add 1 and divide by 2: $x = 13$. Check: $\sqrt{(25)} = 5$, so it works.

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Practice questions

1 Solve $\sqrt{(x)} = 6$.

- **A** x = 36
- **B** x = 6
- **C** x = 12
- **D** x = 9

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2 Solve $\sqrt{(x+3)} = 5$.

- **A** x = 25
- **B** x = 22
- **C** x = 2
- **D** x = 28

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3 Solve $\sqrt{(3x)} = 9$.

- **A** x = 81
- **B** x = 9
- **C** x = 27
- **D** x = 3

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4 Solve $\sqrt{(x-2)} = 4$.

- **A** x = 6
- **B** x = 16
- **C** x = 18
- **D** x = 14

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5 Solve $\sqrt{(2x+1)} = 7$.

- **A** x = 24
- **B** x = 49
- **C** x = 25
- **D** x = 48

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6 Solve $\sqrt{(x-5)} = -4$.

- **A** No solution
- **B** x = 21
- **C** x = 11
- **D** x = -11

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7 The solution is $x = 50$. Which equation has it:

- **A** $\sqrt{(2x)} = 10$
- **B** $\sqrt{(x)} = 8$
- **C** $\sqrt{(x+15)} = 7$
- **D** $\sqrt{(2x+2)} = 10$

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8 Ben solves $\sqrt{(x)} = 9$ by writing $x = 3$. What is Ben's mistake?

- **A** He took the square root instead of squaring
- **B** He squared 9 instead of taking the square root
- **C** He divided 9 by 3
- **D** He multiplied 9 by 3

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9 Solve $2\sqrt{(x)} = 12$.

- **A** x = 36
- **B** x = 6
- **C** x = 144
- **D** x = 12

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10 Solve $\sqrt{(x)} + 2 = 6$.

- **A** x = 16
- **B** x = 4
- **C** x = 36
- **D** x = 8

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ANSWER KEY

1. x = 36

2. x = 22

3. x = 27

4. x = 18

5. x = 24

6. No solution

7. $\sqrt{(2x)} = 10$

8. He took the square root instead of squaring

9. x = 36

10. x = 16

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