LO: Rearrange subject and solve problems involving worded formulae.

Mental Math

1 Solve these equations.

a $2a - 4 = 2$

b $10 - 2x = 5$

c $\frac{3y}{5} = -6$

2 If $a = 3$ and $b = -2$ find

a ab

b $a + b$

c $3a - 2b$

d $a(2 + b)$.

Mental Math

1 **a** $a = 3$ **b** $x = 2.5$ **c** $y = -10$

2 **a** -6 **b** 1 **c** 13

d 0

Mental Math

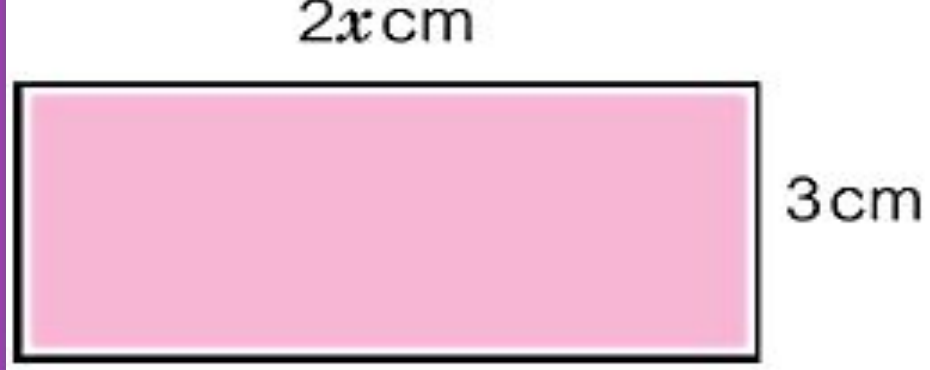
Equations Involving Formulae

LO: Rearrange subject and solve problems involving worded formulae.

Starter

05:00

Here is a rectangle.



a Write down and simplify an expression for the perimeter of the rectangle.

b Copy and complete the formula for calculating perimeter P.

$P = \square + 6$

c The perimeter of the rectangle is 34 cm.
Work out the length of the longest side.

Equations Involving Formulae

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Starter

Here is a rectangle.

a $4x + 6$ **b** $P = 4x + 6$

c $x = 7$ cm so longest side = 14 cm

a Write down and simplify an expression for the perimeter of the rectangle.

b Copy and complete the formula for calculating perimeter P.

$P = \square + 6$

c The perimeter of the rectangle is 34 cm.
Work out the length of the longest side.

Equations Involving Formulae

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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 ✓

D use formulae from mathematics and other real-life contexts expressed initially in words or diagrammatic form and convert to letters and symbols

C find the area of simple shapes using the formulae for the areas of triangles and rectangles

A understand the process of manipulating formulae or equations to change the subject, to include cases where the subject may appear twice or a power of the subject occurs

LO: Rearrange subject and solve problems involving worded formulae.

Key Concept

10:00

What is a Formula?

- A *formula* is a fact or rule that uses mathematical symbols.
  It will usually have:
- an equals sign (=)
- two or more **variables** (x, y, etc) that stand in for values we don't know yet

*It shows us how things are related to each other.

Equations Involving Formulae

LO: Rearrange subject and solve problems involving worded formulae.

Mini-Plenary

02:00

These are all equations, but only some are formulas:

$x = 2y - 7$	
$a^2 + b^2 = c^2$	
$x/2 + 7 = 0$	

Equations Involving Formulae

LO: Rearrange subject and solve problems involving worded formulae.

Key Concept

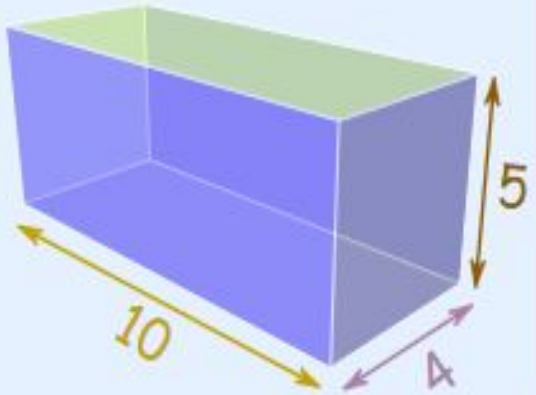
Example: The formula for finding the volume of a box is:

$$V = lwh$$

V stands for volume, **l** for length, **w** for width, and **h** for height.

When l=10, w=4, and h=5, then:

$$V = 10 \times 4 \times 5 = 200$$



Key Concept

LO: Rearrange subject and solve problems involving worded formulae.

Steak cooking instructions

Medium Roast
25 mins per 450g + 25mins

These are all real-life examples of using worded formulae

Tariffs

Tariff #1

Minimum cost:

Then £0.20 every 127.50 metres

Then £0.20 every 89.20 metres

All Year, All Day

Tip-Up Concrete Mixers

1ST DAY	EXTRA DAY	WEEKEND	WEEK
~~£20.34~~	~~£10.17~~	~~£25.43~~	~~£40.68~~
£10.00	£5.00	£12.50	£20.00

My Turn

LO: Rearrange subject and solve problems involving worded formulae.

Here is a rule to work out the time it takes to cook a piece of meat.

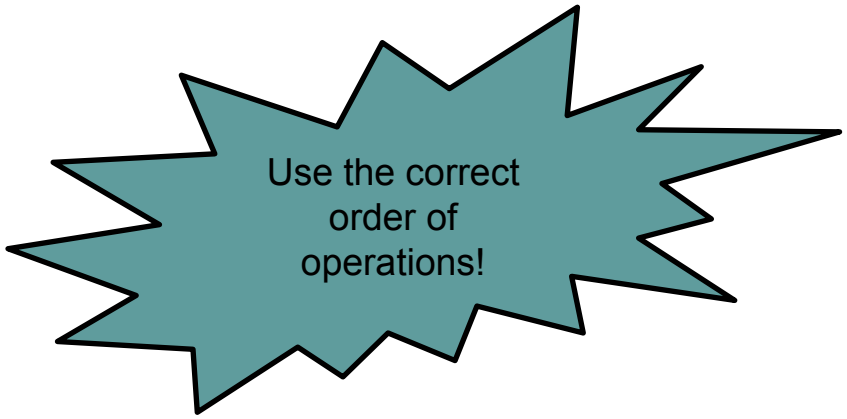
$$\text{Time in minutes} = 36 \times \text{weight in kg} + 30$$

A piece of meat has a weight of 4 kg.

(a) Use the rule to work out the time, in minutes, it takes to cook this piece of meat.

Time in minutes

$$= 36 \times 4 + 30$$
$$= 144 + 30$$
$$= 174 \text{ minutes}$$



My Turn

LO: Rearrange subject and solve problems involving worded formulae.

Here is a rule to work out the time it takes to cook a piece of meat.

$$\text{Time in minutes} = 36 \times \text{weight in kg} + 30$$

It takes 192 minutes to cook a different piece of meat.
(b) Work out the weight of this piece of meat.

$$192 = 36 \times \text{weight in kg} + 30$$
$$-30 \qquad\qquad -30$$
$$162 = 36 \times \text{weight in kg}$$
$$\div 36 \qquad \div 36$$
$$4.5 = \text{weight in kg}$$

Your Turn

LO: Rearrange subject and solve problems involving worded formulae.

02:00

This rule can be used to work out the time, in minutes, it takes to make microchips.

$$\text{Time} = \text{number of microchips} \div 20 + 4$$

(a) Work out the time it takes to make 100 microchips.

$$\text{Time} = 100 \div 20 + 4$$

$$= 5 + 4$$

$$= 9 \text{ minutes}$$

Use the correct order of operations!

Your Turn

LO: Rearrange subject and solve problems involving worded formulae.

02:00

This rule can be used to work out the time, in minutes, it takes to make microchips.

$$\text{Time} = \text{number of microchips} \div 20 + 4$$

(b) Work out the greatest number of microchips that can be made in 60 minutes.

$$60 = \text{number of microchips} \div 20 + 4$$
$$-4 \qquad\qquad -4$$
$$56 = \text{number of microchips} \div 20$$
$$\times 20 \qquad\qquad \times 20$$
$$1120 = \text{number of microchips}$$

Core Task

LO: Rearrange subject and solve problems involving worded formulae.

10:00

Task 1:

STEM A formula you can use to work out the distance, s, a car has travelled in metres is

$$s = ut + \frac{1}{2}at^2$$

where: u is the starting speed in metres per second
a is the acceleration in metres per second^2
t is the time in seconds.

Work out the distance the car has travelled when

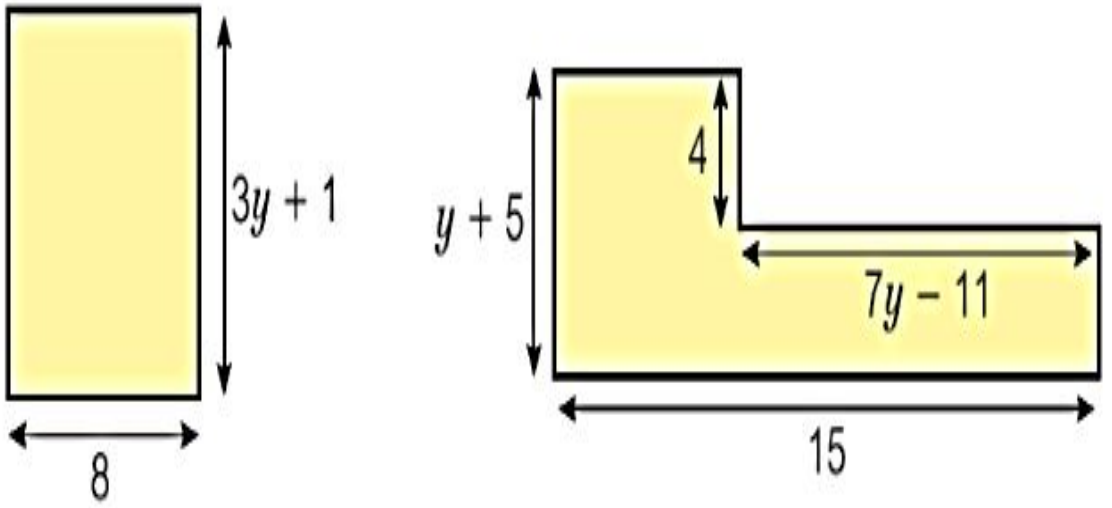
a $u = 0$, $a = 2$ and $t = 10$

b $u = 13$, $a = 3$ and $t = 4$

c $u = 25$, $a = -4$ and $t = 8$.

Task 2:

In this diagram the yellow shapes have the same area.



Work out the value of y.

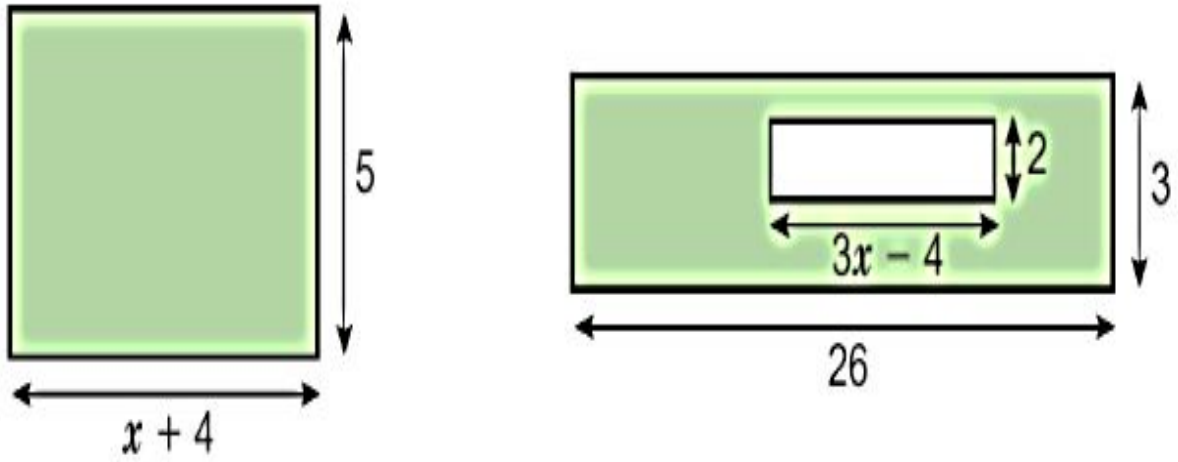
Equations Involving Formulae

LO: Rearrange subject and solve problems involving worded formulae.

Task 3:

Problem-solving

a In this diagram the green shapes have the same area.



Work out the value of x.

Extension:

Make the indicated variable the subject of each formula:

(1) $c = \sqrt{x - y}$ (y)

(2) $\sqrt{\left(\frac{f}{m}\right)} = p$ (m)

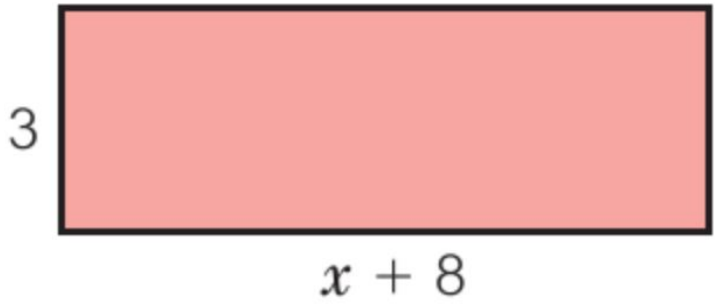
Plenary

LO: Rearrange subject and solve problems involving worded formulae.

05:00

Plenary

These two rectangles have the same area.



Work out the value of x.

$x = 12$