MATHEMATICS · GRADES 10-12

Solving using square roots

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you work out a side length from an area, like the side of a square patio or the edge of a square tile floor, by undoing a square. The area tells you the side multiplied by itself, so finding the side means reversing that multiplication. A square root does exactly that, turning the area back into the length that made it. That is how you go from the size of a room to the length of skirting you need, or from a garden area to the length of fence along one side.



Rule

Solving using square roots: when you take the square root of both sides, remember both roots, the positive and the negative.

A square has two square roots, and leaving one out loses an answer.

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Worked examples

EXAMPLE 1

Q Solve $x^2 = 49$

SOLUTION

Take the square root of both sides:

$\sqrt{(x^2)} = \sqrt{49}$

Remember both roots: $x = 7$ or $x = -7$

Check: $7^2 = 49$ and $(-7)^2 = 49$

EXAMPLE 2

Q Solve $(x - 2)^2 = 25$

SOLUTION

Take the square root of both sides: $x - 2 = 5$ or $x - 2 = -5$

Add 2 to each: $x = 7$ or $x = -3$

Check: $(7 - 2)^2 = 25$ and $(-3 - 2)^2 = 25$

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Practice questions

1 Solve $x^2 = 36$

- **A** x = 6 or x = -6
- **B** x = 6
- **C** x = 3 or x = -3
- **D** x = 36 or x = -36

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2 Solve $3x^2 = 75$

- **A** x = 5 or x = -5
- **B** x = 5
- **C** x = 15 or x = -15
- **D** x = 75 or x = -75

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3 Solve $(x - 1)^2 = 16$

- **A** $x = 5$ or $x = -3$
- **B** $x = 5$ or $x = 3$
- **C** $x = 4$ or $x = -4$
- **D** $x = 1$ or $x = -1$

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4 Solve $x^2 + 9 = 58$

- **A** $x = 7$ or $x = -7$
- **B** $x = 7$
- **C** $x = 49$ or $x = -49$
- **D** $x = 8$ or $x = -8$

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5 Solve $(x + 3)^2 = 9$

- **A** x = 0 or x = -6
- **B** x = 3 or x = -3
- **C** x = 0 or x = 6
- **D** x = 6 or x = -6

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6 The area of a square is 144 cm^2. What is the side length?

- **A** 12 cm
- **B** 72 cm
- **C** 24 cm
- **D** 144 cm

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7 The solutions are $x = 4$ or $x = -8$. Which equation has these solutions?

- **A** $(x + 2)^2 = 36$
- **B** $(x - 2)^2 = 36$
- **C** $x^2 = 36$
- **D** $(x + 2)^2 = 16$

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8 Dan solves $x^2 = 25$ by writing $x = 5$. What did Dan miss?

- **A** Nothing: x = 5 is the whole answer
- **B** The negative square root, x = -5
- **C** The square root of 5
- **D** The positive square root, x = 5

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9 Solve $x^2 = 7$

- **A** $x = \sqrt{7}$ or $x = -\sqrt{7}$
- **B** $x = 7$ or $x = -7$
- **C** $x = \sqrt{7}$
- **D** $x = 3.5$ or $x = -3.5$

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10 Which one is not a perfect square?

- **A** $x^2 = 25$
- **B** $x^2 = 36$
- **C** $x^2 = 49$
- **D** $x^2 = 50$

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ANSWER KEY

1. $x = 6$ or $x = -6$

2. $x = 5$ or $x = -5$

3. $x = 5$ or $x = -3$

4. $x = 7$ or $x = -7$

5. $x = 0$ or $x = -6$

6. 12 cm

7. $(x + 2)^2 = 36$

8. The negative square root, $x = -5$

9. $x = \sqrt{7}$ or $x = -\sqrt{7}$

10. $x^2 = 50$

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