MATHEMATICS · GRADES 7-9

Checking solutions by substitution

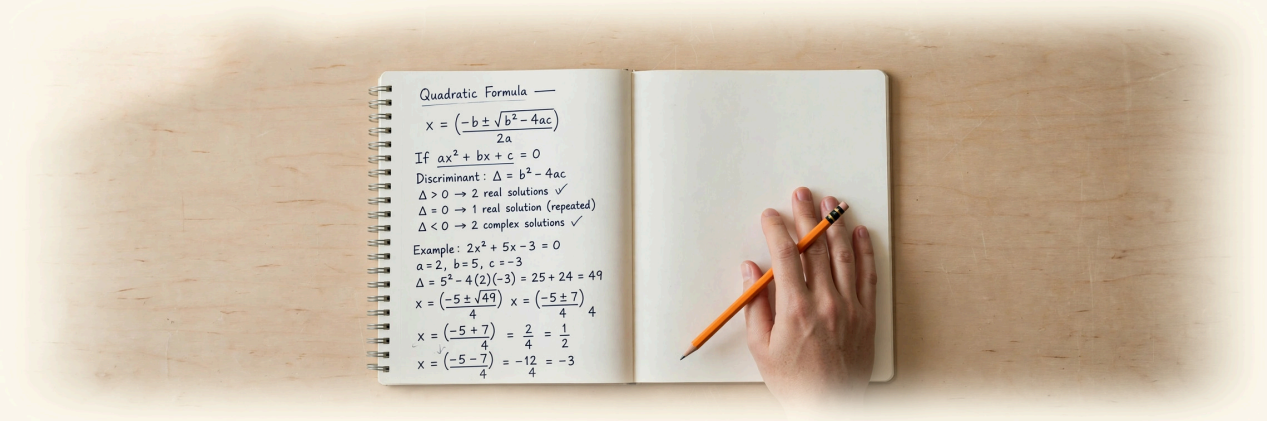
Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you make sure your answer to an equation is right. You put it back into the original equation and check both sides match before you move on. It is a quick habit that turns a guess into a verified answer, and it catches the small slips that are easy to miss in the middle of working.



Rule

A value is a solution only if substituting it makes both sides of the equation equal.

To check a solution, put it back into the original equation and work out both sides. If the two sides match, the value is a solution, and if they do not match, it is not.

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Worked examples

EXAMPLE 1

Q Check whether $x = 4$ is a solution of $3x + 2 = 14$

SOLUTION

Check whether $x = 4$ is a solution of $3x + 2 = 14$

Substitute 4 for x: $3 \times 4 + 2$

Work it out: $12 + 2 = 14$

$14 = 14$, so $x = 4$ is a solution.

EXAMPLE 2

Q Check whether $x = 5$ is a solution of $2x - 3 = 6$

SOLUTION

Check whether $x = 5$ is a solution of $2x - 3 = 6$

Substitute 5 for x: $2 \times 5 - 3$

Work it out: $10 - 3 = 7$, not 6.

7 is not 6, so $x = 5$ is not a solution.

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Practice questions

1 Put 3 in for x in $x + 4 = 7$ and see if both sides match. Answer yes or no.

A Yes

B No

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2 Put 2 in for x in $2x = 6$. Does the equation balance? Answer yes or no.

A Yes

B No

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3 Check $x = 5$ in $3x - 5 = 10$ by substitution. Is $x = 5$ a solution? Answer yes or no.

- A Yes
- B No

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4 Is $x = 4$ a solution of $x^2 + 1 = 4$? Work out $4^2 + 1$ and compare. Answer yes or no.

- A Yes
- B No

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5 Substitute 6 for x in $2x + 1 = 13$. Is $x = 6$ a solution? Answer yes or no.

- A Yes
- B No

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6 Does $x = 3$ satisfy $5x + 10 = 25$? Answer yes or no.

- **A** Yes
- **B** No

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7 One of these equations has $x = 4$ as its solution. Which one is it?

- **A** $2x + 1 = 9$
- **B** $2x + 1 = 10$
- **C** $x + 4 = 9$
- **D** $2x + 1 = 7$

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8 **Mia is checking $x = 6$ in $2x - 4 = 8$. She works out $2 + 6 - 4 = 4$. Where did Mia go wrong?**

A. She added 2 + 6 instead of multiplying 2 × 6; 2 × 6 - 4 is 8, so x = 6 is a solution.

B. She multiplied 2 × 6 instead of adding 2 + 6; 2 + 6 - 4 is 4, so x = 6 is not a solution.

C. She subtracted 4 before multiplying; 2 × (6 - 4) is 4, so x = 6 is not a solution.

D. She added 2 + 6 instead of multiplying 2 × 6; 2 × 6 - 4 is 8, so x = 6 is not a solution.

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9 One of these checks is wrong. Which one?

- **A** x = 2 in 2x = 4, because 2 × 2 is 4.
- **B** x = 3 in 3x = 12, because 3 × 3 is 9, not 12.
- **C** x = 5 in 5x = 25, because 5 × 5 is 25.
- **D** All three checks are correct.

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10 Three of these statements are true and one is false. Which statement is false?

- **A** x = 2 solves x + 3 = 5
- **B** x = 3 solves x + 3 = 5
- **C** x = 2 solves 2x = 4
- **D** x = 2 solves x - 1 = 1

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ANSWER KEY

1. Yes

2. No

3. Yes

4. No

5. Yes

6. Yes

7. $2x + 1 = 9$

8. She added 2 + 6 instead of multiplying 2 × 6; 2 × 6 - 4 is 8, so x = 6 is a solution.

9. x = 3 in 3x = 12, because 3 × 3 is 9, not 12.

10. x = 3 solves x + 3 = 5

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