SOLVING EQUATIONS WITH VARIABLES ON BOTH SIDES

LO: To solve equations involving complex equations.

25 September 2025

Week 5, Day 4

25/09/2025

Solving Equations with variables on both sides

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Key words: Transpose, isolate, combine, like terms, multi-step

Mental Maths

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MENTAL MATHS: Solve for the unknown.

1) $c - 1 = 4$

2) $8 = c + c$

3) $-2x = -4$

4) $3c + 4c = 7$

5) $6 = -3c$

6) $5y = 1 - 4$

7) $y - 3 = 9$

8) $c + 2 = 10$

9) $-2x = 10$

10) $88v = -11$

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MENTAL MATHS (ANSWERS)

Solve for the unknown.

C = 5 — 1) $c - 1 = 4$

C = 4 — 2) $8 = c + c$

X = 2 — 3) $-2x = -4$

C = 1 — 4) $3c + 4c = 7$

C = -2 — 5) $6 = -3c$

6) $5y = 1 - 4$ — C = -3/5

7) $y - 3 = 9$ — C = 12

8) $c + 2 = 10$ — C = 8

9) $-2x = 10$ — C = -5

10) $88v = -11$ — C = -1/8

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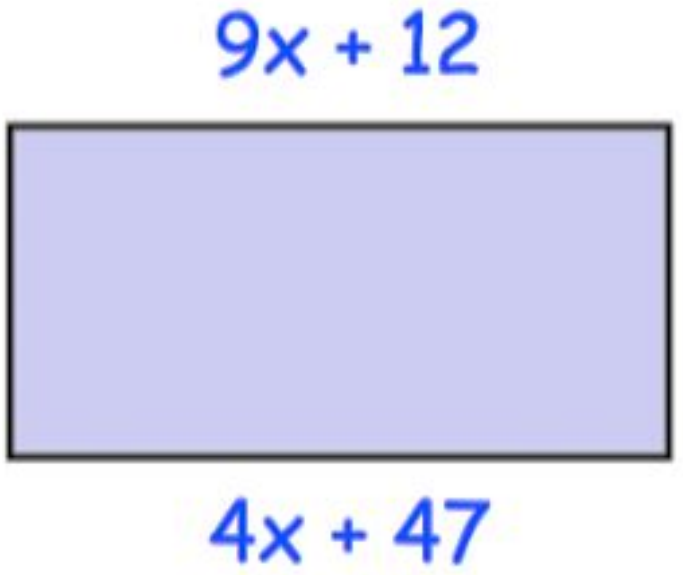
STARTER

Shown is a rectangle

(a) Explain why $9x + 12 = 4x + 47$

(b) Find x



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STARTER (ANSWERS)

(a) The opposite sides of a rectangle have the same length

(b) $x = 7$

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GCSE/iGCSE Assessment Objective Specification – Foundation/Higher

A	understand that symbols may be used to represent numbers in equations or variables in expressions and formulae
A	solve linear equations, with integer or fractional coefficients, in one unknown in which the unknown appears on either side or both sides of the equation
B	set up simple linear equations from given data

The three angles of a triangle are $a°$, $(a + 10)°$, $(a + 20)°$.

Find the value of a

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KEY CONCEPT:

Example:

1) Solve for z: $7z - (3z - 4) = 12$

Solution:

Step 1. Simplify the left side of the equation by removing parentheses and combining like terms.

Distribute through by -1.

$7z - 3z + 4 = 12$

Combine like terms on the left side of the equation.

$4z + 4 = 12$

Step 2. Use subtraction to isolate the variable term on the left side of the equation.

Subtract 4 from each side of the equation.

$4z + 4 - 4 = 12 - 4$

$4z = 8$

Step 3. Use division to solve for the variable.

Divide each side of the equation by 4.

The solution to $7z - (3z - 4) = 12$ is $z = \mathbf{2}$.

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My Turn

Your Turn

Solve the following equations:

(a) $7x + 9 = 2x + 19$

$- 2x$ $\quad$ $- 2x$

$5x + 9 = 19$

$- 9$ $\quad$ $- 9$

$5x = 10$

$\div 5$ $\quad$ $\div 5$

$x = 2$

(b) $3x - 1 = 6 - 4x$

$+ 4x$ $\quad$ $+ 4x$

$7x - 1 = 6$

$+ 1$ $\quad$ $+ 1$

$7x = 7$

$\div 7$ $\quad$ $\div 7$

$x = 1$

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MINI PLENARY:

Solve: $5x + 7 = 4x + 2$

The answer is $x = 5$

TRUE	FALSE
Stand Up	Remain Seated

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MINI PLENARY:

Solve: $9x - 5 = -2x + 50$

The answer is $x = 5$

TRUE	FALSE
Stand Up	Remain Seated

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MINI PLENARY:

Solve: $4x + 5 = 2x + 3$

The answer is $x = -1$

TRUE	FALSE
Stand Up	Remain Seated

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Worked example

Solve the equation $4(2a - 1) = 32 - 3(2a - 2)$.

$4(2a - 1) = 32 - 3(2a - 2)$

$8a - 4 = 32 - 6a + 6$ — Multiply out the brackets. Take care with the minus signs.

$8a - 4 = 38 - 6a$ — Collect like terms on the right-hand side. 32 + 6 = 38

$8a + 6a = 38 + 4$ — Rearrange to get like terms on both sides.

$14a = 42$

$a = \frac{42}{14} = 3$ — Simplify and then solve.

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A ✓ solve linear equations, with integer or fractional coefficients, in one unknown in which the unknown appears on either side or both sides of the equation	
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Core Task 1:

1. $8x + 8 = 2x + 62$
2. $7x + 3 = x + 33$
3. $6x + 5 = 3x + 17$
4. $7x + 7 = 3x + 7$
5. $7x + 10 = 4x + 25$
6. $7x + 4 = 2x + 29$
7. $5x + 10 = 4x + 14$
8. $8x + 1 = 4x + 29$

Core Task 2:

1. $8 - 3x = 20 - 6x$
2. $8 - 4x = -10x - 28$
3. $8 - 3x = 5x + 64$
4. $5x + 1 = 49 - 3x$
5. $7 - 9x = 15 - 10x$
6. $4 - 5x = 32 - 9x$
7. $10x + 6 = 42 - 2x$
8. $3 - 5x = 3x + 11$

Core Task

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Task 3:

1. $10(x - 8) = 3x - 66$
2. $5(x + 4) = 9x - 12$
3. $7(x + 5) = 10x + 20$
4. $7(x - 2) = 9x - 16$
5. $6(x + 3) = 10x - 18$
6. $9(x + 2) = 4x + 23$
7. $3(x - 10) = 2x - 25$
8. $10(x + 6) = 3x + 60$
9. $3(x - 4) = 4x - 18$
10. $5(x - 8) = 10x - 45$

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Extension

Solve the equations.

1 a. $-4(-4-x) = \frac{7x}{-8}$

1 b. $\frac{-3c}{5} = 5 - 4c$

Plenary

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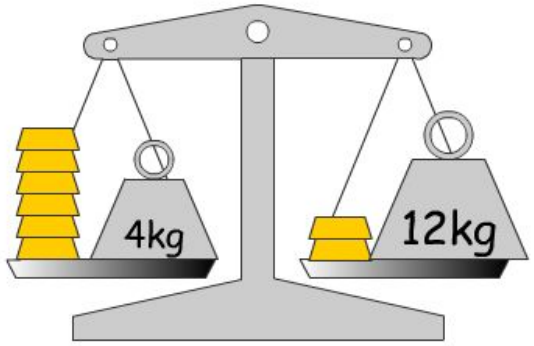
05:00



What is the weight of one bar of gold in the picture?

Write the picture as an equation and solve it.

$$6x + 4 = 2x + 12$$

- 2x - 2x

$$4x + 4 = 12$$

- 4 - 4

$$4x = 8$$

÷ 4 ÷ 4

$$x = 2$$

How do you feel?
S-Secure
M-Met
W-Working towards