

WA8MNALE1

Linear and non-linear equations and inequalities

Core + Challenge

Equations with Like Terms on Both Sides

I can collect like terms, expand brackets and solve equations with the variable on both sides, then verify by substitution.

Name: _____ Date: _____ Score: _____ / 58

Key idea

Collect like terms on each side first: $3x + 5 + 2x - 1 = 19 \rightarrow 5x + 4 = 19 \rightarrow 5x = 15 \rightarrow x = 3$.

Variable on both sides: subtract the smaller x-term from both sides: $7x - 4 = 3x + 12 \rightarrow 4x - 4 = 12 \rightarrow 4x = 16 \rightarrow x = 4$.

Brackets: expand first (watch the signs): $3(x + 2) = 2(x - 1) + 11 \rightarrow 3x + 6 = 2x + 9 \rightarrow x = 3$. Note $-(x - 4) = -x + 4$.

Verify: substitute into **each side separately**. $x = 3$: LHS = $3(5) = 15$, RHS = $2(2) + 11 = 15 \checkmark$

A

Fluency *practise the skill*

/ 16 marks

Solve each equation for x. 1 mark each.

1. $3x + 2x = 20$ _____

9. $3(x + 2) = x + 14$ _____

2. $4x + 3 - x = 18$ _____

10. $2(x - 1) = 5x + 7$ _____

3. $5x = 2x + 12$ _____

11. $5x - 2x + 4 = x + 10$ _____

4. $7x - 4 = 3x + 12$ _____

12. $9 - 2x = x + 3$ _____

5. $6x + 1 = 4x + 11$ _____

13. $4(x + 1) = 2(x + 7)$ _____

6. $2x + 9 = 5x - 12$ _____

14. $3x + 1 = 7x + 3$ _____

7. $8x - 5 = 3x - 25$ _____

15. $10 - 3x = 2x - 5$ _____

8. $x + 7 = 4x - 11$ _____

16. $6x + 5 = 2x + 5$ _____

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B

Core *apply the skill to problems*

/ 22 marks

- 1 Solve $5x + 3 - 2x + 7 = 31$.

[2 marks]

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Answer:

- 2 Solve $9x - 7 = 4x + 18$ and verify your solution by substituting into both sides.

[2 marks]

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Answer:

- 3 Solve $3(2x - 1) = 4(x + 3)$.

[2 marks]

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Answer:

- 4 Solve $5(x - 2) - 3(x + 1) = 7$.

[3 marks]

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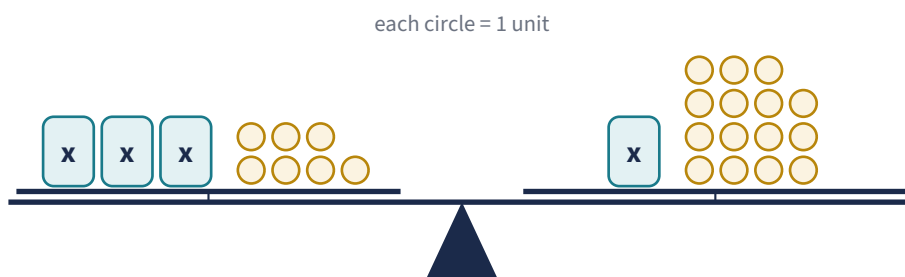
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Answer:

- 5 The scale is balanced. Each bag holds the same number of units, x . Write an equation and find x .

[2 marks]

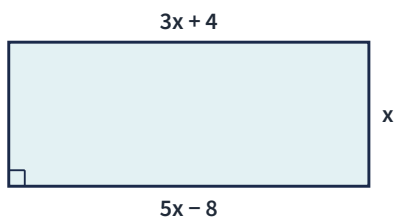


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Answer:

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- 6 Opposite sides of a rectangle are equal. Find x , then the length of the rectangle. [2 marks]



Answer: _____

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

Answer: _____

- 8 Solve $7 - 3x = 2(4 - x) + 5$ and verify your answer. [2 marks]

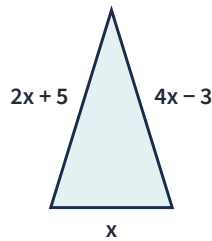
Answer: _____

- 9 Gym A charges a \$40 joining fee plus \$12 per week. Gym B charges \$10 to join plus \$18 per week. Write and solve an equation to find when the total costs are equal. [2 marks]

Answer: _____

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- 10 The triangle is isosceles: the two sloping sides are equal. Find x and then the perimeter. [3 marks]



Answer: _____

C Reasoning *explain, justify and check*

/ 9 marks

- 1 Omar solved $2(x + 3) - (x - 4) = 15$ like this: $2x + 6 - x - 4 = 15$, $x + 2 = 15$, $x = 13$. Find his error and solve the equation correctly. [3 marks]

- 2 When x appears on both sides, why is it usually easier to subtract the smaller x -term from both sides? Use $2x + 9 = 5x - 12$ as an example. [2 marks]

- 3 Is $x = -2$ a solution of $4 - 3x = x + 12$? Show both sides. [2 marks]

- 4 Explain why $3(x + 4) = 3x + 5$ has no solution, but $2(x + 5) = 2x + 10$ is true for every value of x . [2 marks]

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D**Challenge** *multi-step and problem-solving*

/ 11 marks

1 Solve $\frac{3x-1}{4} - \frac{x+1}{3} = 2$.

[3 marks]

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Answer: _____

2 The equation $ax + 7 = 3x + a$ has solution $x = 4$. Find a .

[3 marks]

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Answer: _____

3 A square has side $(x + 3)$ cm and an equilateral triangle has side $(2x - 1)$ cm. Their perimeters are equal. Find x and the perimeter.

[3 marks]

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Answer: _____

4 (a) Find k so that $2(x + k) = 2x + 10$ is true for every value of x . (b) For which values of k does $3x + k = 3(x + 2)$ have 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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