

4 Geometry and measures

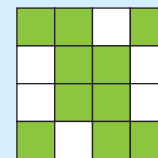
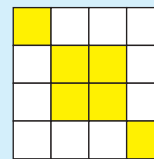
4.1 Symmetry

I can

- identify reflection symmetry in 2D shapes
- identify rotation symmetry in 2D shapes

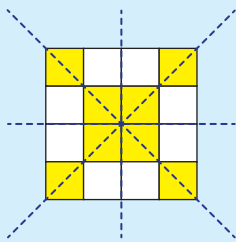
Example

- a i** How many lines of symmetry does this shape have?
- ii** Colour two squares so that it has four lines of symmetry.
- b i** What is the order of rotational symmetry of this shape?
- ii** Colour two squares so that it has rotational symmetry of order four.



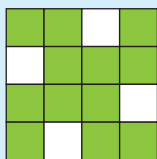
Solution

- a i** It has two lines of symmetry. They pass through opposite corners.
- ii** Colour the other two corners. This will make the shape symmetrical horizontally and vertically as well as diagonally.



The four lines of symmetry have been drawn on the shape.

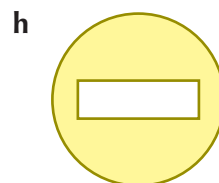
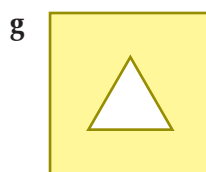
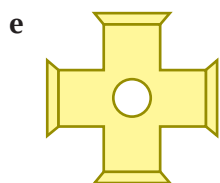
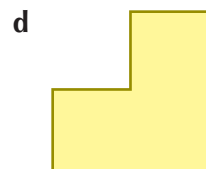
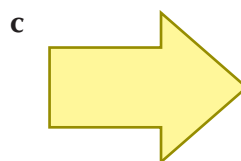
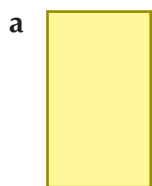
- b i** It has rotational symmetry of order two.
- ii** Colour the two squares as shown.



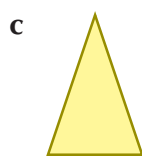
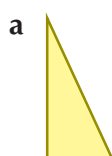
The shape now has rotational symmetry of order four. If you rotate the shape about the centre it will come back on itself four times in one complete revolution. You can check this with tracing paper.

Practice questions

1 All of these shapes have line symmetry. Draw the lines of symmetry on each shape.



2 Some of these shapes do not have line symmetry. Put a tick inside the shapes that have line symmetry. Put a cross inside those that do not.



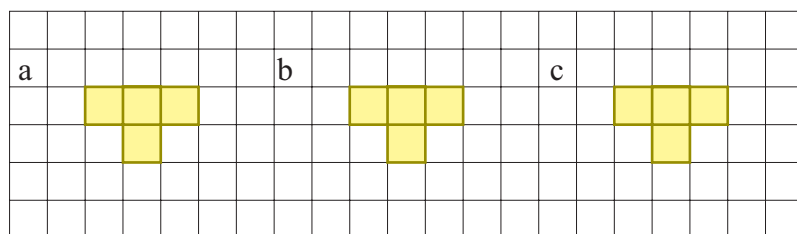
3 If possible, add one extra square to give the shape

a four lines of symmetry.

b one line of symmetry.

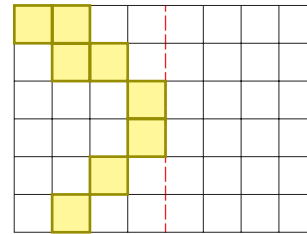
c no lines of symmetry.

Say if it is not possible.

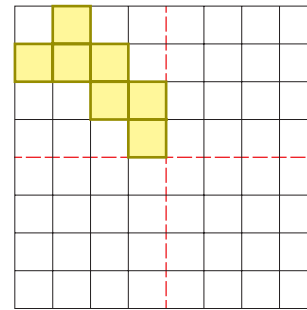


4

a Shade in squares to turn the dashed line into a line of symmetry.

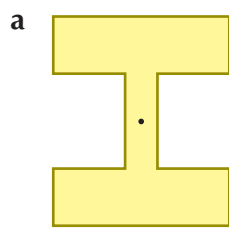


b Shade in squares to turn both the dashed lines into lines of symmetry.

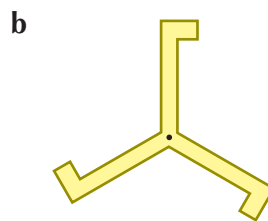


5

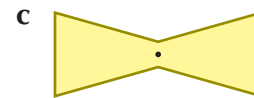
Work out the order of rotation symmetry of each shape.



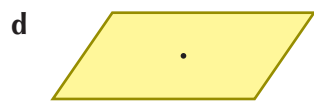
Order _____



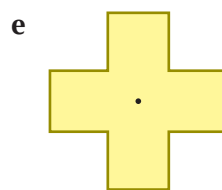
Order _____



Order _____



Order _____



Order _____

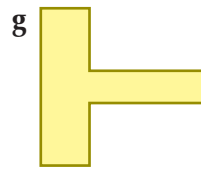
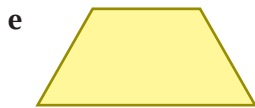
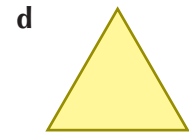
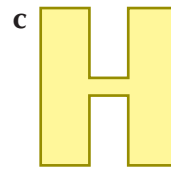
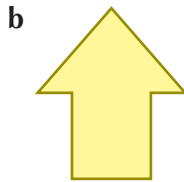


Order _____

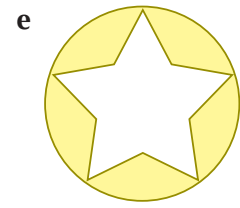
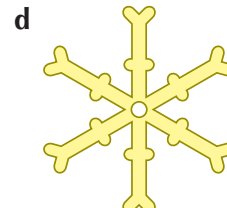
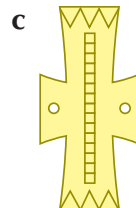
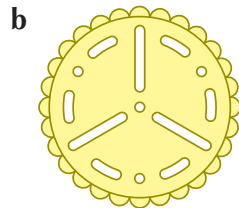
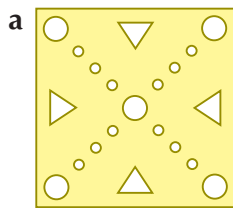
6 Some shapes do not have rotation symmetry.

Put a 1 inside shapes that do **not** have rotation symmetry.

Write the order of rotation symmetry inside the other shapes.



7 Write down the order of rotation symmetry of each design.



Order _____

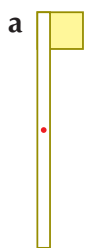
Order _____

Order _____

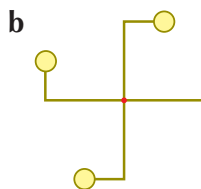
Order _____

Order _____

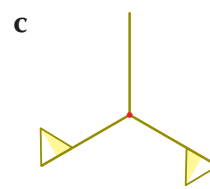
8 Complete these shapes so they have rotation symmetry of the given order about the centre shown.



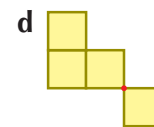
Order 2



Order 4



Order 3



Order 2

4.2 3D shapes

I can

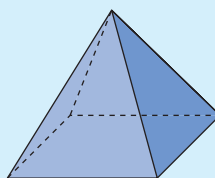
- identify properties of 3D shapes

Example

This is a square-based pyramid.

Work out the number of

- a** faces **b** edges **c** vertices



Solution

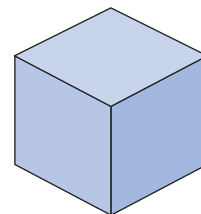
- a** There is a square base and four triangular faces. There are five faces all together.
- b** Two faces meet at an edge. There are four edges round the base and four sloping edges. There are eight edges all together.
- c** There is a vertex at each end of an edge. There are four vertices round the base and one more at the top. There are five vertices all together.

Practice questions

- 1** This is a cube.

Write down the number of

- a** faces _____ **b** edges _____ **c** vertices _____



- 2** The shape of this wooden block is a triangular prism.

Work out the number of

- a** faces _____ **b** edges _____ **c** vertices _____

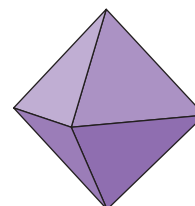


- 3** This shape is an octahedron.

It has eight triangular faces.

- a** How many vertices does it have? _____

- b** How many edges does it have? _____



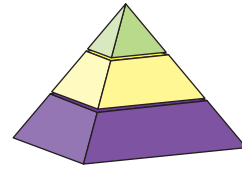
4 A prism is sliced into three parts.

a Look at the yellow slice. Complete this sentence.

The yellow slice has _____ edges and _____ vertices.

b Two of the faces of the yellow slice are squares.

What shape are the other faces? _____.

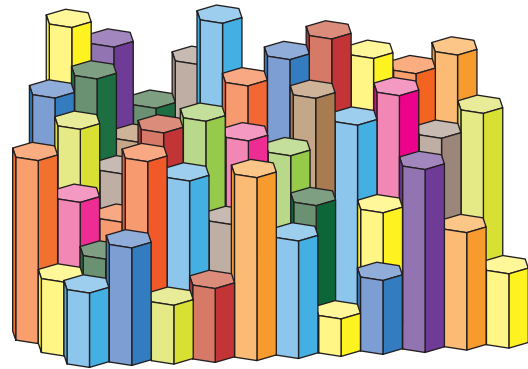


5 All these shapes are hexagonal prisms.

A hexagonal prism has eight faces. Two are hexagons. The other six are rectangles.

a How many vertices does a hexagonal prism have? _____

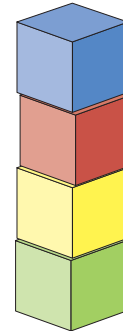
b How many edges does a hexagonal prism have? _____



6 Four cubes are balanced one on top of the other.

a How many square faces are completely visible? _____

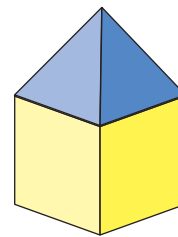
b How many square faces are not completely visible? _____



7 A pyramid is placed on top of a cube to make this shape.

For this shape, work out the number of

a vertices _____ b faces _____ c edges _____



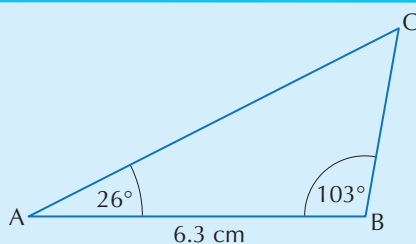
4.3 Measuring angles

I can

- use a protractor to measure angles of any size

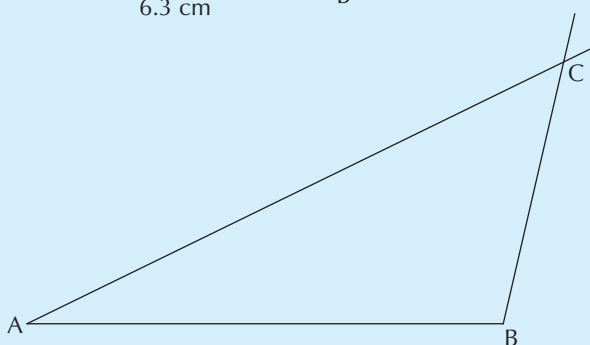
Example

- Draw this triangle.
- Measure angle C.
- Measure the length of BC.



Solution

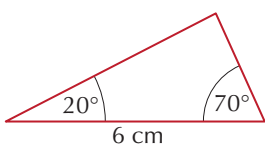
- Start by drawing AB.
Draw the angles at A and B.
The lines cross at C.
- Angle C is 51°.
- The length of BC is 3.5 or 3.6 cm.



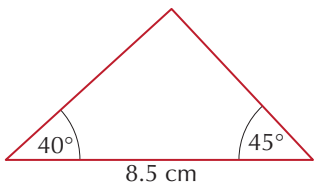
Practice questions

- 1 Use a ruler and a protractor to make an accurate drawing of each of the following triangles. Measure and label the third angle.

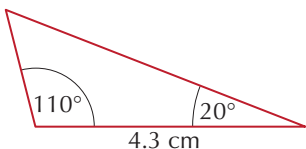
a



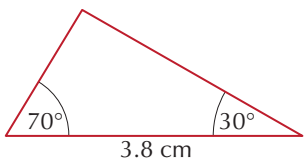
b



c

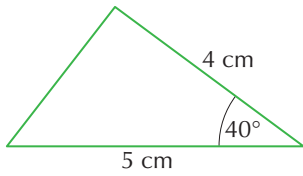


d

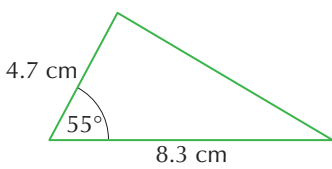


- 2 Use a ruler and a protractor to make an accurate drawing of each of the following triangles. Measure and label the other angles on your drawing.

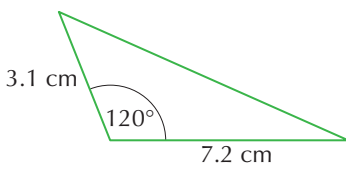
a



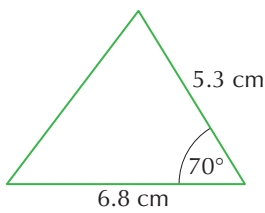
b



c

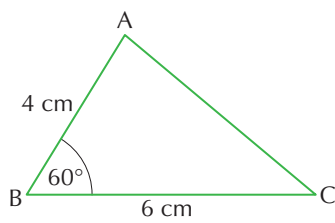


d



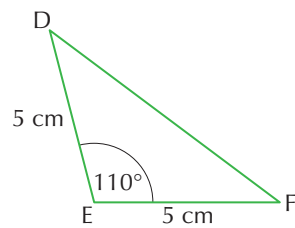
- 3 Construct each of the following triangles accurately on squared paper. Remember to label all of the lines and angles. Measure the lines shown.

a



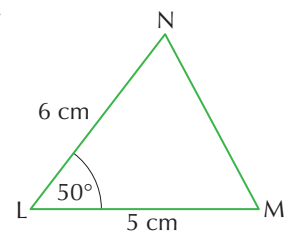
AC = _____ cm

b



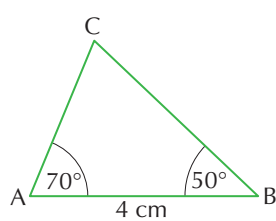
DF = _____ cm

c



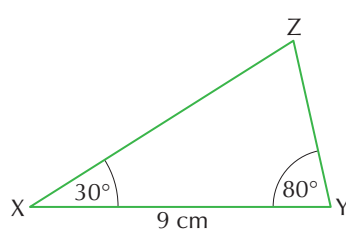
NM = _____ cm

d



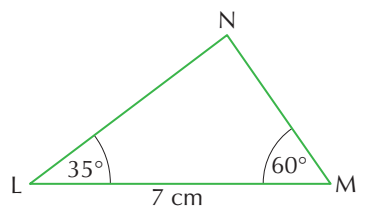
CB = _____ cm

e



XZ = _____ cm

f



LN = _____ cm

4.4 Calculating angles

I can

- work out angles of a triangle
- work out angles round a point

Example

Work out the sizes of angles a and b .

Solution

115 and a are angles on a straight line. They add up to 180° .

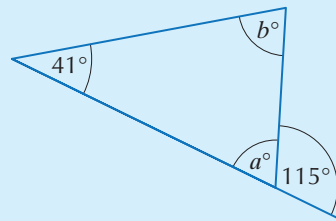
$$a = 180^\circ - 115^\circ = 65^\circ$$

The three angles of a triangle add up to 180° .

$$41 + 65 + b = 180$$

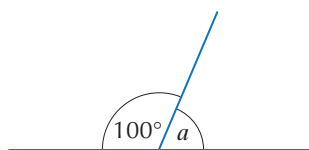
$$106 + b = 180$$

$$b = 180 - 106 = 74$$

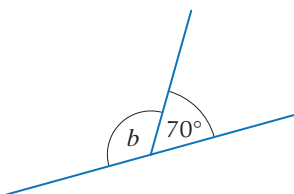


Practice questions

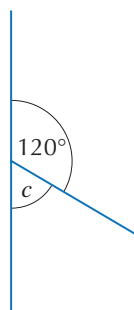
- 1 Find the missing angles.



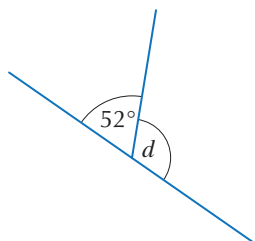
$$a = \underline{\hspace{2cm}}^\circ$$



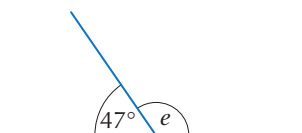
$$b = \underline{\hspace{2cm}}^\circ$$



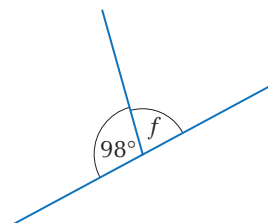
$$c = \underline{\hspace{2cm}}^\circ$$



$$d = \underline{\hspace{2cm}}^\circ$$

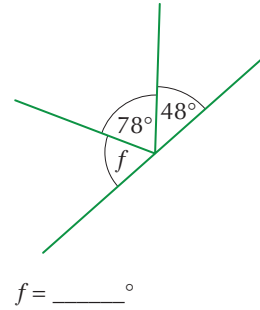
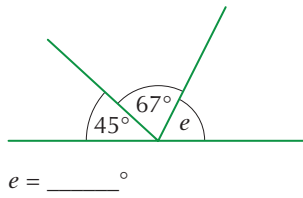
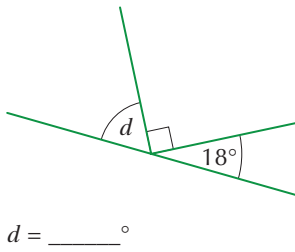
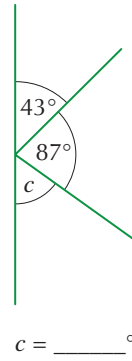
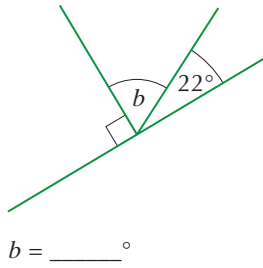
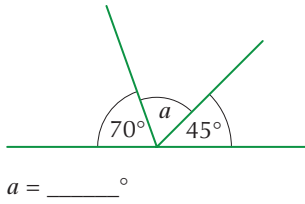


$$e = \underline{\hspace{2cm}}^\circ$$

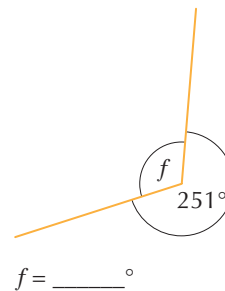
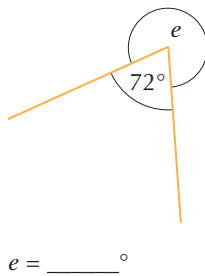
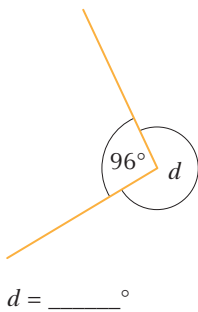
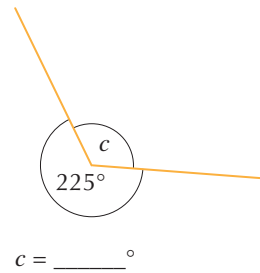
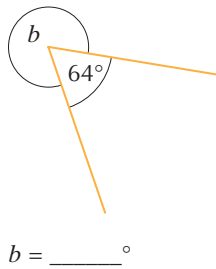
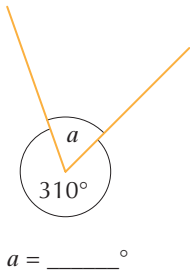


$$f = \underline{\hspace{2cm}}^\circ$$

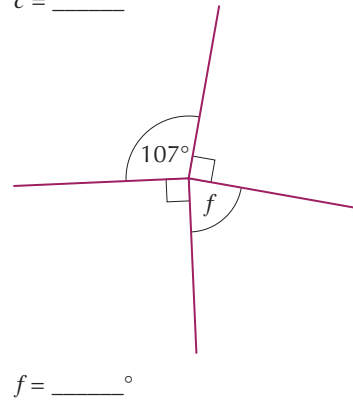
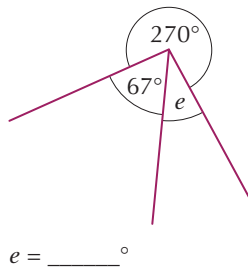
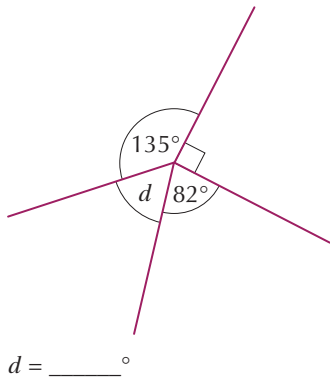
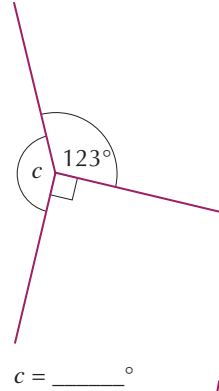
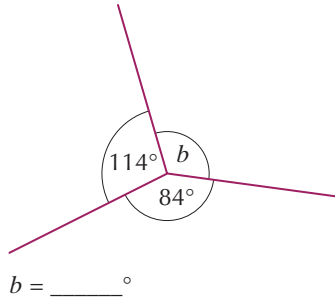
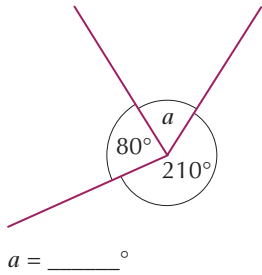
2 Find the missing angles.



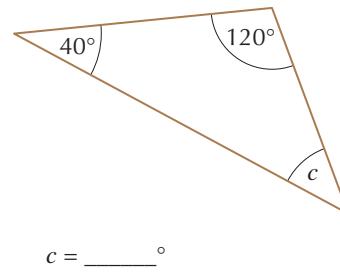
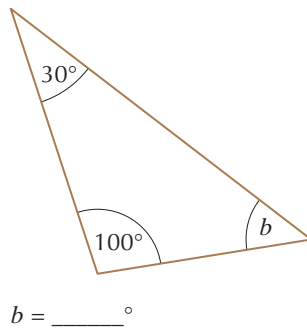
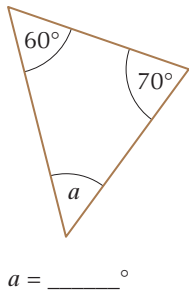
3 Find the missing angles.



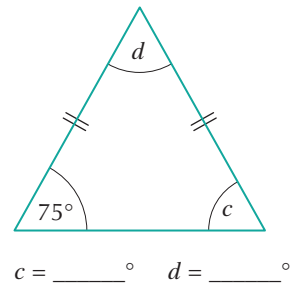
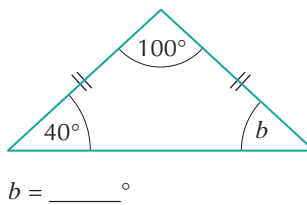
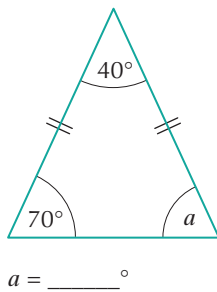
4 Find the missing angles.



5 Find the size of the angle marked by a letter in each triangle.



6 Find the size of the unknown angles in each isosceles triangle.



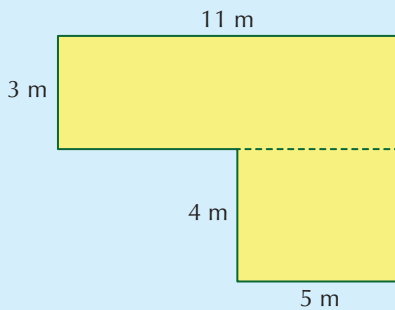
4.5 Area and perimeter

I can

- use the formula for the area of a rectangle
- distinguish between area and perimeter

Example

This is the plan of the floor of a room.



- Work out the area of the floor.
- Work out the perimeter of the floor.

Solution

- a** There are two rectangles.

The area of the top rectangle is $3 \times 11 = 33 \text{ m}^2$.

The area of the bottom rectangle is $4 \times 5 = 20 \text{ m}^2$.

The total area is $33 + 20 = 53 \text{ m}^2$.

The sides are in metres (m) so the area is in square metres (m^2).

- b** There are two missing lengths.

The right-hand side is $3 + 4 = 7 \text{ m}$.

The other missing length is $11 - 5 = 6 \text{ m}$.

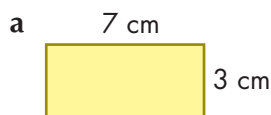
The perimeter is the total length round the edge of the room.

The perimeter is $11 + 7 + 5 + 4 + 6 + 3 = 36 \text{ m}$.

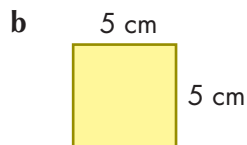
The sides are in metres so the perimeter is in metres.

Practice questions

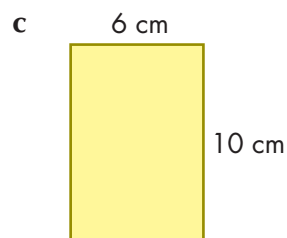
1 Work out the area of each rectangle using the formula $A = l \times w$.



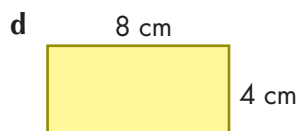
$A = \underline{\hspace{2cm}} \text{ cm}^2$



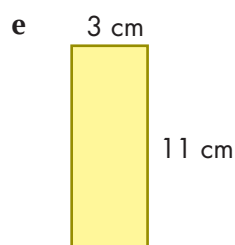
$A = \underline{\hspace{2cm}} \text{ cm}^2$



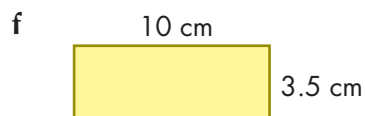
$A = \underline{\hspace{2cm}} \text{ cm}^2$



$A = \underline{\hspace{2cm}} \text{ cm}^2$



$A = \underline{\hspace{2cm}} \text{ cm}^2$



$A = \underline{\hspace{2cm}} \text{ cm}^2$

2 Work out the perimeter of each rectangle in Question 1.

a

b

c

d

e

f

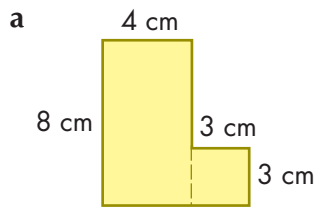
3 The table shows the length and width of five rectangles.

Work out the area of each rectangle.

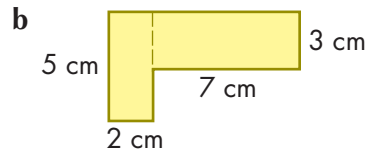
Length	Width	Area
7 cm	11 cm	
4 m	15 m	
10 cm	25 cm	
13 km	4 km	
12 cm	32 cm	

- 4 These shapes have been divided into rectangles.

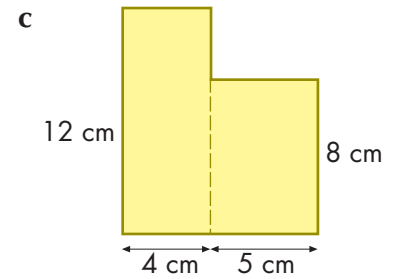
Work out the area of each rectangle, then find the total area of the shape.



Area = _____ cm^2



Area = _____ cm^2



Area = _____ cm^2

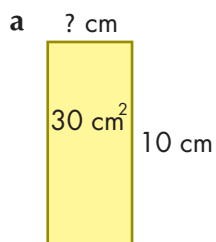
- 5 Work out the perimeter of each shape in Question 4.

a _____

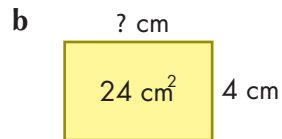
b _____

c _____

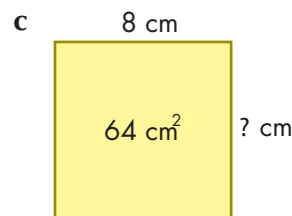
- 6 Find the unknown length or width for each rectangle.



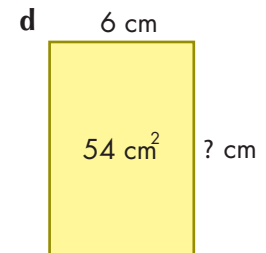
_____ cm



_____ cm



_____ cm



_____ cm

Comments, next steps, misconceptions



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