

Using algebraic expressions

Year 7 About 70 minutes No calculator 45 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-7-using-algebraic-expressions/

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark] **A2** Needed today [1 mark]
 Expand $4(3x - 5)$. Work out $\frac{7+9}{2} \times 5$.

Answer

Answer

- A3** Needed today [1 mark] **A4** From chapter 6 [1 mark]
 Write down the highest common factor of 14 and 35. A cuboid is 2 cm by 3 cm by 6 cm. Work out its volume.

Answer

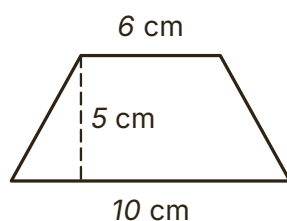
Answer cm³**B Example, then your turn**

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Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

The area of a trapezium can be written as $A = \frac{(a+b)h}{2}$ or as $A = \frac{h}{2}(a+b)$. Work out the area of this trapezium both ways.



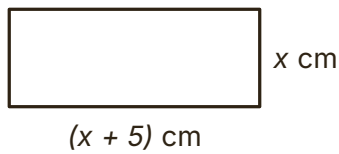
Not drawn accurately

Hint a and b are the parallel sides; h is the height. Both forms must give the same answer.

- B1** The perimeter of a rectangle [3 marks]
 can be written as $P = 2(l + w)$
 or as $P = 2l + 2w$. Work out P
 both ways when $l = 7.5$ and
 $w = 3.5$. Then expand $2(l + w)$
 to show that the two forms
 always agree.

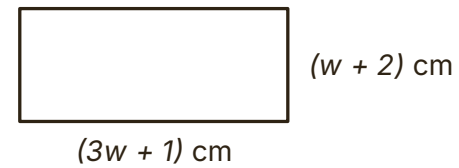
EXAMPLE 2

Write an expression for the perimeter of this rectangle in the form $2(\dots)$.



Not drawn accurately

Hint Add all four sides. Then ask: what times 2 gives each term?

B2 Write an expression for the perimeter of this rectangle in the form $2(\dots)$. [2 marks]

Not drawn accurately

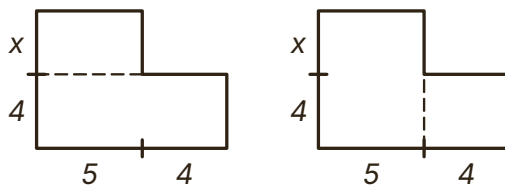
Answer $2(\dots)$ cm

EXAMPLE 3

This shape is split into two rectangles in two different ways. Lengths are in cm.

(a) Use each diagram to write an expression for the area.

(b) Show that the two expressions are equivalent.

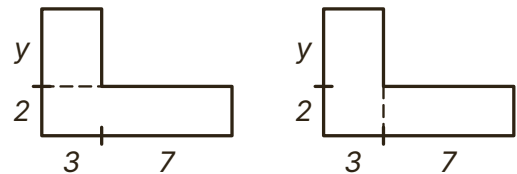


Hint Left: a 9 by 4 rectangle and a 5 by x one. Right: a 5 by $(x + 4)$ rectangle and a 4 by 4 one.

B3 This shape is split into two rectangles in two different ways. Lengths are in cm. [3 marks]

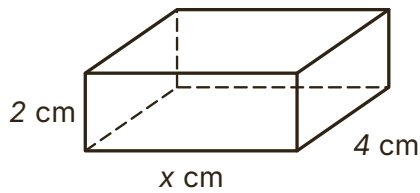
(a) Use each diagram to write an expression for the area.

(b) Show that the two expressions are equivalent.



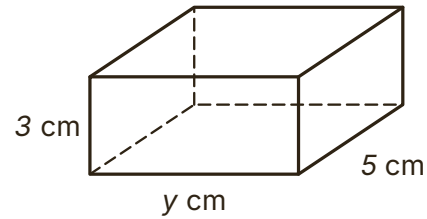
EXAMPLE 4

For this cuboid, write an expression for (a) its volume, (b) its total surface area in the form $4(\dots)$.



Not drawn accurately

Hint A cuboid has three pairs of equal faces: front and back, top and bottom, the two ends.

B4 For this cuboid, write an expression for (a) its volume, (b) its total surface area in the form $2(\dots)$. [3 marks]

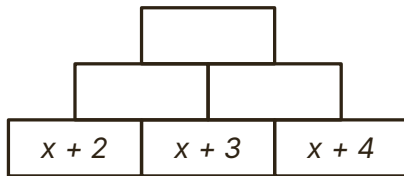
Not drawn accurately

Answer (a) (b) $2(\dots)$

c Practice

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- C1** Each brick is the sum of the two below it. Write the top brick in the form $4(\dots)$. [2 marks]



Answer $4(\dots)$

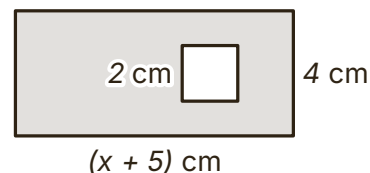
- C2** Which two of these are equivalent to $12y - 18$? [2 marks]
- A $6(2y - 3)$ B $12(y - 18)$
 C $3(4y - 6)$ D $2(6y - 18)$

Answer and

- C3** (a) Write $15n + 20$ in the form $5(\dots)$. [2 marks]
 (b) Write $12n - 8$ in the form $4(\dots)$.

Answer (a) $5(\dots)$ (b) $4(\dots)$

- C4** A 2 cm by 2 cm square is cut out of a rectangle. Write an expression for the shaded area in the form $4(\dots)$. [2 marks]



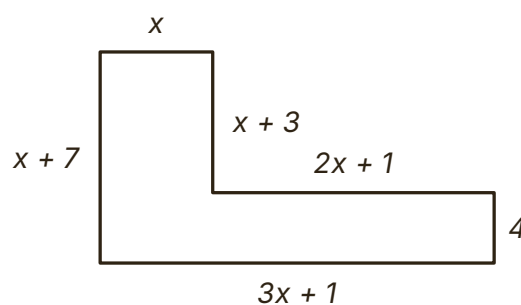
Not drawn accurately

Answer $4(\dots)$ cm^2

- D1** Jo says, " $4x + 12$ written with a bracket is $4(x + 12)$." [3 marks]
Jo is wrong. Explain why, and write $4x + 12$ correctly with a bracket.

- D2** Here is a shape. All the lengths are in centimetres.

- (a) Show that the perimeter of the shape is $8(x + 2)$ cm. [3 marks]



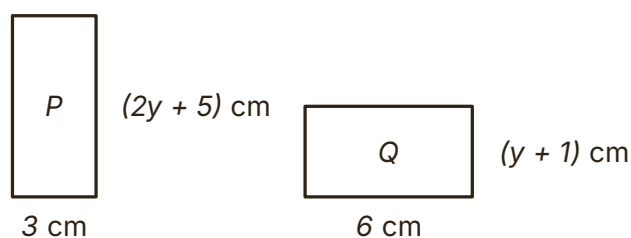
- (b) The perimeter is 56 cm. Work out the value of x . [2 marks]

Not drawn accurately

Answer $x = \dots\dots$

Total for D2: 5 marks

- D3** Rectangle P is 3 cm by $(2y + 5)$ cm. Rectangle Q is 6 cm by $(y + 1)$ cm. [4 marks]
Show that the area of P is always 9 cm^2 more than the area of Q .



Not drawn accurately

- D4** Three friends share a taxi. The fare for a journey of n miles is $\pounds(6n + 15)$. They share the fare equally.

- (a) Write $6n + 15$ in the form $3(\dots\dots)$. [1 mark]

Answer $3(\dots\dots)$

- (b) Write an expression for the amount each friend pays. [1 mark]

Answer $\pounds \dots\dots$

(c) Each friend pays £13. Work out how many miles the journey was.

[3 marks]

Answer miles

Total for D4: 5 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 $12x + 18$ can be written as $k(\dots)$, where k is a whole number greater than 1 [5 marks]
and the bracket has whole numbers in it.

Find every way of doing this.

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** k must divide into both 12 and 18.
Hint 2 The numbers greater than 1 that divide both 12 and 18 are 2, 3 and 6.
Hint 3 $12x + 18 = 2(6x + 9) = 3(4x + 6) = 6(2x + 3)$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can show that two forms of a formula give the same answer. ☐ ☐ ☐

I can write a perimeter or area in the form $k(\dots)$. ☐ ☐ ☐

I can split a shape two ways and show the areas are equivalent. ☐ ☐ ☐

I can write expressions for the volume and surface area of a cuboid. ☐ ☐ ☐