Mathletics

Series F Student

Length, Perimeter and Area

My name

First edition printed 2009 in Australia.

A catalogue record for this book is available from 3P Learning Ltd.

ISBN 978-1-921860-82-9

Published 3P Learning Ltd

For more copies of this book, contact us at: www.3plearning.com/contact

Designed 3P Learning Ltd

Series F – Length, Perimeter and Area

Contents

Series F – Length, Perimeter and Area

Contents

Series Authors:

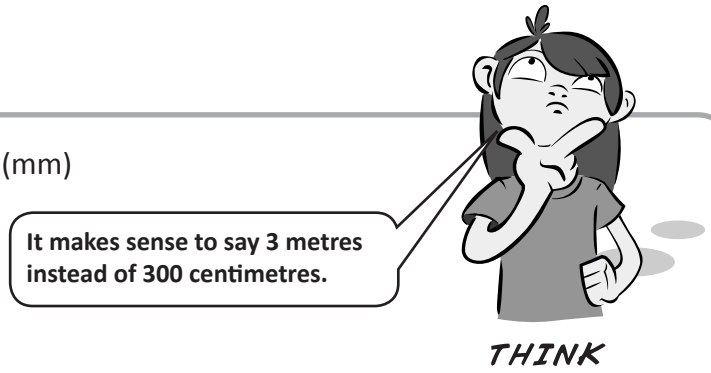
Rachel Flenley
Nicola Herringer

Please note:
These pages have been designed to print to 'shrink to printable area' as this is a common default setting on many computers. There may be minor discrepancies with measurements as individual printers and photocopiers print to slightly different proportions.

Units of length – m, cm, mm

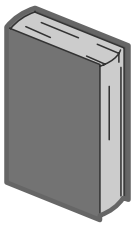
Metres (m), centimetres (cm) and millimetres (mm) are used regularly in everyday life.

10 mm = 1 cm
100 cm = 1 m
1,000 m = 1 km



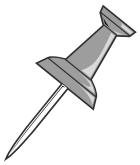
1 **Complete the measure of each item below by adding either mm, cm or m next to the number:**

a



20 ☐

b

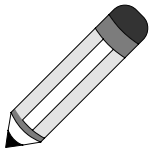


14 ☐

c

4 ☐

d



13 ☐

e

2 ☐

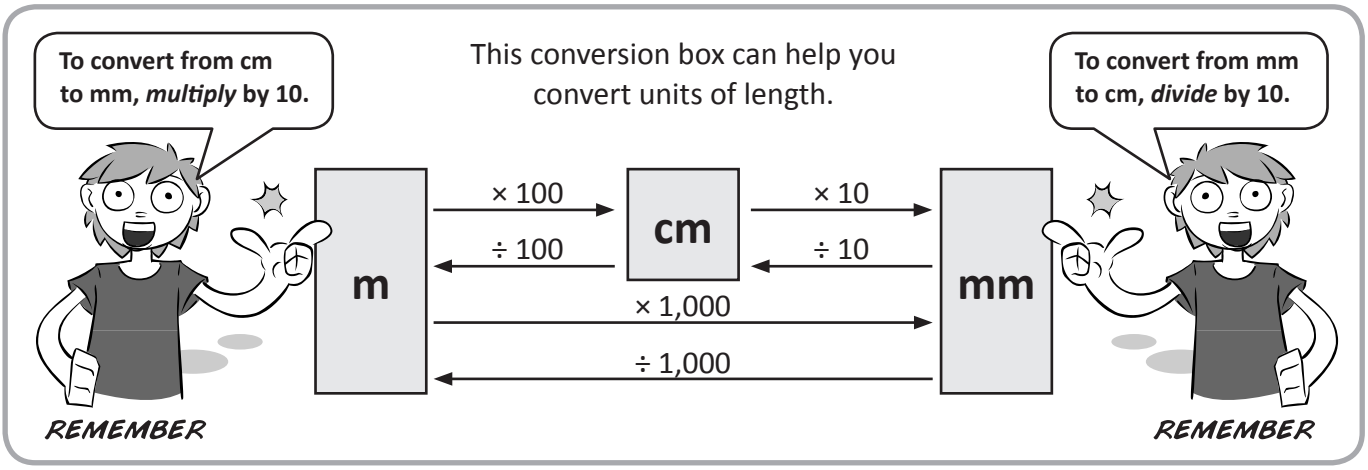
f

28 ☐

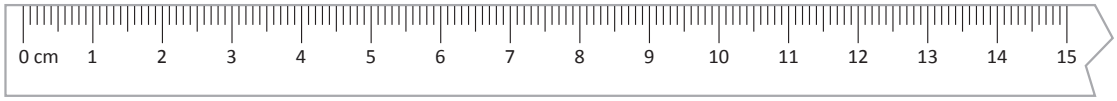
2 **Estimate and then measure these lengths. Which unit will you use?**

	Object	Estimate	Measure
a	Height of a desk		
b	Shoulder to the fingertips		
c	Width of the door		
d	Hand span		
e	Pencil sharpener		
f	Width of a fingernail		
g	A4 paper length		

Units of length – m, cm, mm



3 **Convert these lengths to millimetres:**



a 5 cm = ____ mm **b** 3 cm = ____ mm **c** 9 cm = ____ mm

d 7 cm = ____ mm **e** 11 cm = ____ mm **f** 15 cm = ____ mm

4 **Convert these lengths to centimetres:**

a 50 mm = ____ cm **b** 20 mm = ____ cm **c** 223 mm = ____ cm

d 15 mm = ____ cm **e** 156 mm = ____ cm **f** 495 mm = ____ cm

5 **Convert these lengths to metres:**

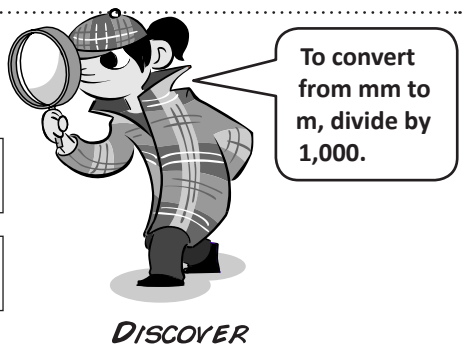
a 300 cm = ____ m **b** 500 cm = ____ m **c** 250 cm = ____ m

d 900 cm = ____ m **e** 2,000 cm = ____ m **f** 4,550 cm = ____ m

6 **Convert these lengths to metres:**

a 1,000 mm = ____ m **b** 5,000 mm = ____ m

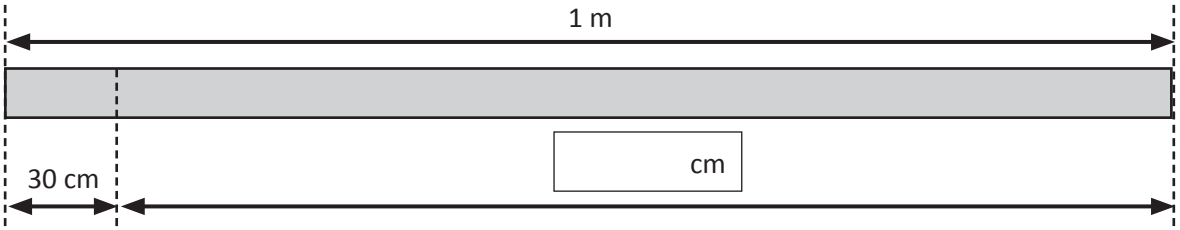
c 4,500 mm = ____ m **d** 500 mm = ____ m



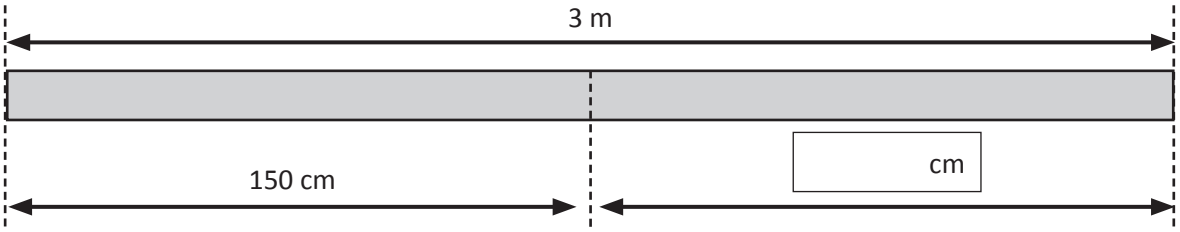
Units of length – find and order length

1 **Look carefully at how each shape is divided and find the missing length:**

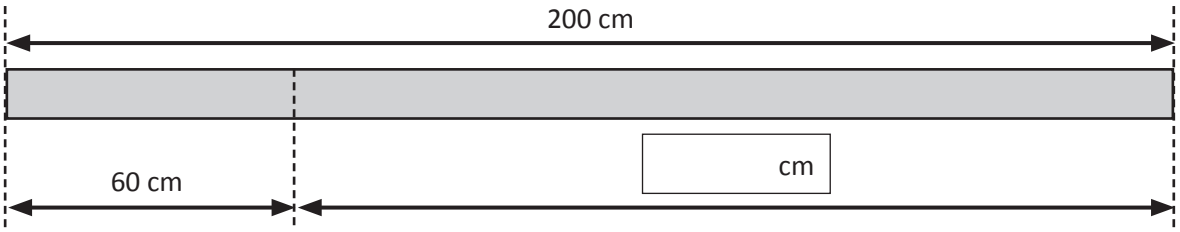
a



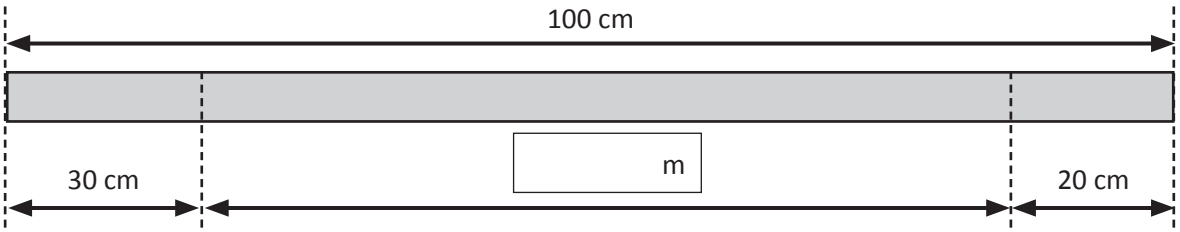
b

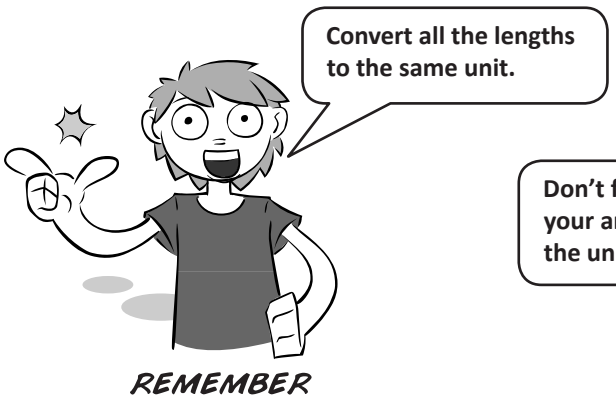


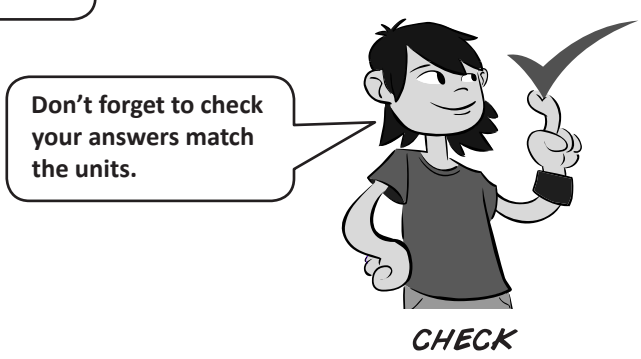
c



d







Units of length – find and order length

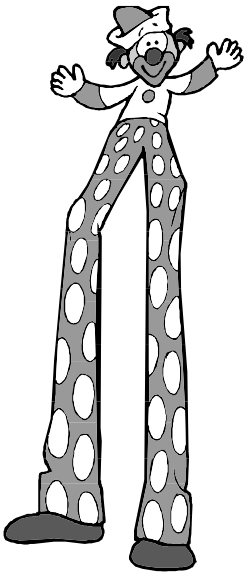
2 **Here is a list of some objects and their heights. Put them in order from shortest to tallest:**

door	1.95 m	1	_____
flagpole	16 m	2	_____
fridge	145 cm	3	_____
ladybird	2 mm	4	_____
tree	11 m	5	_____
giraffe	457 cm	6	_____

Shortest

Tallest

3 **Mr Marlowe's class went on an excursion to the circus. He asked his pupils to guess the height of a clown on stilts. Fill in the missing heights:**



Name	Height of the Clown on Stilts		
Peter	3 m 30 cm		3.3 m
Sara		415 cm	4.15 m
Omar	3 m 64 cm		3.64 m
Julia		397 cm	3.97 m
Heba	4 m 9 cm	409 cm	

It turned out that the clown was 3 m and 58 cm tall.

a Who had the closest guess? _____

b How far off was this person? _____

c What was the difference between the highest and the lowest guess? _____

d Write your height and find the two people in your class who are closest to your height.

Units of length – metres to kilometres

Which units of measurement do we already know about?

1 km = 1,000 m

1 m = 0.001 km

100 m = 0.1 km

To convert from km to m, multiply by 1,000. To convert from m to km, divide by 1,000.

1 **Would you use metres or kilometres to measure the following lengths?**

a Driveway ☐ **b** Distance from London to Edinburgh ☐

c Height of your house ☐ **d** A marathon race ☐

e Distance from Earth to the Moon ☐ **f** Length of the school playground ☐

2 **Write these lengths in kilometres:**

a 2,000 m = ☐ km **b** 5,000 m = ☐ km **c** 8,000 m = ☐ km

d 1,500 m = ☐ km **e** 3,645 m = ☐ km **f** 1,747 m = ☐ km

3 **Write these lengths in metres:**

a 3 km = ☐ m **b** 7 km = ☐ m **c** 4 km = ☐ m

d 0.5 km = ☐ m **e** 3.7 km = ☐ m **f** 8.2 km = ☐ m

4 **Which is shorter? Circle the shorter distance:**

a 2 km or 2,220 m **b** 0.58 km or 600 m **c** 3.2 km or 3,100 m

d 0.75 km or 0.79 km **e** 560 m or 0.565 km **f** 5.5 km or 5,600 m

5 **Which is longer? Circle the longer distance:**

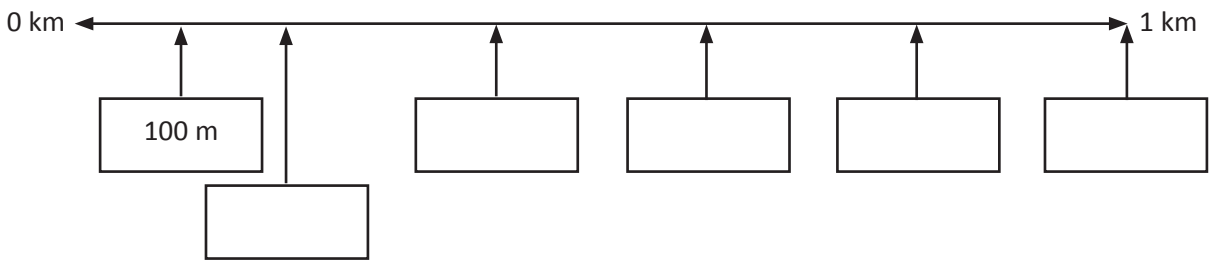
a 300 km or 2,500 m **b** 0.85 km or 800 m **c** 1,900 m or 2.9 km

d 1.58 km or 1,600 m **e** 855 m or 0.875 km **f** 7.25 km or 7,200 m

Units of length – metres to kilometres

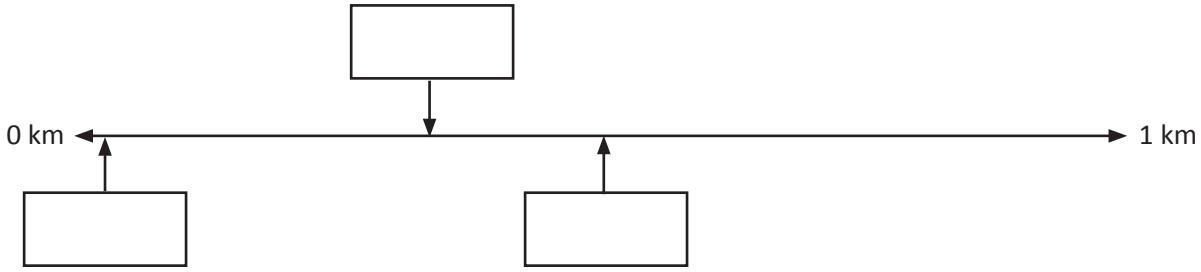
6 **Mark these lengths in metres on the line below. The first one has been done for you.**

~~100 metres~~	600 metres	400 metres	1,000 metres	200 metres	800 metres

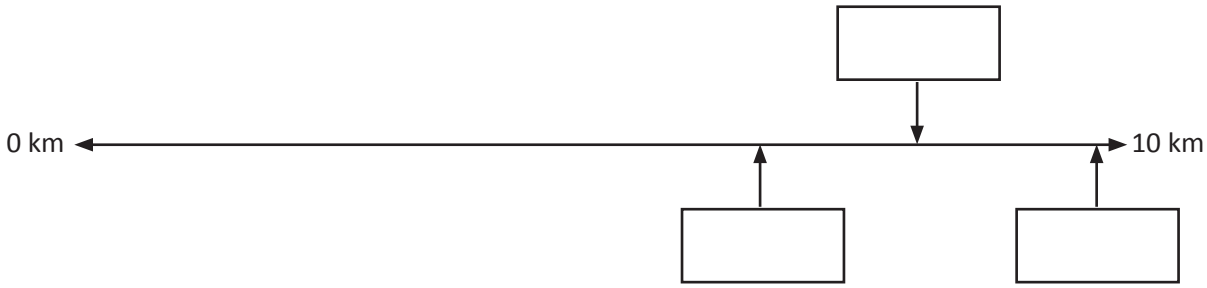


7 **Fill in the boxes to answer these word problems:**

a Abdul walked 0.4 of a kilometre, Sara walked 20 metres and Kaitlyn walked half a kilometre. Write their names in the boxes below to show how far each of them walked.



b In a 10 km fun run event, Omar stopped after $6\frac{1}{2}$ km, Peter stopped after 8,000 m and Heidi stopped 10 m before the end. Write their names in the boxes below to show how far each of them ran.



c Leng walked 250 m to the bus stop, and then rode the bus for 3 km to the beach. When she arrived at the beach she went for a 4 km jog by the sea.

How many **metres** did she travel altogether?

	km	+		km	+		km	=		m

Units of length – metric and imperial equivalents

Most measurements used today in the UK are metric – that is, they are based on tens, hundreds and thousands. However, you will still sometimes come across old 'imperial' measurements, such as stone, pounds, pints, yards, feet and inches, and all road signs still measure longer distances in miles rather than kilometres. Therefore, it's useful to know how these imperial measurements relate to metric measurements.

				approximately...
Length	1 inch	=	2.54 cm	2.5 cm
	1 foot (12 inches)	=	30.48 cm	30 cm
	1 yard (3 feet)	=	91.44 cm	90 cm
	1 mile (1,760 yards)	=	1.61 km	1.6 km
Mass	1 ounce	=	28.35 g	30 g
	1 pound (16 ounces)	=	0.45 kg	0.5 kg
	1 stone (14 pounds)	=	6.35 kg	6.5 kg
Capacity	1 pint	=	0.57 l	0.6 l

1 **Using the *approximate* equivalents, convert these imperial measures to metric:**

a 2 pounds = ____ kg

b 4 inches = ____ cm

c 5 pints = ____ l

d 10 miles = ____ km

e 5 yards = ____ m

f 6 ounces = ____ g

2 **Circle the correct approximate imperial equivalent to the metric measurements:**

a 8 km	2 miles	5 miles	10 miles
b 4 litres	7 pints	1 pint	20 pints
c 65 kg	1 stone	100 stone	10 stone
d 10 cm	2 inches	4 inches	12 inches

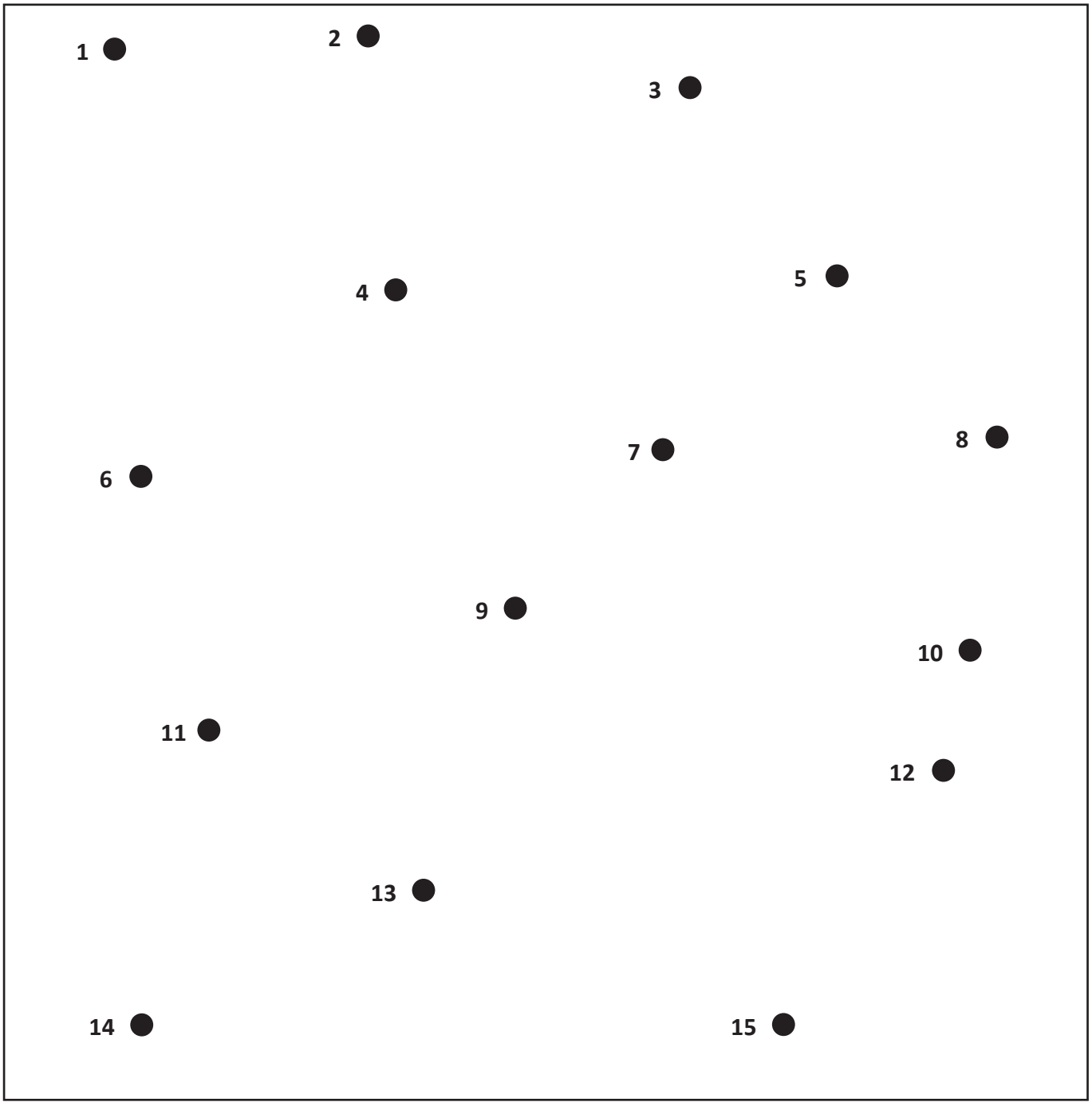
Spot the distance

apply

What to do

This is an estimating game for two players.

- The first player chooses two spots.
- The second player estimates the distance between the spots in mm. Measure from each spot's edge.
- The second player draws a line between the spots and then measures the distance with their ruler. They score 100 points for the right answer, 40 points for an estimate within 10 mm, and 20 points for an estimate within 20 mm.
- The second player picks two spots for the first player.
- The player with the most points after 10 rounds wins!



Word problems — solve

a If there are 60 brochures in a stack and each of them are 8 mm thick, how high is the stack?

b A plank of wood is 5 m long. If 150 cm is sawn off, how much is left?

c How many 20 mm pieces of gold wire can be cut from 1 m?

d If a fingernail grows 2 mm a week, how many cm would it grow in 1 year?

e One day I bought 3 sherbet sticks. Their lengths were 0.75 m, 50 cm and 75 cm. What was the total length? If sherbet sticks cost £2 a metre, how much did I spend?

Travelling far – measure distances

1 **Write these distances in decimal notation:**

a 2 km 123 m = ____ km

b 4 km 235 m = ____ km

c 2 km 245 m = ____ km

d 5 km 235 m = ____ km

e 8 km 145 m = ____ km

f 8 km 23 m = ____ km

g 835 m = ____ km

h 593 m = ____ km

2 **Write these distances in metres:**

a 3.6 km = ____ m

b 2.8 km = ____ m

c 0.6 km = ____ m

d 9.3 km = ____ m

e 8.2 km = ____ m

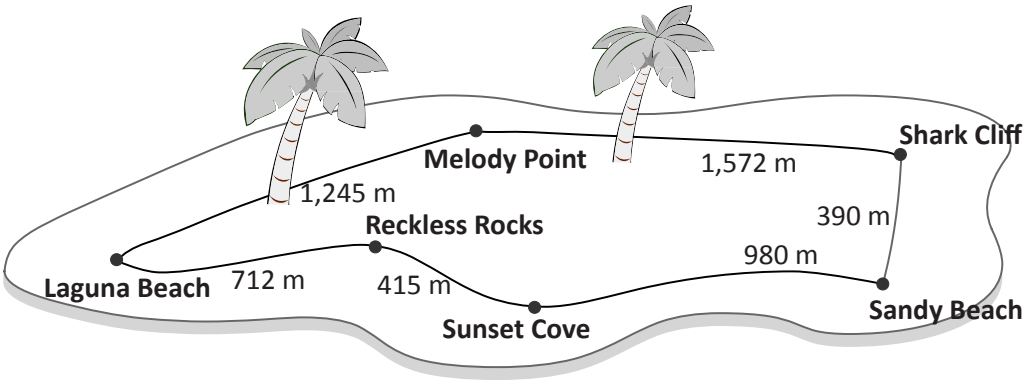
f 7.1 km = ____ m

g 5.6 km = ____ m

h 0.2 km = ____ m

i 0.1 km = ____ km

3 **Look carefully at Mermaid Island and work out how long these walking trails are. Record all answers in kilometres.**



a Sunset Cove to Sandy Beach ____ km

b Melody Point to Shark Cliff ____ km

c Reckless Rocks to Laguna Beach ____ km

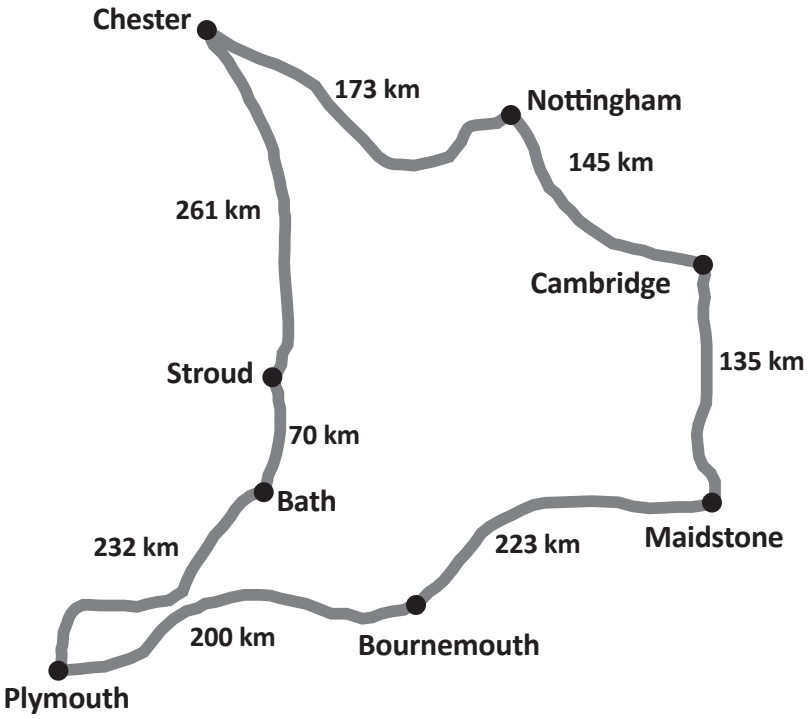
d Melody Point to Sandy Beach via Shark Cliff ____ km

e Laguna Beach to Shark Cliff via Melody Point ____ km

Travelling far – measure distances

Road maps sometimes have the distance between towns written on the road that connects them. This information helps you plan your journey.

4 **Here is a page from Hannah's journal where she has noted the places she went to during a road trip with her family. Add the distances that they travelled each day.**



Day 1 Today we left home at Plymouth and drove straight to Bournemouth. ____ km

Day 2 We left Bournemouth after breakfast then we had lunch in Maidstone. We stayed the night in Cambridge. ____ km

Day 3 We drove to Nottingham to find out about getting a new puppy! ____ km

Day 4 We had to leave early this morning as it turns out the puppy we want is in Chester. ____ km

Day 5 Our new puppy is a boy! We named him Chester, after the town he came from. We decided to travel back to Nottingham to show Chester to our cousins. ____ km

Day 6 Today we drove all the way from Nottingham to Bath. Dad wanted to keep going till we got home but mum made him stop. ____ km

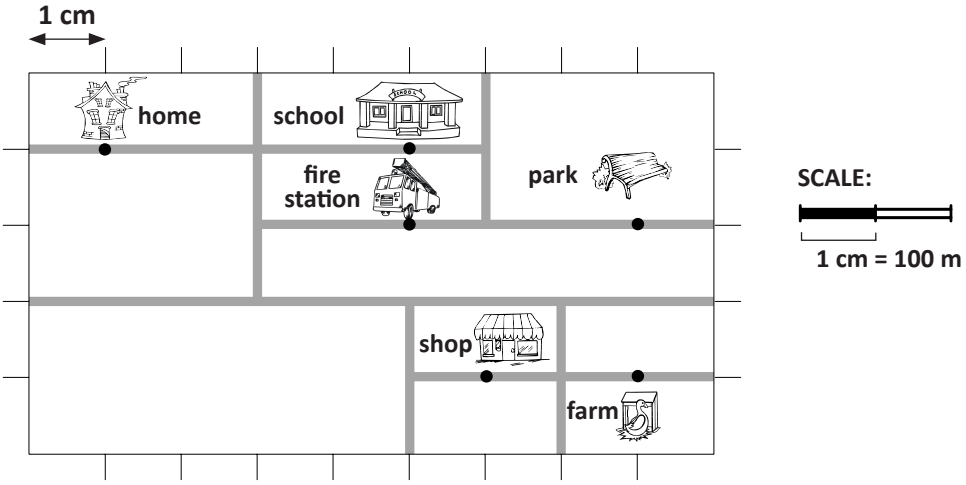
Day 7 Today we drove the rest of the way home. ____ km

5 **What is the total distance that Hannah and her family travelled? Show all of your working below.** ____ km

Travelling far – maps and scale

Scale is used to show long distances on a map.
This makes it easier for us to translate distance on a map to distance in the real world.

1 **Use this map to answer the questions below. Look carefully at the scale.**



What is the shortest distance by road from:

a home to school? _____ m

b home to the park? _____ m

c the fire station to the shop? _____ m

d the school to the farm? _____ m

e home to the shop? _____ m

f Draw your own route on the map.
Which landmarks do you go past? _____

What is the total distance of your route? _____

2 **Now, suppose the scale is 1 cm = 1 km. What is the shortest distance by road from:**

a the fire station to the park? _____ km

b the park to home? _____ km

c home to the shop? _____ km

Travelling far – maps and scale

3 **Use the scale of 1 cm = 2 m to draw these lines in the boxes:**

a	22 m
b	16 m
c	9 m

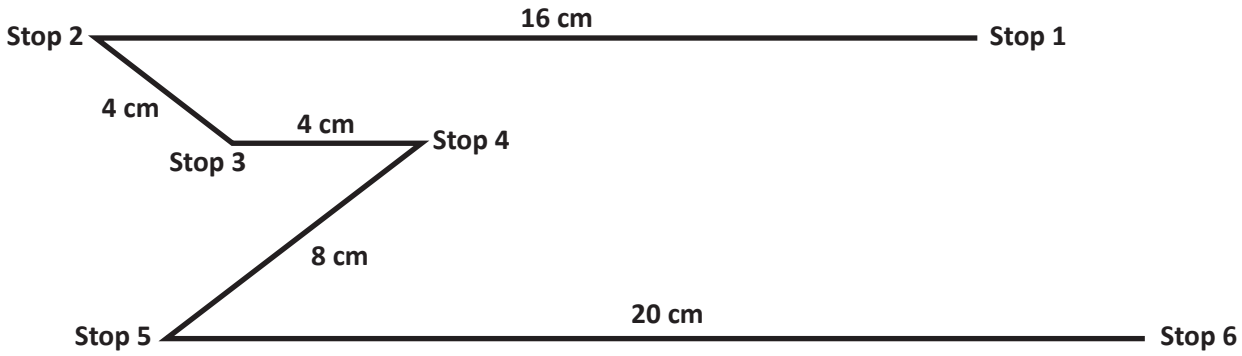
4 **Complete this table using a scale of 1 cm = 3 cm:**

Scale length in cm	2	5	15	4	6	9	10	8	12	7
True length in cm										

5 **Complete this table using a scale of 1 cm = 6 m:**

Scale length in cm	5	10	15	7	12	9	11	2	8	6
True length in m										

6 **Use this map* of a train route to answer the questions using this scale 4 cm = 10 km:**



Not drawn to scale.

a What is the distance from Stop 1 to Stop 2? _____ km

b What is the distance from Stop 4 to Stop 5? _____ km

c What is the distance from Stop 2 to Stop 5? _____ km

d What is the total distance of this train route? _____ km

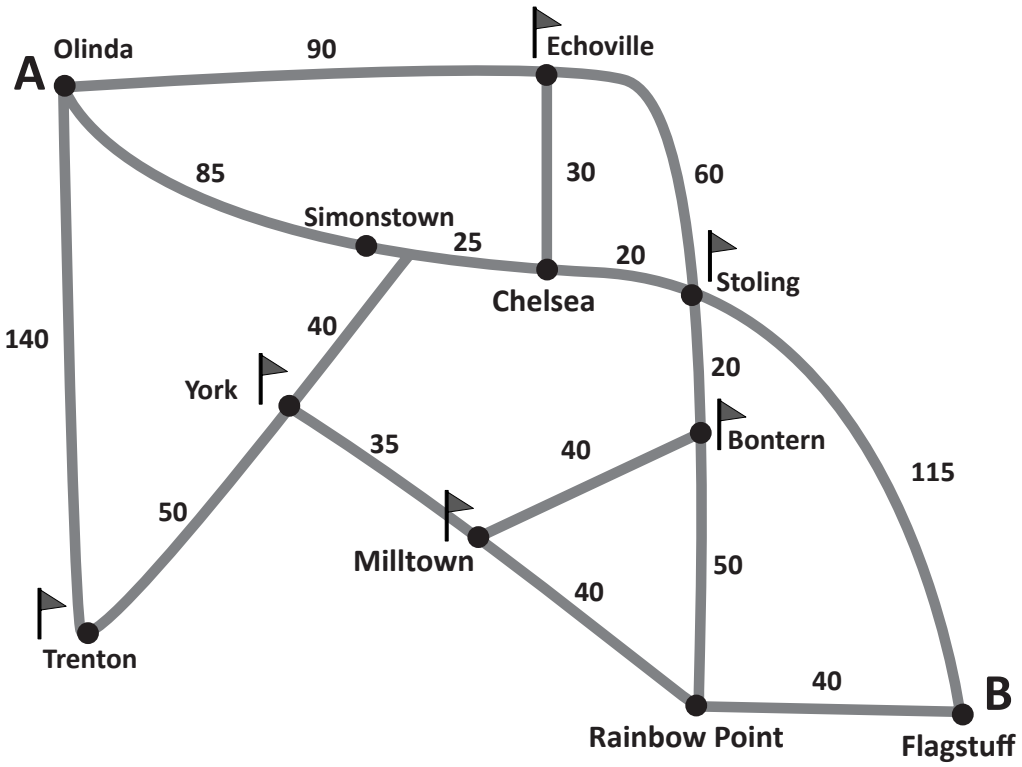
Flag it! apply

Getting ready

On your marks, get set, go! You are about to participate in a race to collect as many flags as possible in less than 400 km.

What to do

1. Start at Point A.
2. Work out how you will get to Point B collecting as many flags as you can at various towns along the way. Use a calculator to help you add the distances.
3. You need to decide on your route. You may not exceed 400 km.



What to do next

Use the space below to show your route and calculate the distance you cover between towns.

The City to School

create

Getting ready

Your group has been hired by your favourite charity to organise a 1 km fun run at your school.

You will plan and measure out the course and then get another group to test out your run.

The run needs to be exactly 1 kilometre in length. You'll need markers at each 100 m point.

School rules must be followed. You may need to place signs indicating speeds for inside journeys.

The charity organisers will need detailed plans of your route and have asked your teacher to be their auditor. He or she may check on any or all of your calculations.

What to do

- Work with your team to plan the route. Where do you predict 1 km will take you? (You have to stay within the school grounds at all times.)
- How will you measure the distances? What tools will you need?
- If you add obstacles such as climbing over equipment, remember to factor in the distances involved in going up and down!
- Once you have your route planned, test it out. Is it possible? Do you need to refine it?
- How will you record the route for your charity? A map? A scaled drawing? This is a big task in itself so you may want to divide up the roles within the group.

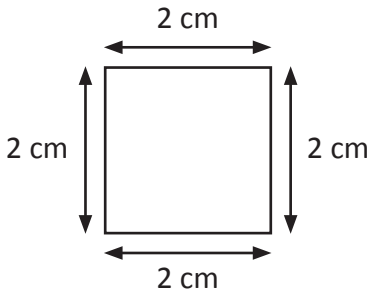
What to do next

Once you think you are ready, submit your plans to your teacher. Stage your event.

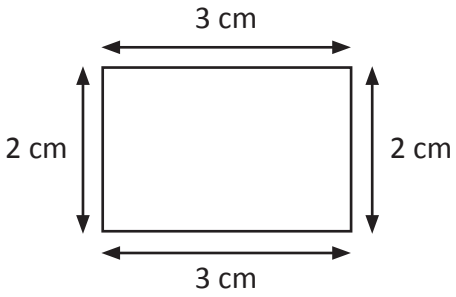
Ask your teacher and the other groups for their feedback.

Perimeter – perimeter of shapes

Perimeter is the length around the outside of a shape.



The perimeter of the square is 8 cm.



The perimeter of the rectangle is 10 cm.

1 **Draw the following shapes and work out their perimeters:**

a A square with 3 cm sides.

P = ____ cm

b A rectangle with two 4 cm sides and two 3 cm sides.

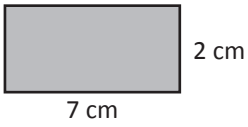
P = ____ cm

c A rectangle that is twice as long as it is wide.

P = ____

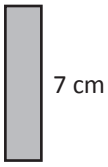
2 **These shapes are not to scale, so you can't use your ruler to work out the perimeter. Can you find the perimeter of these shapes?**

a



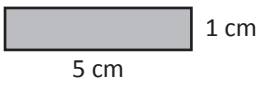
P = ____ cm

b



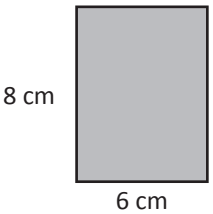
P = ____ cm

c



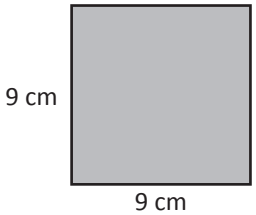
P = ____ cm

d



P = ____ cm

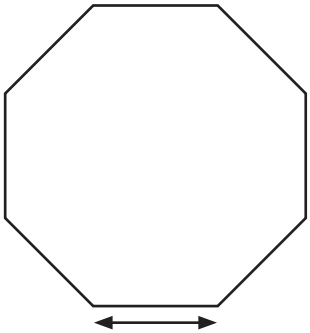
e



P = ____ cm

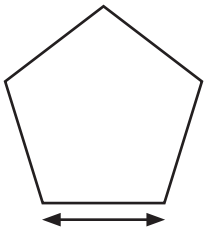
Perimeter – perimeter of shapes

These regular polygons* have sides of equal lengths.



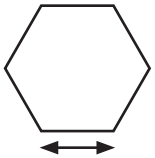
2 cm

P = 16 cm



2 cm

P = 10 cm



1 cm

P = 6 cm

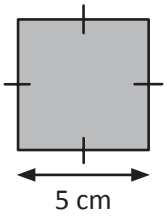
1 cm

P = 4 cm

3 **Find the perimeter of these regular polygons*:**

**Not drawn to scale.*

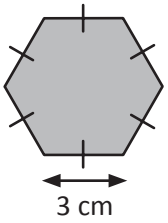
a



5 cm

P = cm

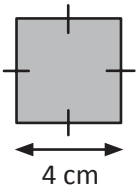
b



3 cm

P = cm

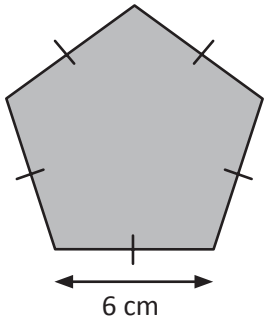
c



4 cm

P = cm

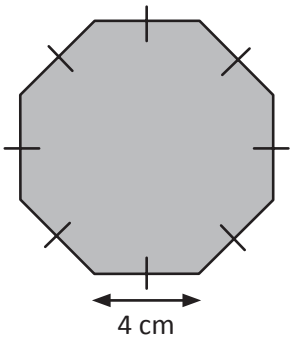
d



6 cm

P = cm

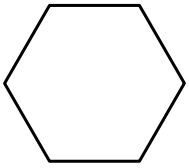
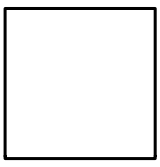
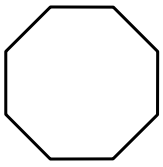
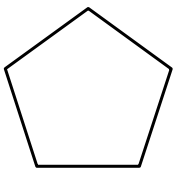
e



4 cm

P = cm

4 **The perimeters of some regular polygons are given in the table below. Fill in the length of the sides:**

				
Perimeter	24 cm	40 cm	48 cm	25 cm
Length of each side				

Perimeter – calculate perimeter

1 **Find the perimeter of these shapes. Choose a unit of measurement to express your answer.**

a

P =

b

P =

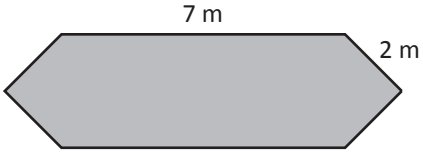
c

P =

d

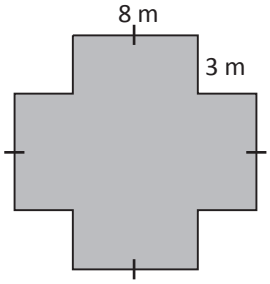
P =

e



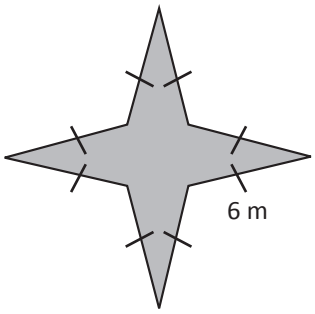
P =

f



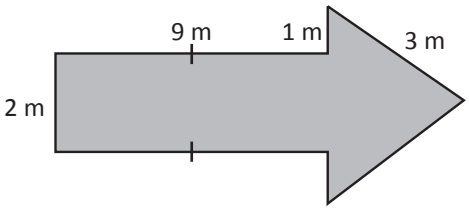
P =

g



P =

h



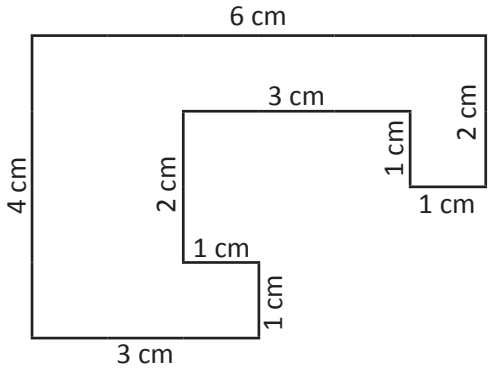
P =

Perimeter – calculate perimeter

Irregular shapes are not symmetrical. This means we need to measure each side.

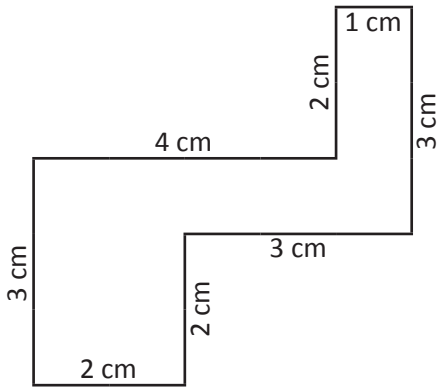
2 **Find the perimeters of these irregular shapes:**

a



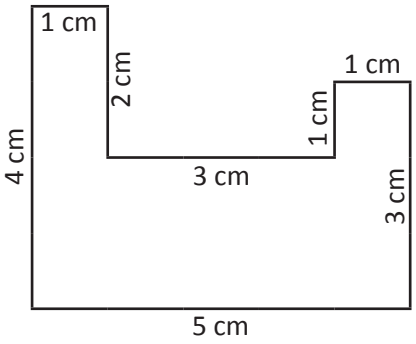
P = ____ cm

b



P = ____ cm

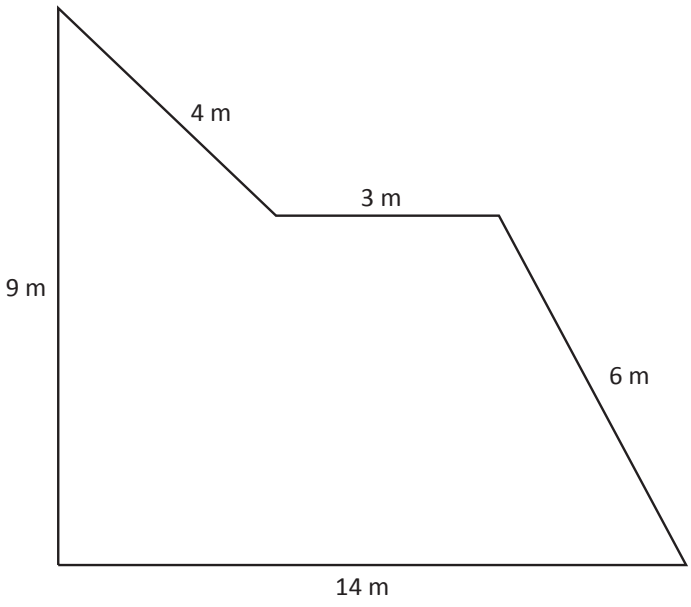
c



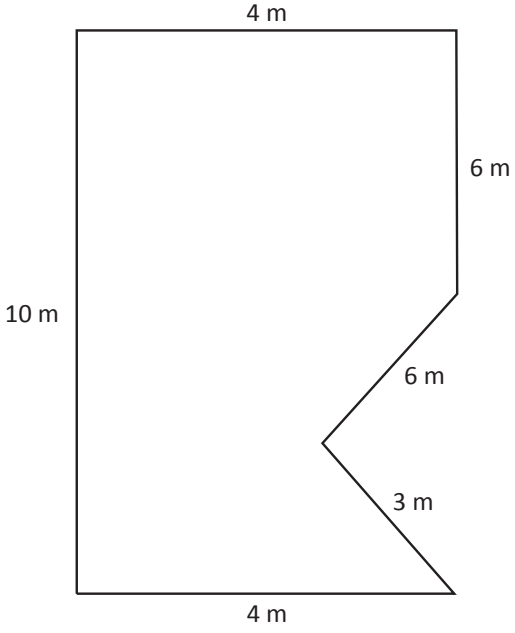
P = ____ cm

3 **Which of these designs for playgrounds would be the least expensive to fence?** ____

Playground A



Playground B



Why? _____

_____

Perimeter – construct shapes

1 **Use this 1 cm dot paper to draw some shapes with different perimeters.**

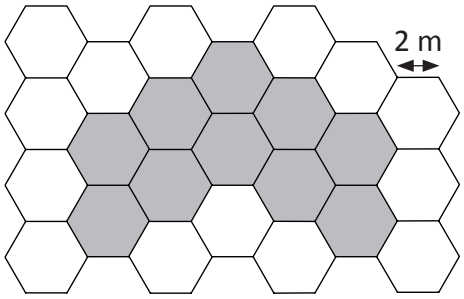
a Draw a rectangle with a perimeter of 12 cm.

b Draw a rectangle with a perimeter of 20 cm.

c Draw a rectangle with a perimeter of 16 cm.

d Draw a rectangle with a perimeter of 10 cm.

2 **Look carefully at this hexagonal grid. If the side of each hexagon is 2 m, what is the perimeter of the shaded area?**

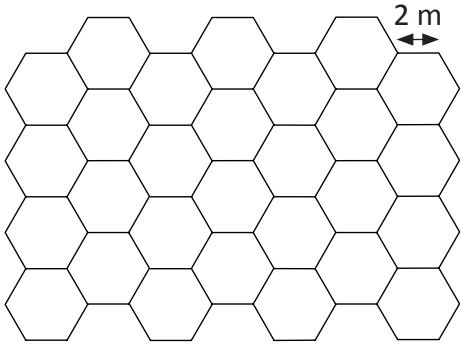


P = Number of sides × 2

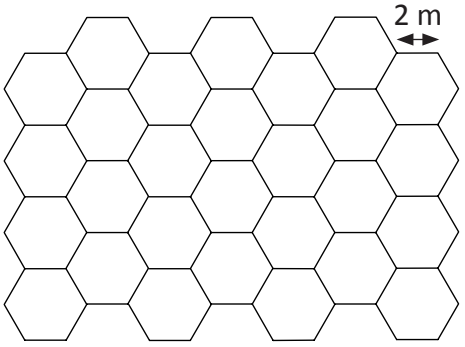
P = 26 × 2

P = 52 m

a Shade the hexagons to construct a shape with a perimeter of 36 m.

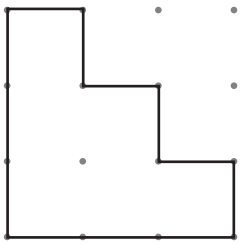


b Shade the hexagons to construct a shape with a perimeter of 60 m.



Perimeter – construct shapes

3 **On the left is a staircase shape. Use the 1 cm dot paper to redraw the shape so that the perimeter is twice as big:**



1 cm

4 **Now draw another version with the perimeter three times as big:**

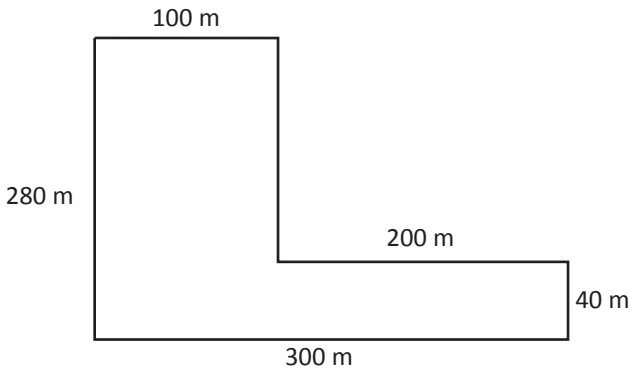
Perimeter problems — solve

What to do

a The length of a rectangle is double its width. Find the perimeter if the width is 200 cm.

b The length of a rectangle is 6 times its width. Find the length and width of the rectangle if the perimeter is 7 metres.

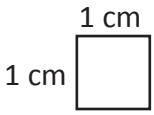
c Charlie ran around the school 3 times. How far did she run? Write your answer in km.



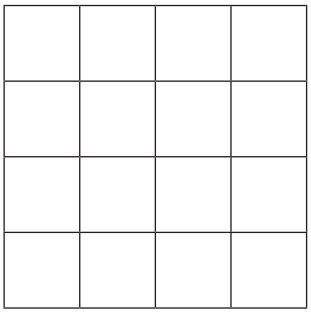
d Jake wants to build a fence around his swimming pool to comply with safety regulations. If the length of his pool area is 6 metres and the width is 4 metres, how much will it cost? Fencing costs £55.50 a metre.

Area – square centimetres (cm²)

Area is the amount of space a shape covers. It is a 2D measurement.
We measure area in square units. For small areas we use square centimetres (cm²).

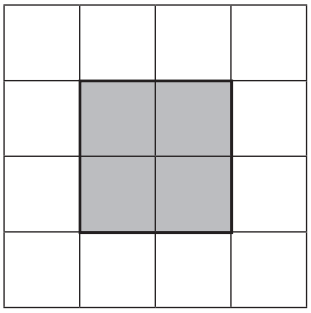


1 **Shade the grid to show a rectangle with the area of 6 cm².**



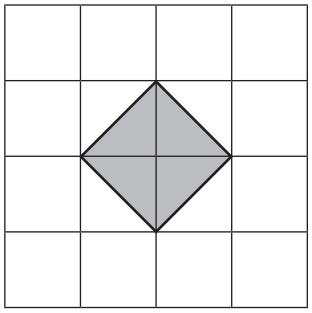
2 **What is the area of each shaded shape? Each square in the grid has an area of 1 cm².**

a



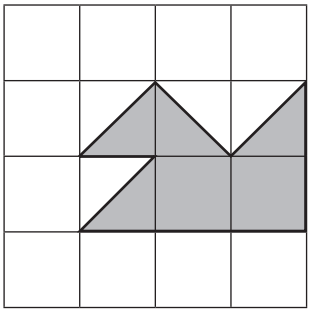
Area = _____ cm²

b



Area = _____ cm²

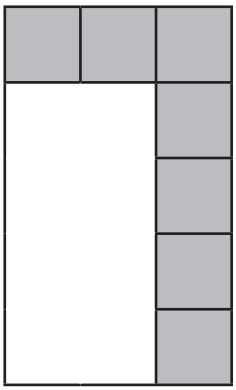
c



Area = _____ cm²

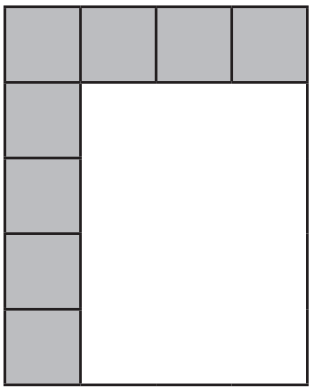
3 **What is the area of each rectangle? Each square in the grid has an area of 1 cm². Some of the squares have been marked in for you.**

a



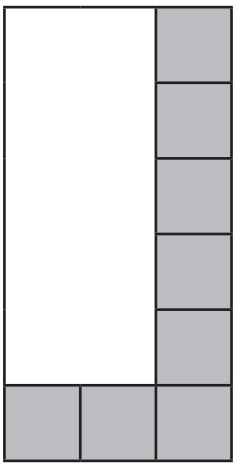
Area = _____ cm²

b



Area = _____ cm²

c



Area = _____ cm²

d Did you need to see all the squares to work out the area? _____

Area – square metres (m^2)

When we need to find the areas of large spaces, we use square metres.
The symbol for square metres is m^2.

1 

In groups, stick pieces of newspaper together to make a square that is 1 metre long and 1 metre wide.

a How many people can fit standing inside one square metre?

b Cut your square into five pieces and then stick it back together. It can be any shape. Draw it here:

Is this still one square metre?

2 **Use your square metre to measure five areas in your school. Estimate first.**

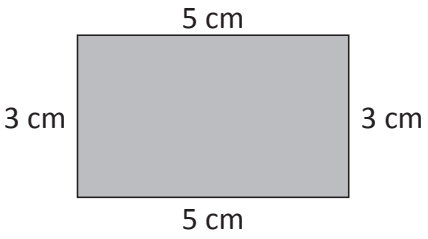
Space to be measured	Estimate	Actual area
a		
b		
c		
d		
e		

Area – square centimetres (cm^2) and square metres (m^2)

We can use this formula to find the area of rectangles:

Area = length × width

Area = 3 × 5 = 15 cm^2

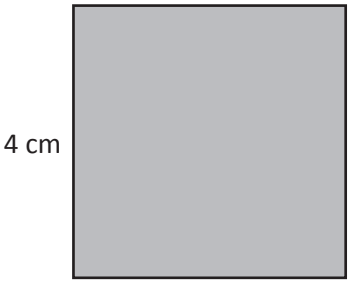


1 **Find the areas of these shapes*:**

a

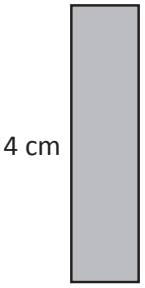
Area = ____ cm^2

b



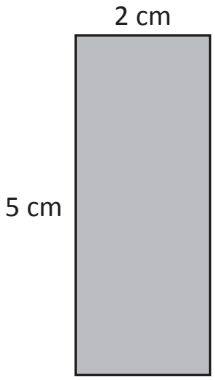
Area = ____ cm^2

c



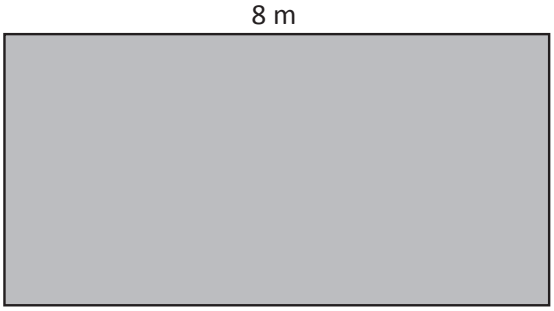
Area = ____ cm^2

d



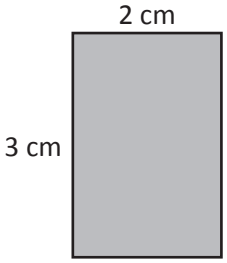
Area = ____ cm^2

e



Area = ____ m^2

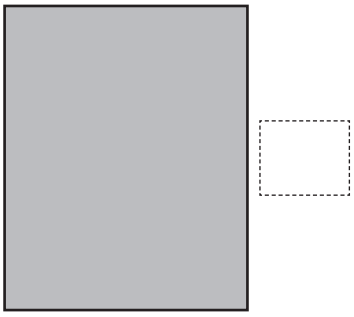
f



Area = ____ cm^2

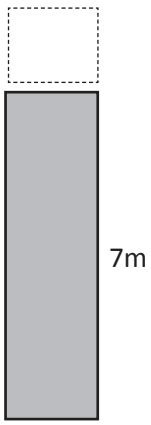
2 **In each shape*, you are given the area but one side is not labelled. Label the missing side:**

a



Area = 20 m^2

b



Area = 14 m^2

c

Area = 24 m^2

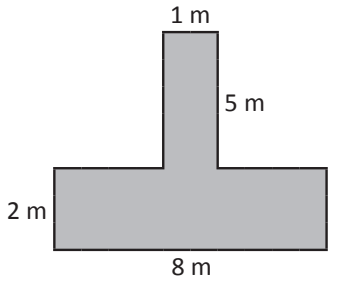
**Not drawn to scale.*

Area – find area of irregular and composite shapes

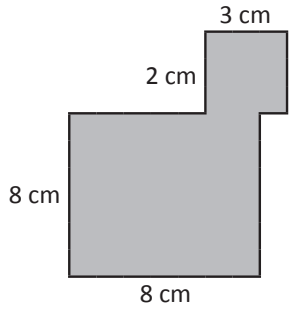
Not all shapes are regular rectangles. We have to find ways to measure the areas of composite and other irregular shapes as well.

One way is to break the shape into rectangles, find these areas, and then add them together.

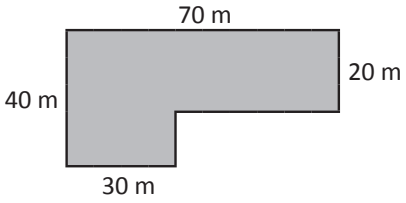
1 **Find the area of the shaded triangles inside the rectangles*:**



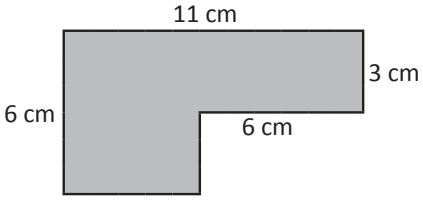
a



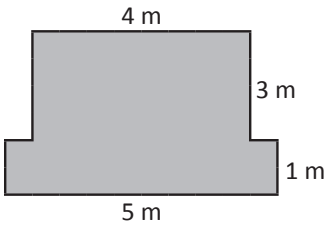
b



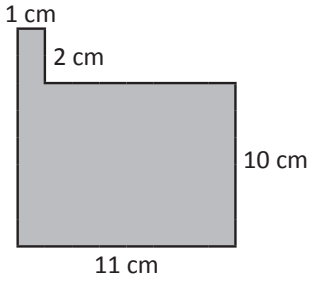
c



d



e



f

2 **Construct your own composite shape with an area of 20 cm^2. Label the lengths of the sides.**

Area – hectares and square kilometres (km^2)

Hectares are used to measure large spaces such as a football pitch.

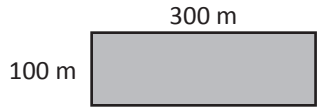
We write hectares as **ha**. One hectare is equal to 10,000 m^2.

An even larger unit is a square kilometre **km^2**. One square kilometre is equal to 100 hectares.

1 ha = 10,000 m^2 1 km^2 = 1,000,000 m^2

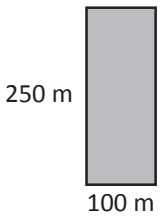
1 **Find the area of each large area*. Write your answer in hectares.**

a



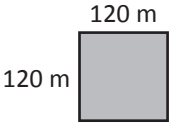
Area = hectares

b



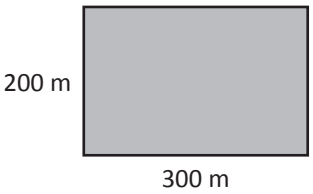
Area = hectares

c



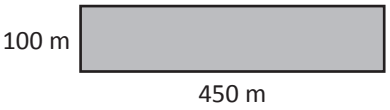
Area = hectares

d



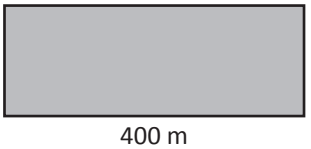
Area = hectares

e



Area = hectares

f



Area = hectares

**Not drawn to scale.*

2 **Order these European countries from smallest to largest areas:**

Country	Area
United Kingdom	242,900 km^2
Ireland	70,300 km^2
France	632,800 km^2
Italy	310,000 km^2
Greece	132,000 km^2
Spain	506,000 km^2
Portugal	92,100 km^2
Germany	357,000 km^2
1 km^2 = 1,000,000 m^2	

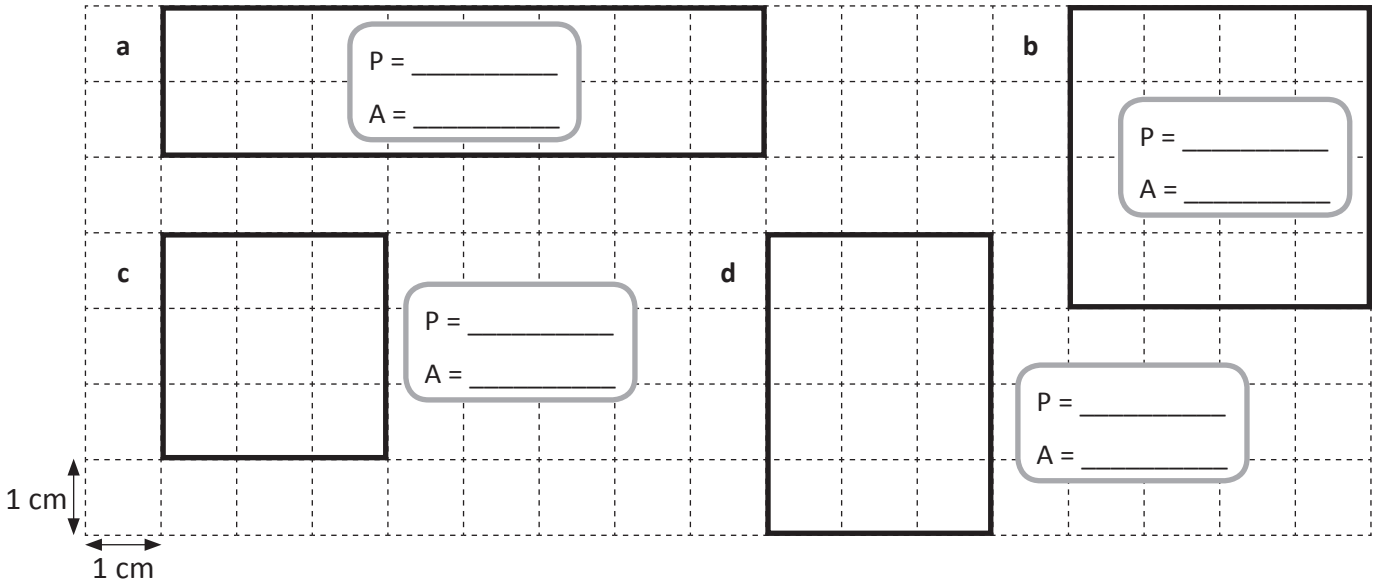
1 _____ **2** _____ **3** _____

4 _____ **5** _____ **6** _____

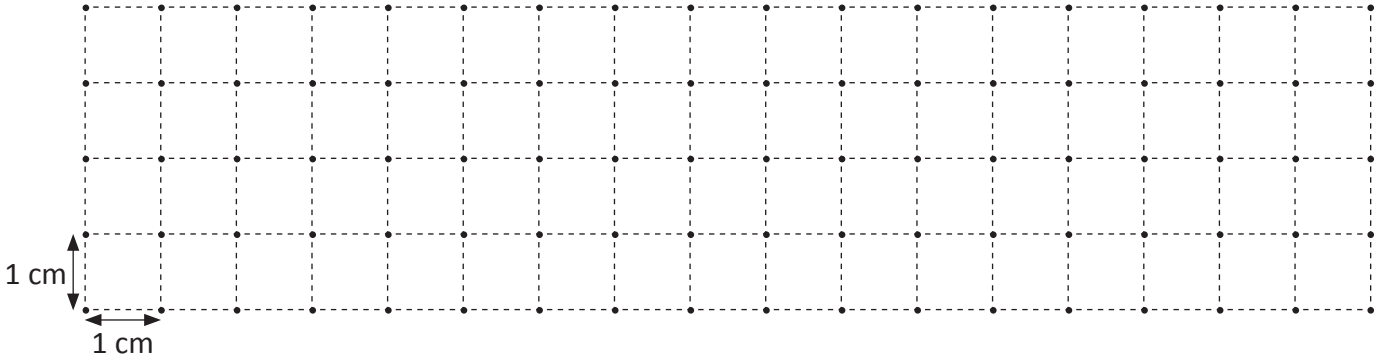
7 _____ **8** _____

Area – area and perimeter

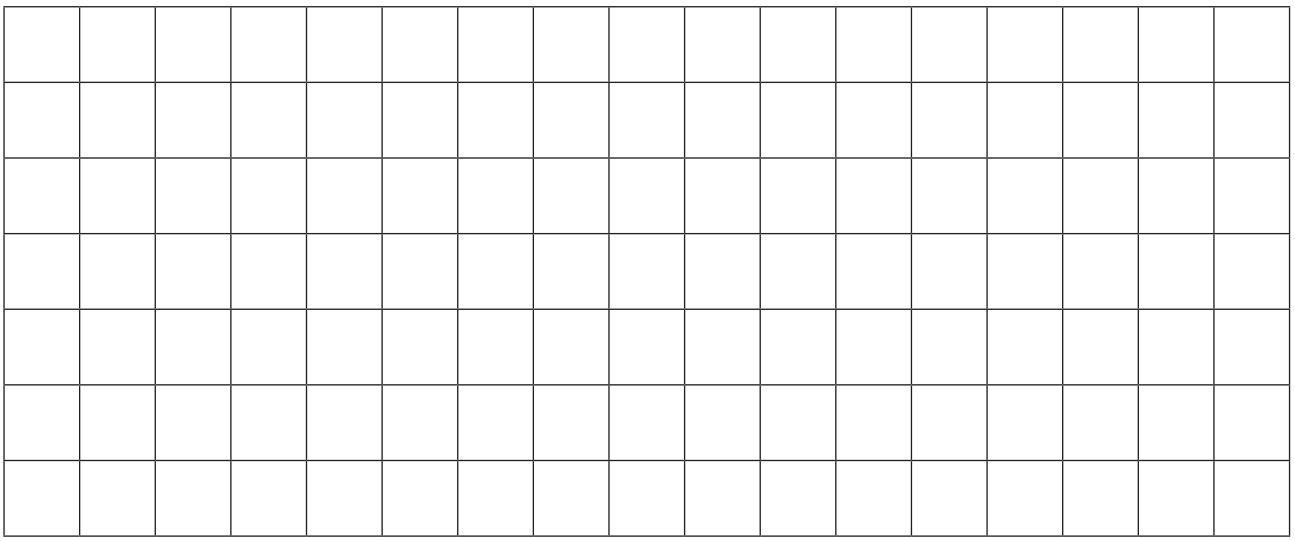
1 **Find the perimeter and area of each shape:**



2 **Use the grid below to draw two shapes with a perimeter of 12 cm but with different areas:**



3 **Use the 1 cm grid below to draw three shapes with areas of 10 cm² but with different perimeters. Record the perimeter of each shape:**



a P = _____ cm **b** P = _____ cm **c** P = _____ cm

4 **Draw 3 different rectangles that have a perimeter of 24 cm and record the area in the table. The first row in the table is a hint of where to start.**

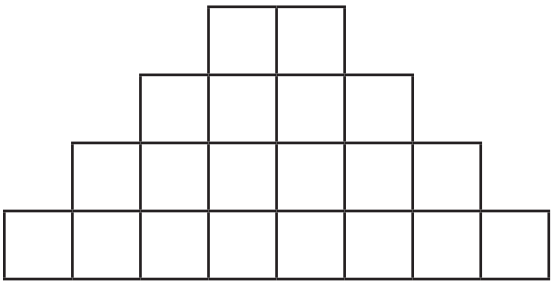
Length	Width	Area
10	2	

5 **Draw as many different rectangles as you can with the area of 36 cm². Label the length of each side:**

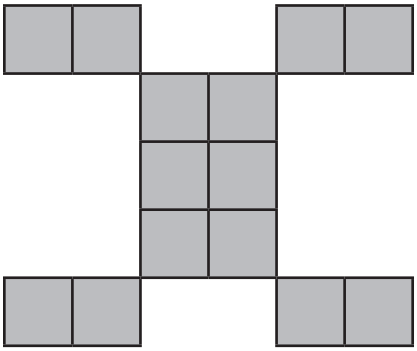
Area and perimetre problem — solve

What to do

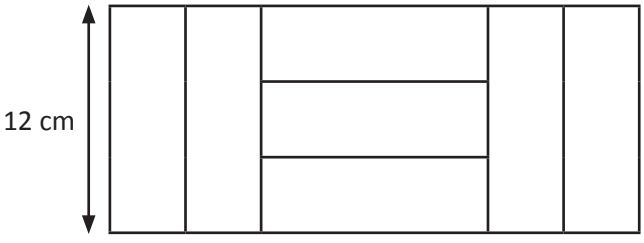
a The area of each square is 9 cm^2. What is the perimeter of this figure?



b The figure is made up of 14 squares. Each square has an area of 36 cm^2. What is the perimeter?



c The area of this rectangle is 336 cm^2. If all the smaller rectangles are exactly the same, what is the perimeter of one rectangle?

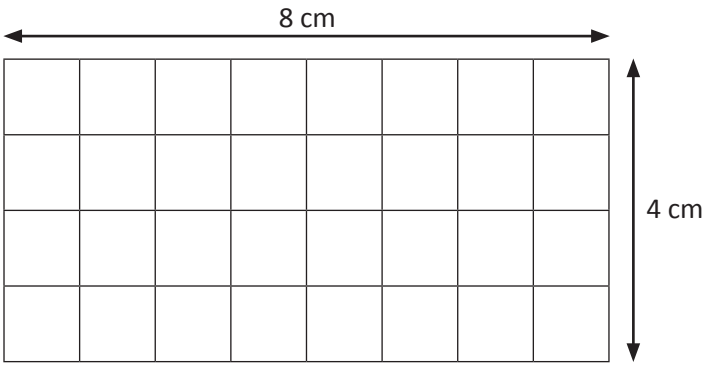


Area puzzles

solve

What to do

Solve these area puzzles:

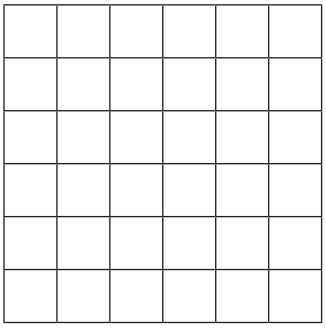


a How many 1 cm² tiles do I need to cover this wall?

How many 4 cm² tiles do I need to cover this same wall?

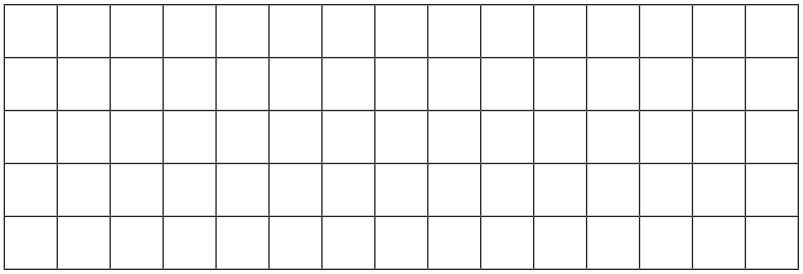
.....

b How many 2 cm² tiles do I need to cover a wall that is 6 cm by 6 cm?



.....

c How many 5 cm² tiles do I need to cover a wall that is 15 cm by 5 cm?



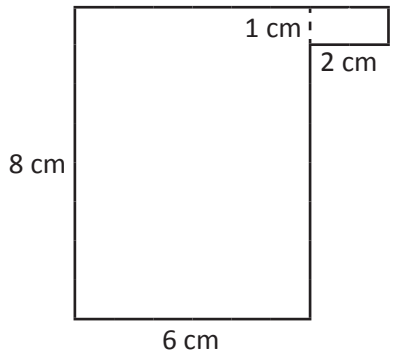
Composite calculations — apply

What to do

Can you find the areas of these rooms*? Circle the room that would be cheapest to carpet.

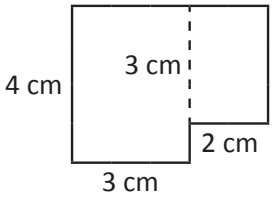
Put a cross in the room that would be most expensive.

a



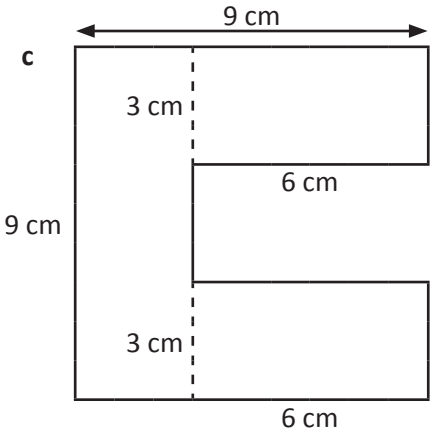
Area = ____ cm²

b



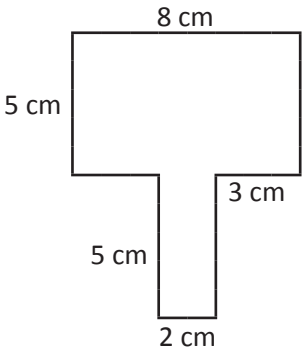
Area = ____ cm²

c



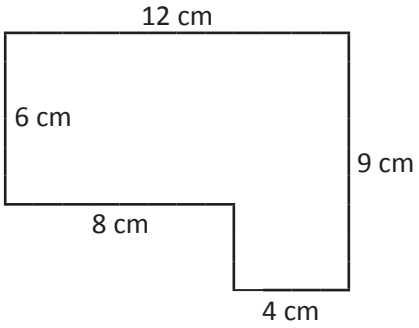
Area = ____ cm²

d



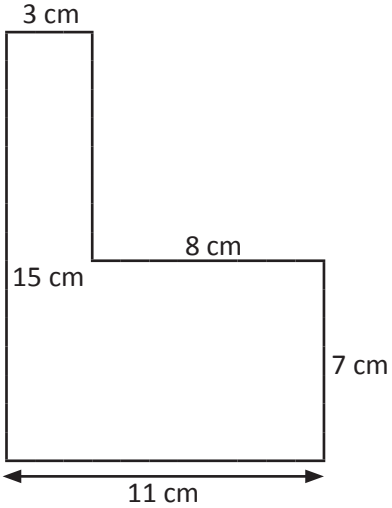
Area = ____ cm²

e



Area = ____ cm²

f



Area = ____ cm²

**Not drawn to scale.*

What to do next

Draw a composite shape that has an area of 50 cm².