

WA8MNALE1

Linear and non-linear equations and inequalities

Core + Challenge

Solving Equations with up to Three Operations

I can solve linear equations with up to three operations, including negatives and fractions, and verify by substitution.

Name: _____ Date: _____ Score: _____ / 58

Key idea

Solve by **undoing** the operations in **reverse order** (backtracking). Keep the equation **balanced**: do the same to both sides.

Brackets: $3(x + 4) - 5 = 16 \rightarrow 3(x + 4) = 21 \rightarrow x + 4 = 7 \rightarrow x = 3$. Fractions: $\frac{2x-3}{5} = 7 \rightarrow 2x - 3 = 35 \rightarrow 2x = 38 \rightarrow x = 19$.

Negative coefficients: $10 - 2x = 4 \rightarrow -2x = -6 \rightarrow x = 3$ (divide by -2 , not subtract 2). Solutions may be fractions or negative.

Verify by substituting into the original equation: $x = 3$ in $3(x + 4) - 5$ gives $3 \times 7 - 5 = 16 \checkmark$.

A

Fluency *practise the skill*

/ 16 marks

Solve each equation for x . 1 mark each.

1. $2x + 5 = 17$ _____

9. $6x - 5 = -23$ _____

2. $3x - 4 = 11$ _____

10. $2(x + 3) - 4 = 12$ _____

3. $\frac{x}{4} + 3 = 9$ _____

11. $\frac{x}{5} - 2 = -6$ _____

4. $5(x - 2) = 30$ _____

12. $\frac{2x+1}{3} = 5$ _____

5. $\frac{x+6}{3} = 5$ _____

13. $4x - 3 = 7$ _____

6. $4x + 9 = 1$ _____

14. $-3(x - 4) = 18$ _____

7. $20 - 3x = 8$ _____

15. $7 - \frac{x}{2} = 10$ _____

8. $-2x + 7 = 15$ _____

16. $3(2x - 1) + 5 = 20$ _____

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B

Core *apply the skill to problems*

/ 22 marks

- 1 The flowchart shows what happens to x . Write the equation it shows, then solve it by backtracking. [2 marks]



Answer: _____

- 2 Write the equation shown by this flowchart and solve it. [2 marks]



Answer: _____

- 3 Solve $15 - 4x = 27$ and verify your answer by substitution. [2 marks]

Answer: _____

- 4 Solve $2(3x - 5) + 7 = 12$. Give your answer as a fraction. [3 marks]

Answer: _____

- 5 Solve $5 - \frac{3x}{4} = 11$. [2 marks]

Answer: _____

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- 6 Sam says $x = 4$ is the solution of $5(x - 2) + 3 = 17$. Check by substitution. Is Sam correct? If not, find the correct solution as a decimal. [3 marks]

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Answer: _____

- 7 Solve $\frac{4x+2}{3} - 1 = -5$. [2 marks]

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Answer: _____

- 8 The formula $F = 1.8C + 32$ converts $^{\circ}\text{C}$ to $^{\circ}\text{F}$. One scorching Perth day reached 113°F . Write and solve an equation to find the temperature in $^{\circ}\text{C}$. [2 marks]

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Answer: _____

- 9 Solve $-2(5 - x) = 9$. [2 marks]

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Answer: _____

- 10 A netball court is a rectangle with perimeter 91.5 m and width 15.25 m. Use $P = 2(l + w)$ to write and solve an equation for its length l . [2 marks]

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Answer: _____

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C

Reasoning *explain, justify and check*

/ 9 marks

- 1 Lena solved $\frac{x}{3} - 4 = 2$ like this: $x - 4 = 6$, so $x = 10$. Find her mistake, give the correct solution and verify it. [3 marks]

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- 2 Explain why we undo the operations in the reverse order to the order in which they were done to x . [2 marks]

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- 3 True or false: $7 - 2x = 3$ and $2x - 7 = -3$ have the same solution. Justify your answer. [2 marks]

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- 4 Hana says, 'To solve $-3x = 12$, subtract 3 from both sides.' Explain why she is wrong and solve the equation. [2 marks]

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D

Challenge *multi-step and problem-solving*

/ 11 marks

- 1 I think of a number, multiply it by 3, subtract 5, divide the result by -2 and then add 9. The answer is my original number. What is my number? [3 marks]

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Answer: _____

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- 2 $x = -2$ is the solution of the equation $\frac{kx+4}{3} - k = 6$. Find the value of k . [3 marks]

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Answer: _____

- 3 Solve $2(3(2x - 1) + 4) - 5 = 31$. Give your answer as a fraction. [3 marks]

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Answer: _____

- 4 For the equation $a(x - 3) = 12$: (a) find a so that the solution is $x = -1$; (b) find the value of a for which the equation has no solution. [2 marks]

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Answer: _____

How did I go?

Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 11 **Total ____ / 58**

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