Mathletics

Series G Student

Length, Perimeter and Area

My name

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Series G – Length, Perimeter and Area

Contents

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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 – choose units of measurement

1 **Think of all the units you know for measuring length. Can you show how they are connected?**

metre ——— 1,000 m = 1 km ——— kilometre

When measuring length, it is important to choose a suitable unit of measurement.
Using millimetres as the unit to measure the distance between London and Moscow is not the most efficient choice. Think of all those zeros.

2 **Choose the conventional unit of length (cm, m, km, mm) to measure the following:**

a The length of your nose ☐

b The distance between England and France ☐

c The length of a swimming pool ☐

d The length of a ladybird ☐

e The height of a basketballer ☐

f The width of an apple pip ☐

g The length of the Trans-Siberian Railway ☐

h The height of a Year 6 pupil ☐

3 **Would more than one choice of unit be appropriate for any of the items above? Which ones and which unit would you use?**

_____

4 **Name 3 things you would measure in mm, cm, km:**

mm	cm	km

Units of length – choose units of measurement

5 **Choose a distance in the school such as the length of your classroom, corridor or playground. Measure it in m, mm and cm. Record your measurements below. Which was easiest to use? Which would you recommend that someone else use if they were to do the same thing?**

mm

cm

m

6 **Play 'Unit Bingo' with some friends. You'll each need a copy of the grid below. One of you will be the caller and the others will play. The players will need 16 counters each.**

1 Fill in the rest of your bingo card with a mixture of items where length can be measured in different measurements. You'll want a mixture of cm, mm, m and km options.

2 The caller nominates a measurement – km, m, cm or mm. If you think you have an item that would most commonly be measured in that unit, call it out.

3 The group can discuss your choice and if they disagree, the caller makes the final decision as to whether you can cover the item with a counter. Obviously there may be more than 1 choice for an object. For example, you may accept both cm and mm as an answer for the chip.

4 The first person to cover all their squares calls "Bingo" and wins.

hand span			
		a chip	
London to Paris			
		length of your tongue	

Units of length – convert measurements

Measurements can be expressed using different units.

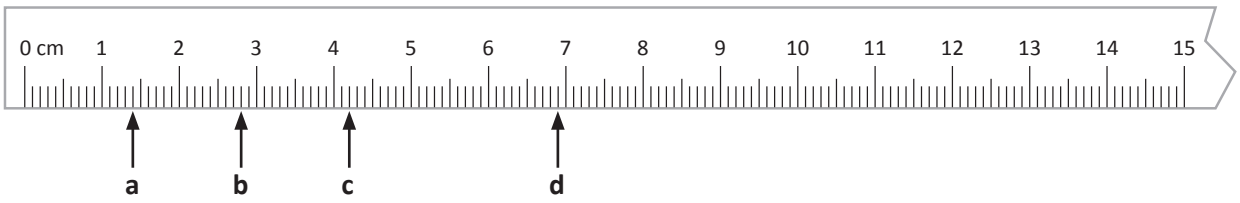
When we convert from a larger unit to a smaller unit, we multiply:

cm ⟶ mm 34 cm = (34 × 10) mm = 340 mm

When we convert from a smaller unit to a larger unit, we divide:

cm ⟶ m 34 cm = (34 ÷ 100) m = 0.34 m

1 **Express the lengths shown on the ruler in 2 ways:**



a ____ mm ____ cm **b** ____ mm ____ cm

c ____ mm ____ cm **d** ____ mm ____ cm

2 **Convert these lengths to centimetres:**

a 200 mm = ____ cm **b** 405 mm = ____ cm **c** 8,238 mm = ____ cm

d 2 m = ____ cm **e** 19 m = ____ cm **f** 450 m = ____ cm

3 **Convert these lengths to metres:**

a 400 cm = ____ m **b** 28 cm = ____ m

c 3,250 mm = ____ m **d** 482 cm = ____ m

e 123 cm = ____ m **f** 7,777 mm = ____ m

g 4,341 mm = ____ m **h** 187 cm = ____ m

i 198 mm = ____ m

Remember these key facts!

10 mm = 1 cm

100 cm = 1 m

1,000 m = 1 km

Units of length – convert measurements

When we order lengths it's easiest to convert them into the same unit first. Here, we are converting to cm:

14 cm 128 mm 1.1 m **convert** ⟶ 14 cm 12.8 cm 110 cm

Now we can clearly see the order of these lengths.

4 **Put these measurements in order from shortest to longest:**

a	13 cm	120 mm	3 m	
b	5,700 mm	5 m	540 cm	
c	3.25 m	300 cm	325 mm	

5 **Use these *Guinness World Record* facts to fill in the missing values.**

Source: *Guinness World Book Records* 2008

	metres	centimetres	millimetres
Longest tongue	0.095 m	cm	95 mm
Tallest living person	2.57 m	257 cm	mm
Longest hair	m	5,267 cm	mm
Longest fingernails	7.513 m	cm	7,513 mm
Smallest tooth	m	cm	3 mm
Longest leg hair	0.127 m	cm	mm

6 **Choose one of the above measurements and work out the length of your equivalent body part. Express your measurement in three different units.**

7 **Without revealing your findings for question 6, ask your friend to measure you. Is their answer the same as yours? If not, why do you think the answers are different?**

Units of length – metric and imperial

Most measurements used today in the UK (and in almost every country in the world apart from the USA) are metric, such as kilograms, metres and litres. They are based on the decimal number system, meaning that multiples of units are 10s, 100s or 1,000s. You will still come across some of the old 'Imperial' units of measurement, though; in particular, miles, which continue to be used to measure longer distances on road signs. Therefore, it's useful to know how to convert between metric and imperial units and back. Most of the equivalents below have been rounded to 1 decimal place.

	Imperial	to	Metric	Metric	to	Imperial
Length:	1 inch	=	2.5 cm	1 centimetre	=	0.4 inches
	1 foot (12 inches)	=	30.5 cm	1 metre	=	3.3 feet
	1 yard (3 feet)	=	91 cm	1 kilometre	=	0.6 miles
	1 mile (1,760 yards)	=	1.6 km			

1 **Convert these measurements from imperial to metric or metric to imperial:**

a 2 metres = _____ feet

b 3 inches = _____ centimetres

c 10 yards = _____ metres

d 5 centimetres = _____ inches

e $1\frac{1}{2}$ miles = _____ kilometres

f 3 feet = _____ centimetres

g 20 millimetres = _____ inches

h 3,520 yards = _____ kilometres

2 **Draw a line between the equivalent distances in miles and kilometres:**

30 miles	4 miles	6 miles	16 miles	20 miles	9 miles
6.4 km	32 km	48 km	9.6 km	25.6 km	14.4 km

3 **Use the conversions given above to complete the word problems.**

a I am 5 feet 5 inches tall. How tall is this in metres? _____ metres

b In a snail race an American snail covered 5 inches in 10 minutes and a European snail travelled 14 cm in the same time. Which snail won? _____

Units of length – estimate and measure

In everyday life, we often estimate measurements. Can you think of a time you would estimate instead of measuring exactly? Or a time you would estimate first, then measure more precisely?

1 **When we compare, we often use fractional language to help us. For example, "He was twice her size!" or "My bedroom is $\frac{2}{3}$ the size of this." Look at the top bar and then the bars below. What fraction of the top bar do you estimate that the lower bars represent?**

a 

b 

c 

d 

2 **Draw each of these lines in mm:**

a 64 mm

b 37 mm

c 27 mm

d 82 mm

3 **Make a choice from the box (on the right) to fill the gaps in these statements:**

a A desk is about _____ metre high.

b A basketballer is about _____ metres high.

c A dinner fork is about 19 _____ long.

d A football pitch is between 100 and 110 _____ long.

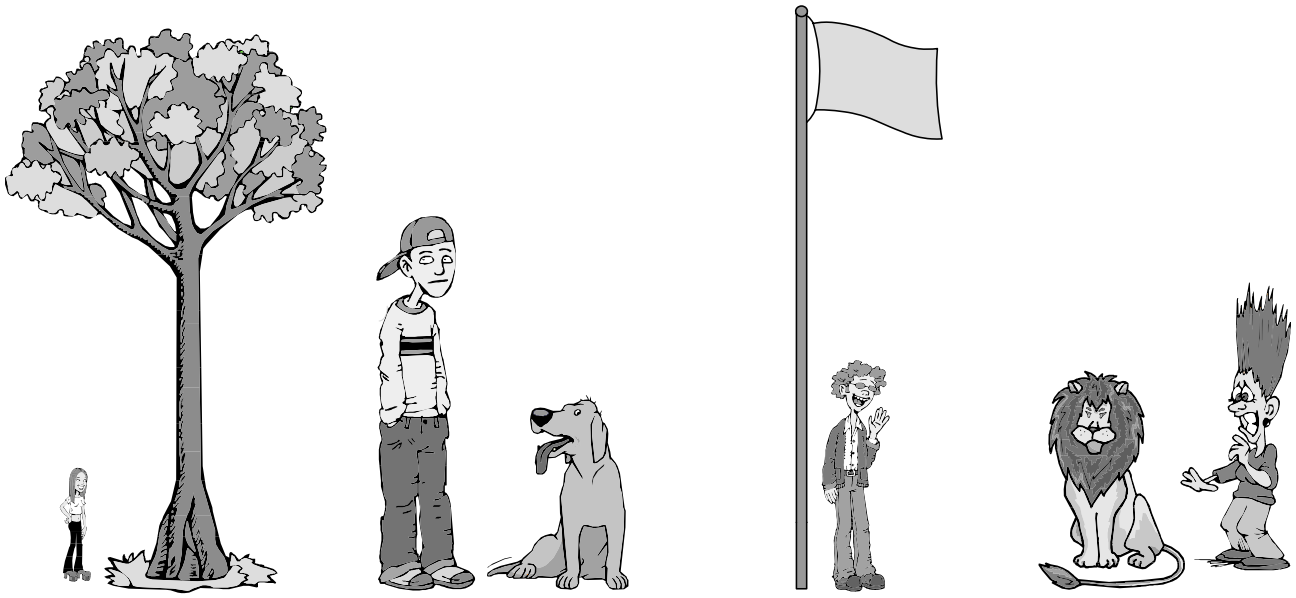
e A crayon could be about _____ cm long.

centimetres
metres
1
8.6
2

Units of length – estimate and measure

Comparing lengths or heights with a known measurement is a useful strategy. The known measurement is called a benchmark.

4 **The average height of an adult woman is around 1.6 m and a man is around 1.8 m. Use these benchmarks to estimate the height of the objects below:**



a ☐ **b** ☐ **c** ☐ **d** ☐

5 **Measure yourself. Using that measurement as a benchmark, estimate the height of 5 objects around the school. Now measure them. How close were your estimations?**

My height:

	Object	Estimation	Actual measurement
1			
2			
3			
4			
5			

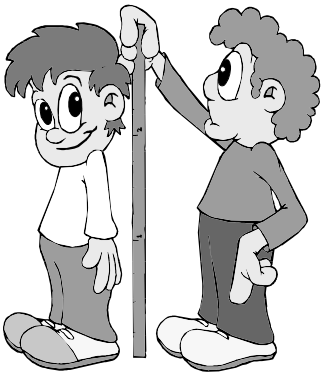
Size me up! investigate

Getting ready

The human body is a fascinating thing. In this activity you will work with a partner to compare the length of different parts of your body to find some common relationships between the measurements. You will record your measurements and findings.

You'll need a tape measure or strips of paper or lengths of string. A ruler may also help.

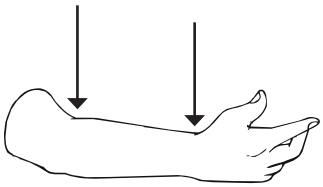
You'll need a pen and paper for recording your data.



What to do

Look at your foot. Consider the length, not how beautiful it is. Can you think of a part of your body that might be the same length? Make your prediction.

It is said that your foot is the same length as your forearm, from your wrist to your elbow. Do you think this is true for you? Test it out.



It is also said that the circumference (or length) of your neck is equal to twice the circumference of your wrist. Test that one out.

Now it's your turn to find some more. With a partner, measure at least 10 different body lengths and see if you can find connections between them.

You could measure the length of: your shin bone, your thigh bone, your navel to the floor, the top of your head to your navel, around your waist, around your head, the length of your head, or the distance between your eyes. The list goes on!

Can you find some measurements that are the same length?

Can you find some that are roughly double or half the size of each other?

What about some that are about one and a half times the length of each other?

Is measuring an exact science? What issues do you face?

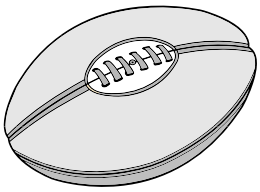
What to do next

If this activity has interested you, you are in for a treat. Use the internet to research the terms 'divine proportions' or 'golden ratio'. What do you find?

How long? apply

Getting ready

In this activity work in groups of 4 to practise and improve on estimating lengths. Note the team average of 6 attempts and see how close your team average estimate can get to the actual measurement. This is about working together, not just about individual estimates.



What to do

1 Choose one action where length can be measured easily. You are going to measure the same action 6 times. Examples include the length of a jump, the distance of a ball throw or how far you can hop on one foot without faltering.

2 One person in the group performs the action. All group members make an estimation of its length. Record the estimations. Work out the average of the estimations. This is an important step – don't just rush to measure the length!

3 Now you can measure the length. As a whole group, how far out was your estimate? Record this on a table such as the one below:

Measurement	Group average	Difference
1.25 m	1.13 m	0.12 m

4 Try the action again and go through the same steps. Was your estimate closer?

5 Repeat the activity until you have done it 6 times.

Remember we work out averages by adding up all the estimates and dividing by the number of estimates.

A 35 cm
B 40 cm
C + 38 cm
113 cm

113 ÷ 3 = 37.66 cm

REMEMBER

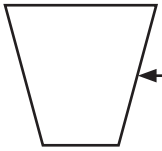
What to do next

Share your process and results with the class.

Which groups improved with more practice? Did groups use strategies to assist them to get closer? If no improvement was shown, why do you think this was?

Perimeter – measure perimeters

Perimeter is the length around a shape. The word originates from Greek and literally means 'around measure'.



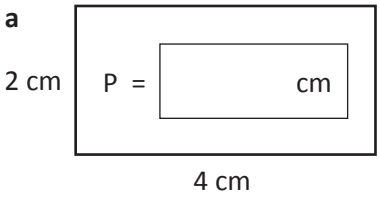
The sides of this shape make the perimeter.

1 **Choose 5 classroom objects. Using a piece of string or strips of paper, find their perimeters. Record your measurements in the table.**

	Item	Perimeter
1		
2		
3		
4		
5		

2 **Look carefully at the dimensions on each shape and find the perimeter. Express your answers in cm:**

a



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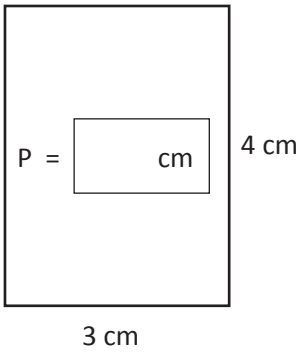
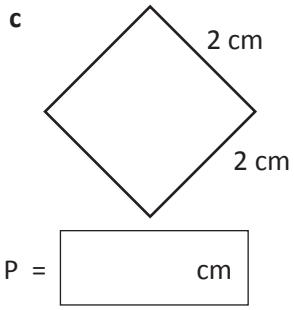


c



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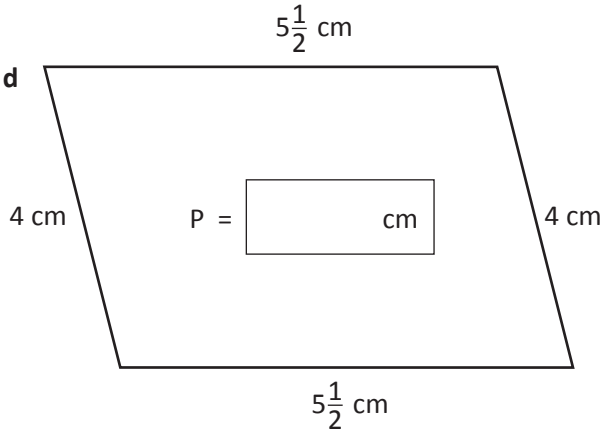
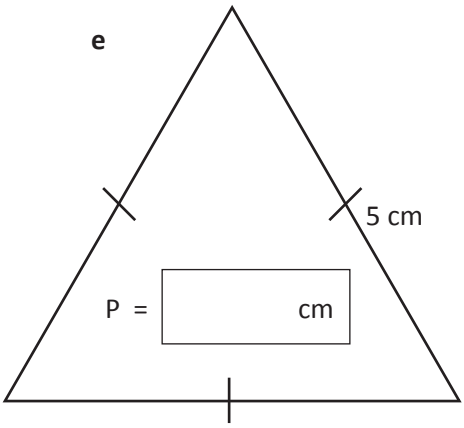
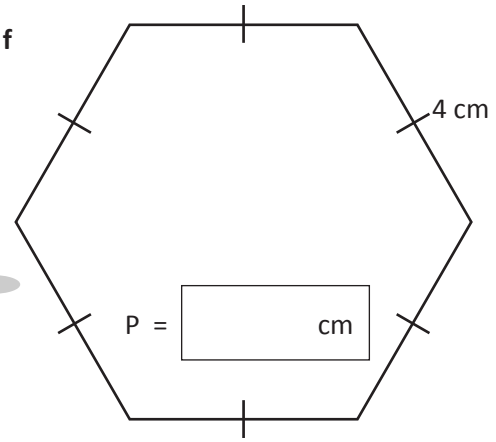
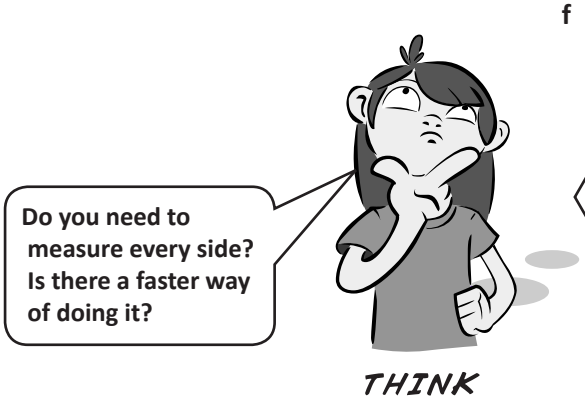


e



f





Perimeter – measure perimeters

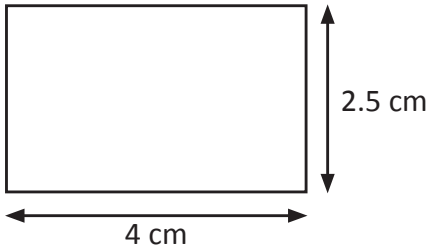
We can find the perimeter of squares and rectangles without measuring every side.

This rectangle has 2 sides measuring 2.5 cm and 2 sides measuring 4 cm.

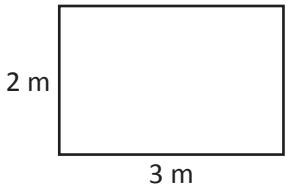
(4 + 4) + (2.5 + 2.5) = 8 + 5 = 13 Perimeter is 2L + 2W

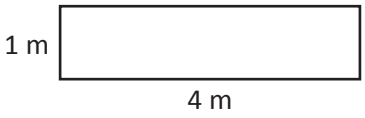
Another way to organise this is 2 × (L + W)

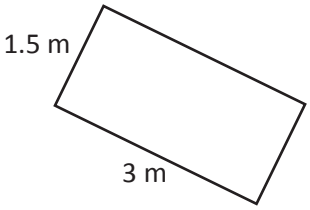
Squares are even easier: 4 × L

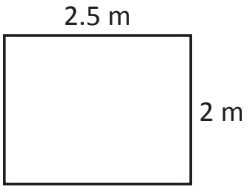


3 **Use a shortcut method to work out the perimeter of:**









a P = ____ **b** P = ____ **c** P = ____ **d** P = ____

4 **Find the perimeter of rectangles with the following dimensions:**

Length	Width	Perimeter
6 cm	2.2 cm	
12.5 mm	4 mm	
5.54 m	3.56 m	
150 cm	1.3 m	

5 **Circle the correct perimeter for these rectangles:**

a Length 12 cm, Width 8 cm — 32 cm 40 cm 20 cm

b Length 14 mm, Width 12 mm — 26 mm 52 mm 40 mm

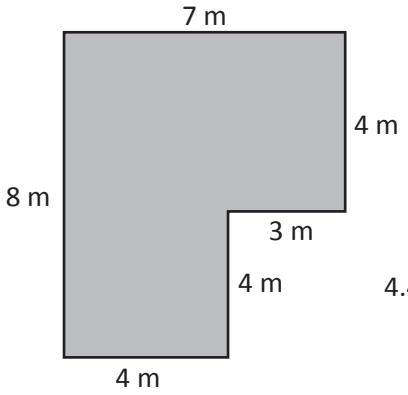
c Length 8.5 cm, Width 2.7 cm — 22.4 cm 112 cm 11.2 cm

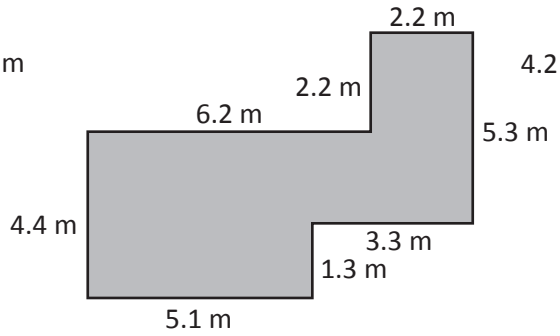
d Length 10.2 cm, Width 8.4 cm — 85.68 cm 36 cm 37.2 cm

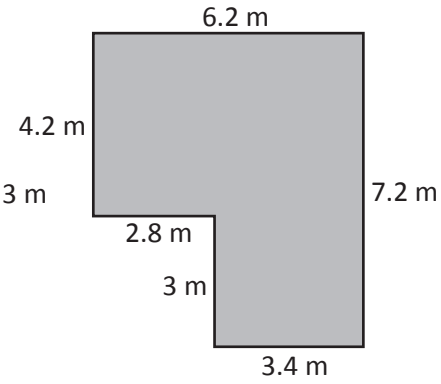
e Length 22 mm, Width 11 mm — 6.6 cm 33 mm 60 mm

Perimeter – perimeters of composite shapes

1 **Work out the perimeter of these composite shapes* by adding the length of the sides:**



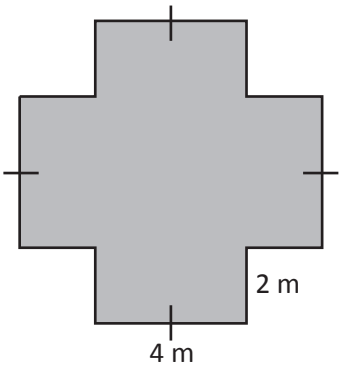


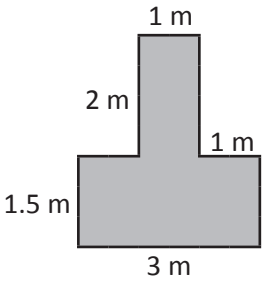


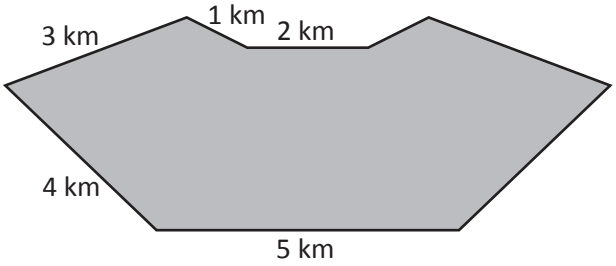
a P = ☐ **b** P = ☐ **c** P = ☐

**Not drawn to scale.*

2 **These shapes* are symmetrical. Use this knowledge to help you find their perimeters:**





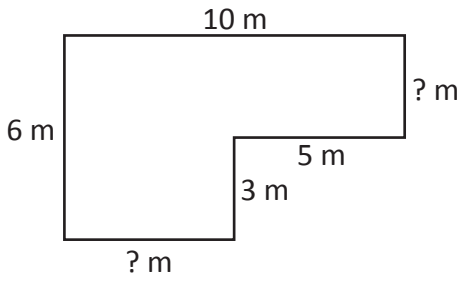


a P = ☐ **b** P = ☐ **c** P = ☐

**Not drawn to scale.*

3 **Draw 3 different shapes on the 5 mm dot paper, each with a perimeter of 200 mm.**

Perimeter – perimeters of composite shapes



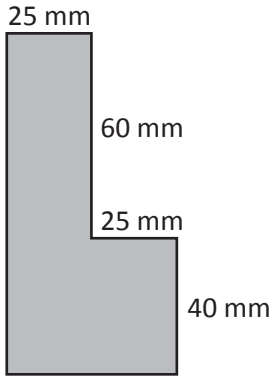
Look at this shape. Some of the measurements are missing.
How do we work out the perimeter?
We use the information we have to help us fill in the gaps.

5 m + ? m = 10 m 10 m – 5 m = 5 m

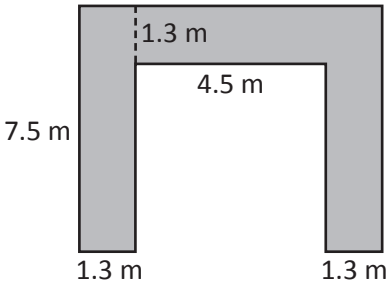
3 m + ? m = 6 m 6 m – 3 m = 3 m

The perimeter of this shape is therefore 32 m.

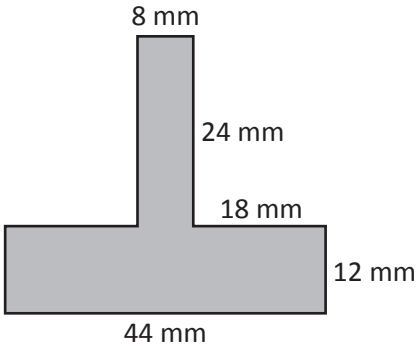
4 **Work out the perimeter of these shapes* using the known measurements to guide you:**



a P = ☐



b P = ☐

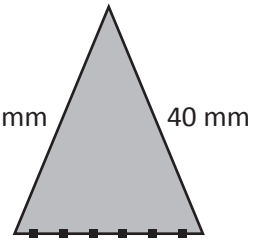


c P = ☐

**Not drawn to scale.*

5 **What is the length of the dotted line in each shape*?**

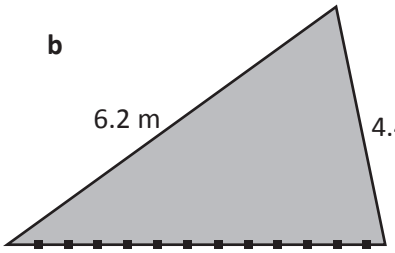
a



☐

P = 110 mm

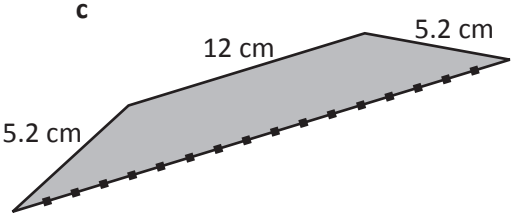
b



☐

P = 16.6 m

c



☐

P = 44 cm

**Not drawn to scale.*

6 **Find the mystery perimeters:**

a I have 4 sides.
My opposing sides are equal.
One of my sides is 8 cm in length.
Another is 4 cm.
What is my perimeter?

☐

b I have 6 sides.
All my sides are equal.
One of my sides is 5.62 mm.
What is my perimeter?

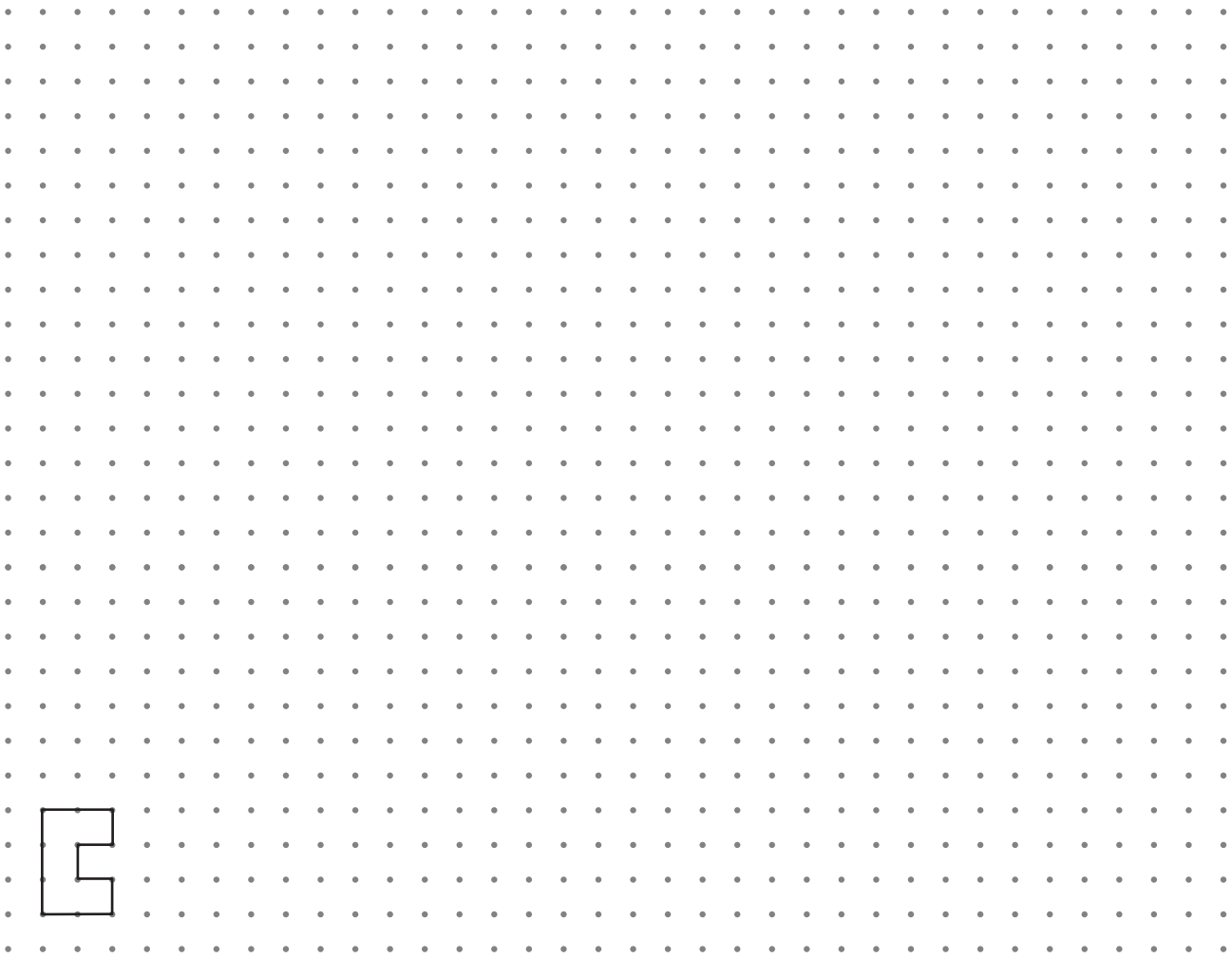
☐

c I am a regular octagon.
6 of my sides total 12.6 cm in length.
What is my perimeter?

☐

Perimeter – perimeters of composite shapes

7 **Using block letters, write your name on this 5 mm dot paper. What is the perimeter of your name?**



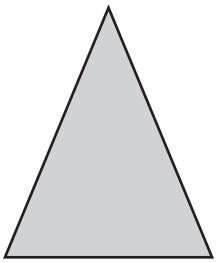
8 **Find 3 things that are roughly twice as long as they are wide. Calculate their perimeter:**

Perimeter puzzles — solve

What to do

Solve these perimeter puzzles:

a Look at this isosceles triangle. The base measures 3 m. The perimeter of the triangle is 11 m.



What is the length of one of the other sides?

.....

b An equilateral triangle has a perimeter of 15.9 mm. How long is each side?

Each side is _____ long.

.....

c Farmer Joe needs to re-fence one of his paddocks. The perimeter of the paddock is 144 m. The paddock is twice as long as it is wide.

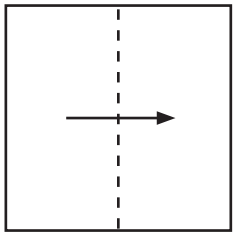
What is its length? What is its width?

L = _____

W = _____

.....

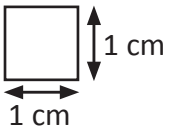
d A square piece of paper is divided in half as shown. If the perimeter of one of the halves is 36 cm, what was the perimeter of the original square?



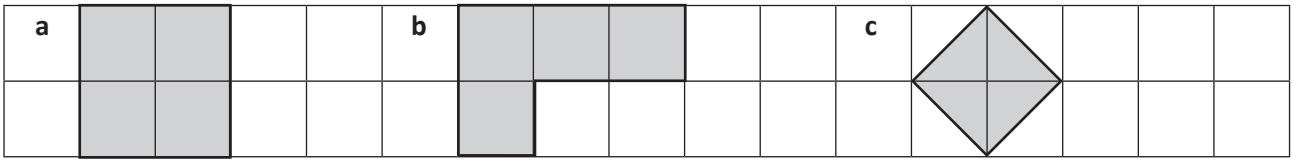
P = _____

Area – square units

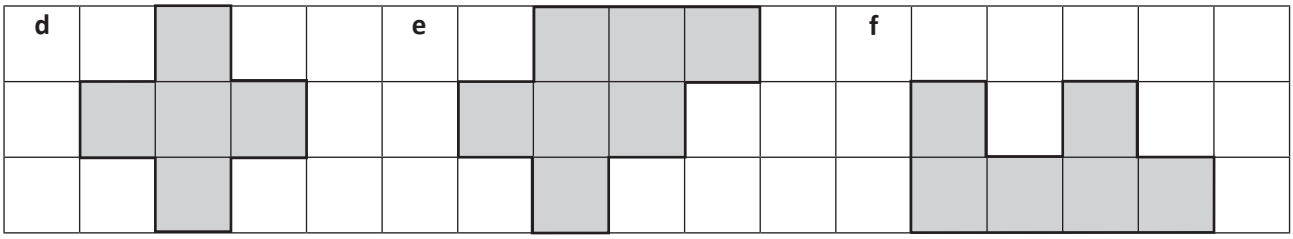
Area is the amount of space a shape covers. It is a 2D measurement.
We measure area in square units. For small areas we use square centimetres.



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

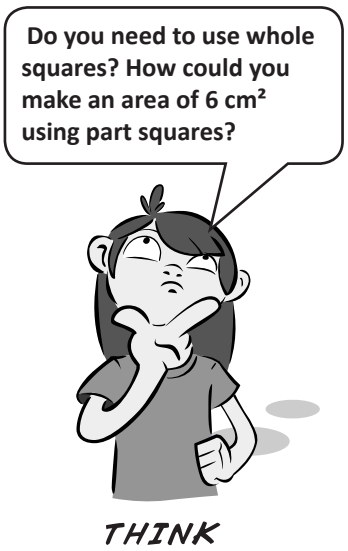


Area = ____ cm² Area = ____ cm² Area = ____ cm²



Area = ____ cm² Area = ____ cm² Area = ____ cm²

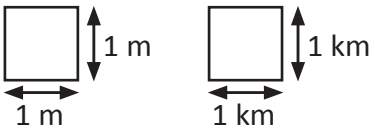
2 **How many different shapes can you make that have an area of 6 cm²?**



Choose another area and see how many of those shapes you can make.

Area – square units

For larger areas such as a tennis court we use square metres (m²)
For even larger areas such as countries, we use square kilometres.
A square kilometre is 1,000,000 m².



3 **How much space do you predict 1 m² would take up?**

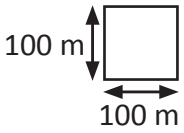
a Work in a small group and use chalk or string to mark your prediction on the ground. Use a ruler to measure it out. Is it smaller or larger than you imagined?

_____

b Now, how many people do you think could fit in your square? They must all be able to stand with both feet on the ground and inside the lines. Test it out. Record your prediction and the result.

Estimate = ☐ Measurement = ☐

We also use hectares (ha) to measure area.
These are larger than square metres but smaller than square kilometres. We use them for measuring spaces such as farms or parks.



100 m × 100 m = 10,000 **m²**
= **1 ha**

4 **Convert the following:**

a 10,000 m²	☐ ha	**b** 80,000 m²	☐ ha	**c** 30,000 m²	☐ ha
d 20,000 m²	☐ ha	**e** 50,000 m²	☐ ha	**f** 110,000 m²	☐ ha
g 4 ha	☐ m²	**h** 9 ha	☐ m²	**i** 12 ha	☐ m²
j 5,000 m²	☐ ha	**k** 15,000 m²	☐ ha	**l** 7,500 m²	☐ ha

5 **Would you choose cm², m², ha or km² to measure the area of the following?**

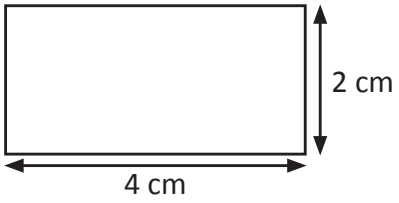
a this page	☐	**b** Egypt	☐
c a farm	☐	**d** a mobile phone screen	☐
e a city park	☐	**f** a national park	☐
g a DVD cover	☐	**h** a football stadium	☐

Area – find area using formulae

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

Area = Length × Width

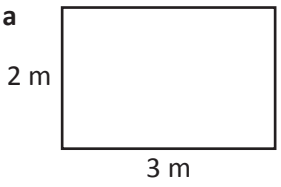
Area = 4 cm × 2 cm = 8 cm²



1 **Use the formula A = L × W to help you find the areas* of:**

This saves us from ruling up grids and counting squares.

a

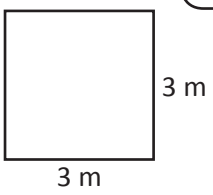


A = ☐

b

A = ☐

c



A = ☐

**Not drawn to scale.*

2 **Find the area of the following:**

a A rectangle measuring 8 cm × 5 cm ☐

b A box measuring 30 cm × 7 cm ☐

c A pool measuring 25 m × 10 m ☐

d A phone measuring 4.5 cm × 10 cm ☐

e A book measuring 35 cm × 12 cm ☐

f A field measuring 60 m × 25 m ☐

g A town square with 4 sides of 10 m ☐

h A rug measuring 10.2 m × 3.4 m ☐

3 **Answer these area word problems:**

a Marianne wants to buy new carpet for her bedroom. Her room is 3 m × 4 m and the carpet she wants costs £50 per m². How much will the new carpet cost her? ☐

b A book is 12 cm longer than it is wide. If it is 10 cm wide, what is the area of the book? ☐

c A garden has an area of 35 m². If the garden is 7 m long, what is its width? ☐

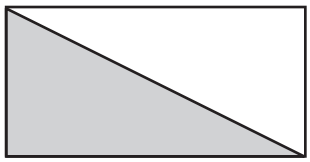
d The area of a rectangle is 48 cm². What might be the length and width? Come up with 2 options:

Option 1 L = ☐ W = ☐

Option 2 L = ☐ W = ☐

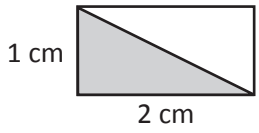
Area – find area using formulae

Each triangle is half of a rectangle.
To find the area of a triangle, we find the area of the rectangle and then divide by two.

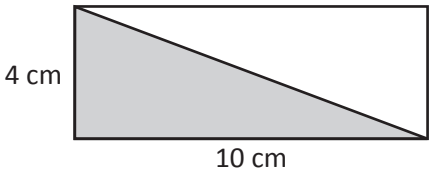


Rectangle = 8 cm × 4 cm = **32 cm²**
Triangle = 32 cm² ÷ 2 = **16 cm²**
The formula for this is:
$\frac{1}{2}$ **Base × Height**

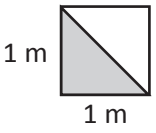
4 **Find the area of the shaded triangles inside the rectangles*:**



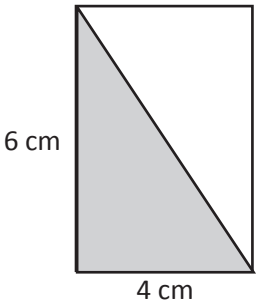
a Area = _____ cm²



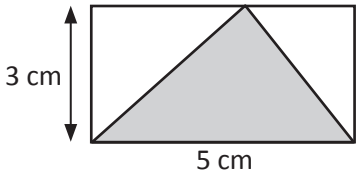
b Area = _____ cm²



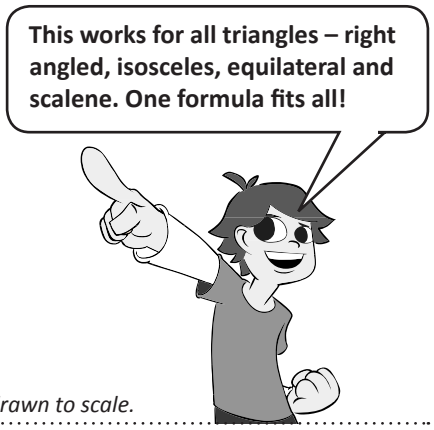
c Area = _____ m²



d Area = _____ cm²

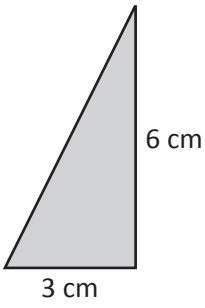


e Area = _____ cm²

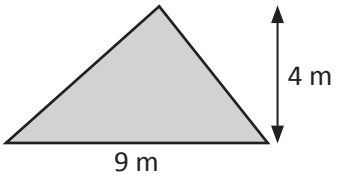


*Not drawn to scale.

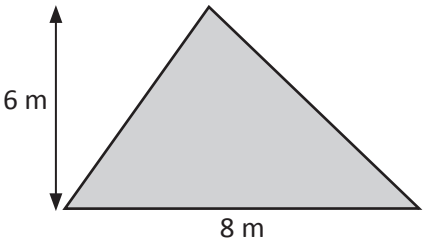
5 **Find the area of these triangles* using the formula $\frac{1}{2}$ Base × Height:**



a Area = _____ cm²



b Area = _____ m²



c Area = _____ m²

d A triangle with a base of 12 cm and height of 7 cm _____

e A triangle with a base of 17 m and a height of 14 m _____

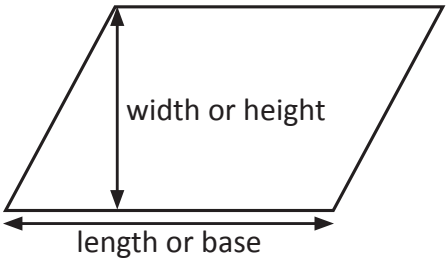
f A triangle with a base of 10.2 m and a height of 9 m _____

*Not drawn to scale.

Area – find area of parallelograms

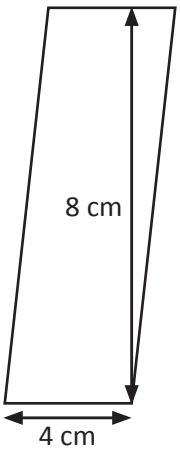
A parallelogram is a quadrilateral with opposite sides of equal length and opposite angles of equal size. To find the area of a parallelogram, you use the same formula as for rectangles – that is, length × width or base × height.

So if the base is 10 cm long and the height is 8 cm long, the area of the parallelogram will be 10 × 8 = 80 cm².

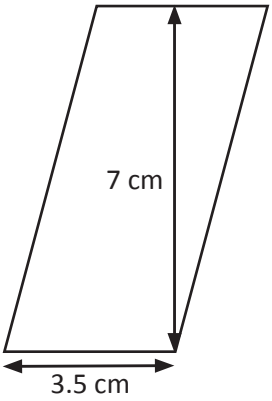


1 **Find the areas of these parallelograms (not drawn to scale):**

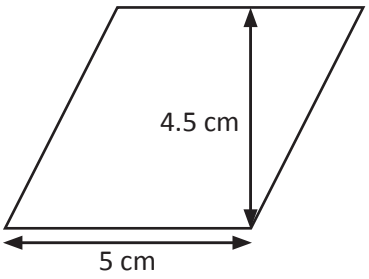
a



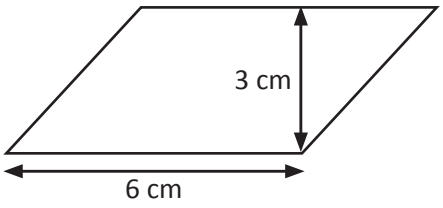
b



c

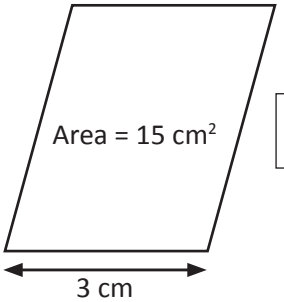


d

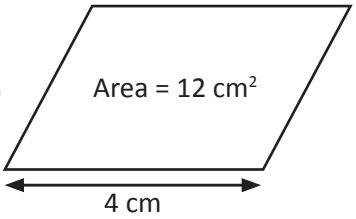


2 **Find the heights of these parallelograms (not drawn to scale):**

a



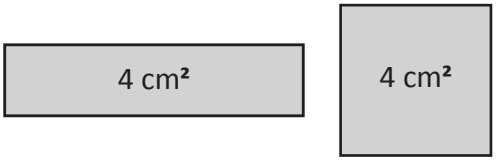
b



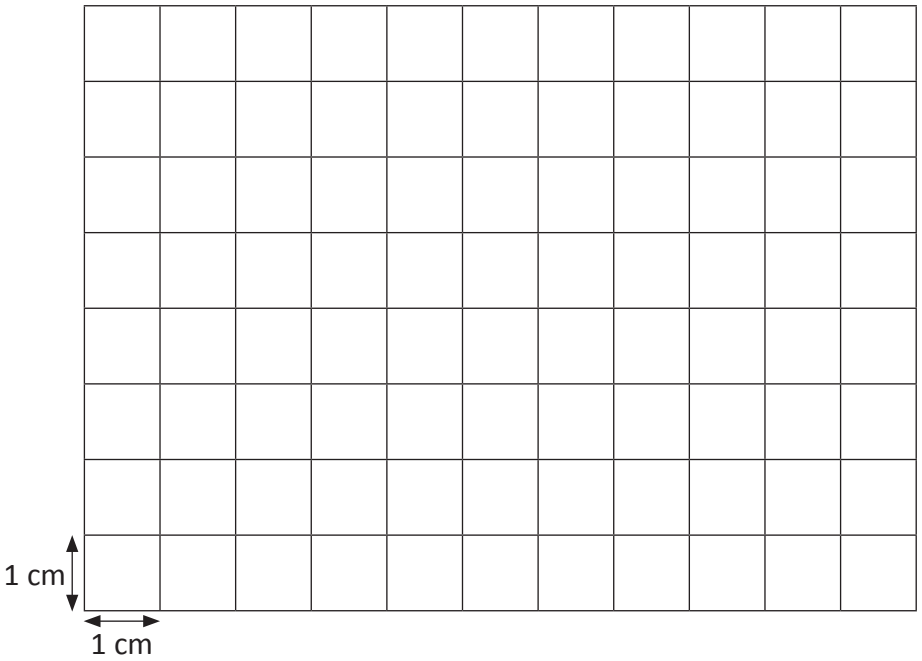
Area – area and perimeter

Do shapes with the same area have the same perimeter?

No.

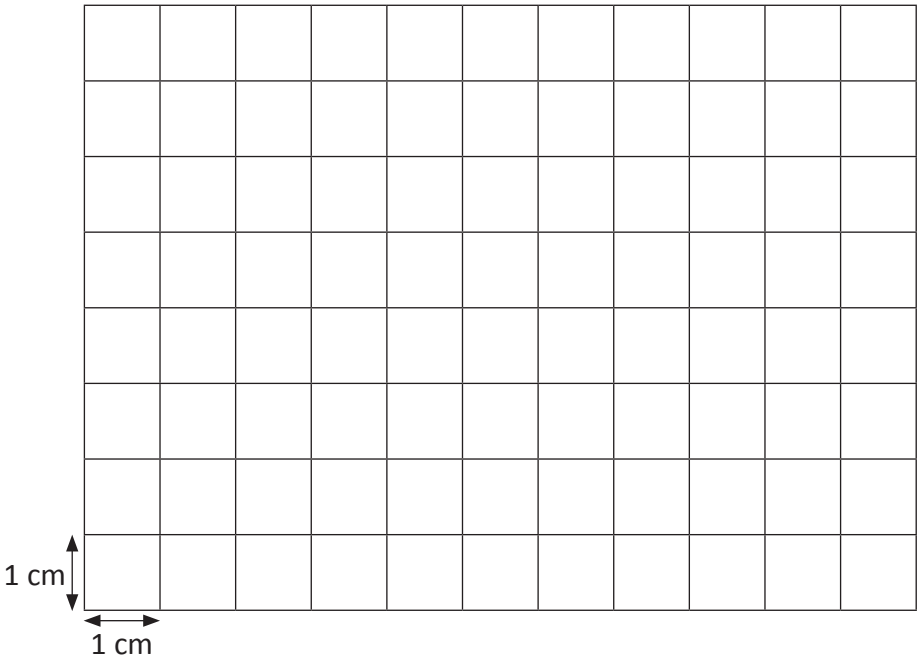


1 **Draw some shapes with an area of 12 cm². Measure and record their perimeters in the table below. What do you find?**



Length	Width	Area

2 **This time, use a perimeter of 20 cm as your starting point. Create different shapes with a perimeter of 20 cm and calculate their area.**



3 **Solve these problems. Show your working out:**

a The perimeter of a square is 48 cm. What is its area?

b The perimeter of a rectangle is 30 cm. If the rectangle is 4 times as long as it is wide, what is the area of the rectangle?

c The area of a square is 36 m². What is its perimeter?

4 **The desks in your classroom are 1 m long and 50 cm wide and seat 2 pupils. Your teacher would like you to put them in groups of 3 so that 6 pupils can sit comfortably. Draw at least 2 different options and calculate the perimeter and area of each option.**

Which is your preferred option? Why?

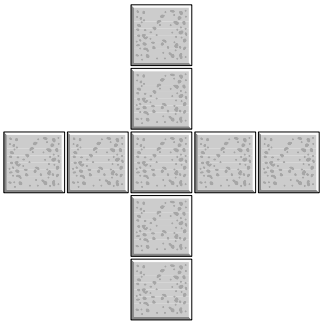
Area and perimeter puzzles — solve

What to do

Shakira has had it with her brothers wrecking her stuff and decides to fence off her own area of the family room using the sofa cushions. There are 8 cushions, each 50 cm long. If she uses two of the walls as part of her boundary, what is the largest area she can make for herself that is brother-free?

Show her best option below:

.....



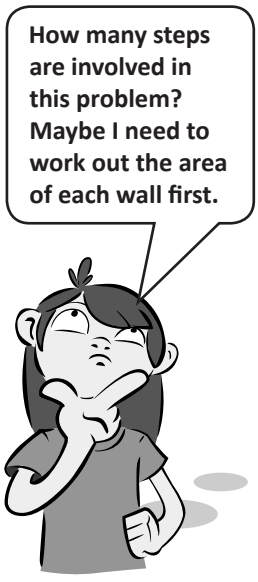
The garden path on the left is made up of 9 identical squares.

a If the perimeter of the path is 20 m, what is its area?

b What about if the perimeter was 60 m? What would then be the area?

c If the area of the path is 36 m², what is its perimeter?

.....



THINK

Paige wants to paint the walls of her room purple. Her parents say she can do it but only if the paint costs less than £250. Paige has found some purple paint going cheap at £55 per 4 litre pot. Each pot will cover 9 m².

Her bedroom is 3 m × 4 m and each wall is 2.5 m high. She has one window with an area of 1 m² that doesn't need to be painted. The ceiling is covered in silver stars already so she won't paint that either.

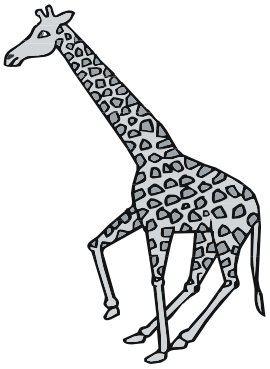
Can she do it? Show your working out.

Animal rescue — investigate

Getting ready

Four African animals have been stolen by smugglers. Fortunately you intercepted them and can return the animals to their natural habitat.

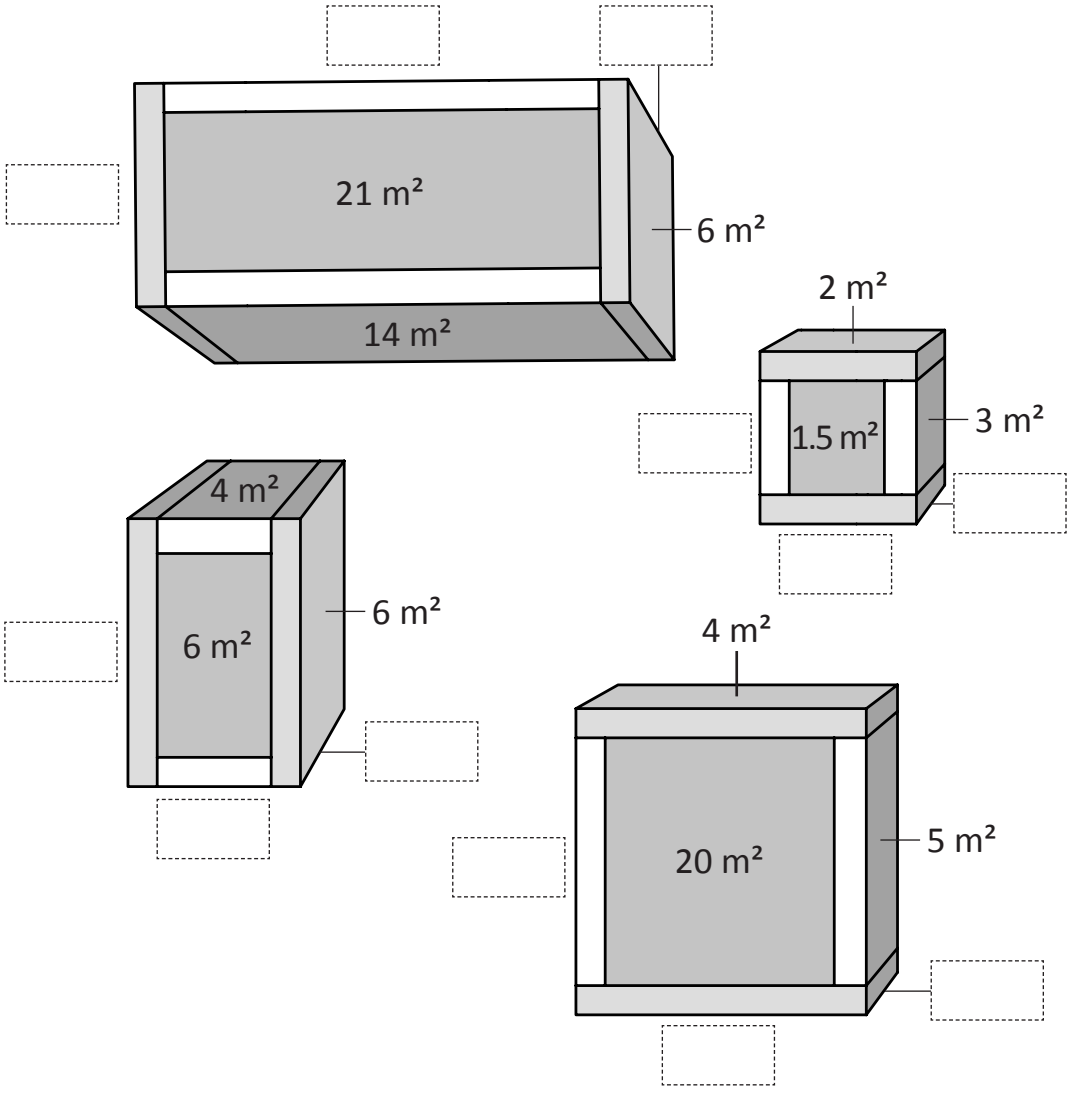
You have four enclosures in which to transport the animals safely. You know the areas of each side of the box but you don't know the lengths, heights or widths. You need to select the right one for each animal.



What to do

Follow these directions:

1. Look at the approximate dimensions of the animals.
2. Now look at the boxes. The area of each side is specified. Knowing this, what could the height, length and width of each side be? Label them.
3. Join the animal to the box you think would fit it best.



Giraffe
H – 5 m
L – 4 m
W – 1 m

Elephant
H – 3 m
L – 7 m
W – 2 m

Hippo
H – 3 m
L – 2 m
W – 2 m

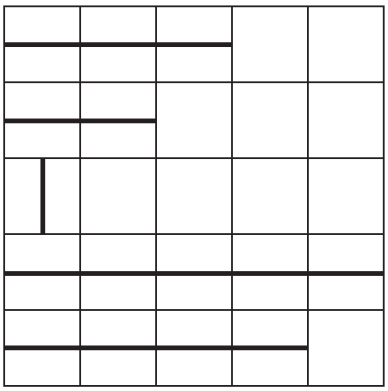
Lion
H – 1.5 m
L – 1 m
W – 2 m

Scale and distance – scale drawings

We use scale drawings to represent larger measurements or objects.
Maps and floor plans are good examples of when we use scale in real life.

We use one measurement to represent another, like this: **1 cm = 5 km**

1 **If the length of each cell on the square grid to the right represents 3 km, how long is each line?**



a ____ km
b ____ km
c ____ km
d ____ km
e ____ km

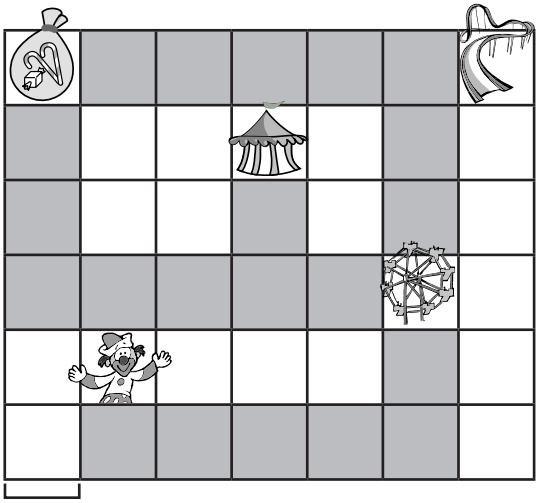
2 **What about if each cell represents 20 cm?**

a ____ cm **b** ____ cm **c** ____ cm **d** ____ cm **e** ____ cm

3 **If the length of (a) was 1.5 m, what would each cell represent in cm?** ____ cm

4 **If the length of (d) was 125 mm, what would each cell represent in mm?** ____ mm

5 **Using the map of the showground below, work out how far apart in real life these places are. You must follow the grey paths.**



1 cm represents 50 m

a From the roller coaster to the show bags. ____

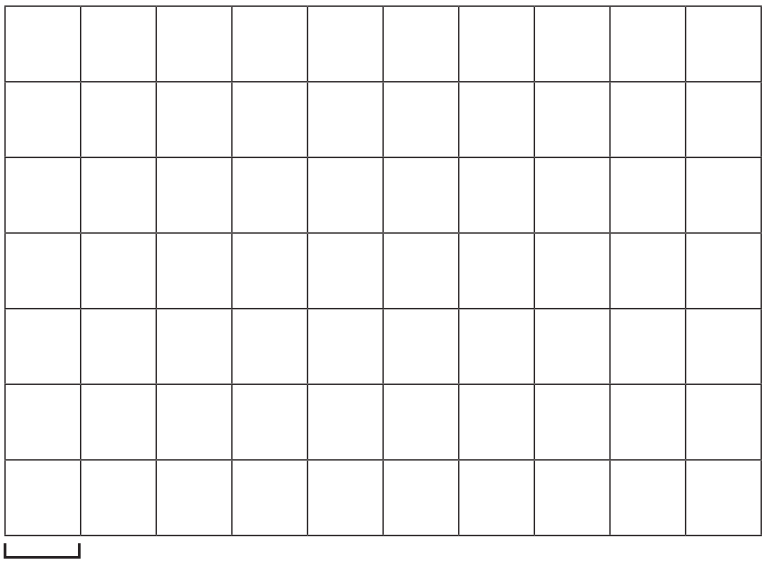
b From the clowns to the big top. ____

c From the Ferris wheel to the big top. ____

d You start off at the Ferris wheel, then go to the roller coaster. You are now feeling a bit queasy and sit down in the big top for a bit. You decide you are feeling better and go on a show bag shopping spree. How far have you walked? ____

e Show your journey on the map.

6 **Now design your own map:**



1 cm represents _____

a Draw 5 places on the map.

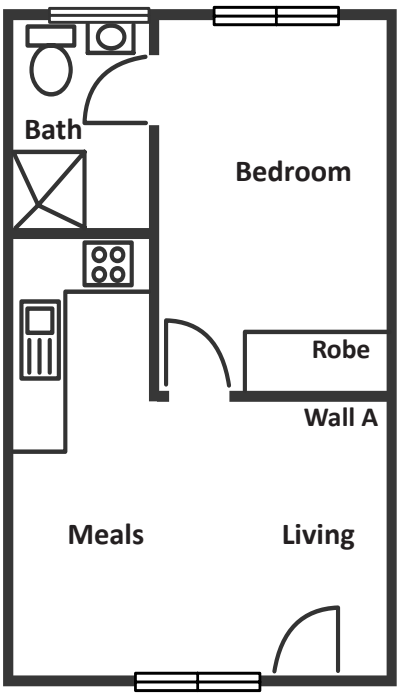
b Decide on a scale.

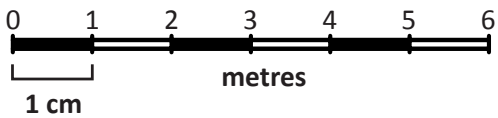
c Write 3 problems on another piece of paper for a friend to solve.

d Ask for feedback from your friend. Do they have enough information to answer your questions?

e Make changes as needed.

7 **Look at the floor plan of the apartment below. Answer the following questions:**





a What is the scale?

_____

b What is the perimeter of the apartment?

_____

c What is the perimeter of the bedroom?

_____

d What is the length and width of the bathroom?

_____

e You want to buy a plasma TV that takes up $\frac{1}{2}$ the length of Wall A. How long will it be?

_____

f If your plasma TV is 0.75 m high, what will its perimeter be?

_____

g Is this a big apartment?

_____

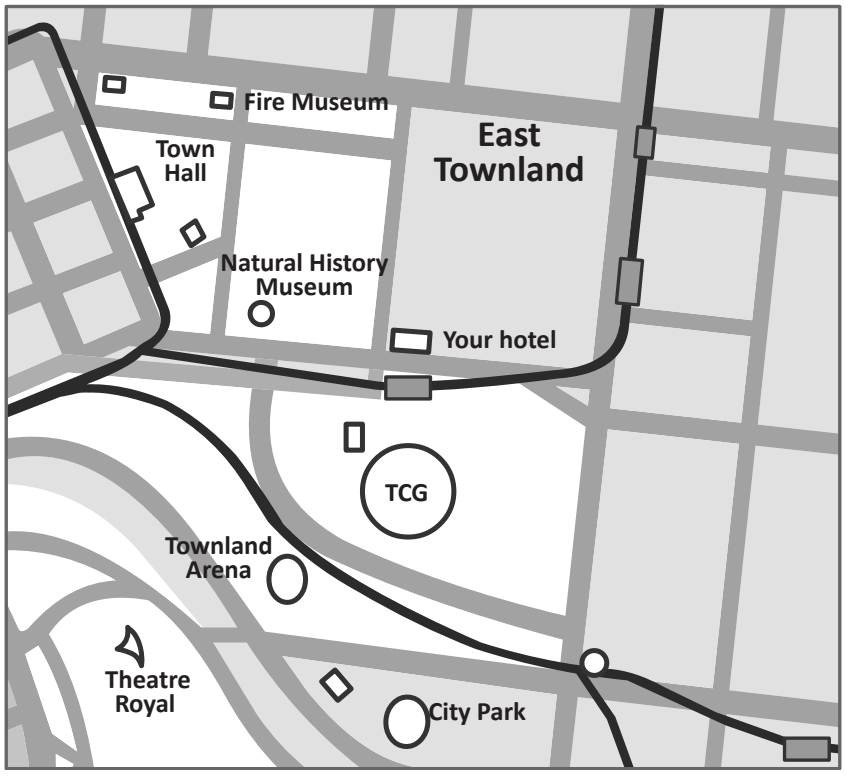
h Explain your thinking.

_____

_____

Scale and distance – maps

We use maps to locate places and to find the distance between them.
Usually we use a scale to work out distances, though sometimes they are marked on the map.



SCALE:

1 cm = 1,000 m

1 **You have won an all expenses paid luxury weekend to the cultural wonder of East Townland. Accommodation in a fancy hotel, sporting tickets, spending money for a shopping spree – the whole works. All you need to do is to get yourself around. Using the map, work out:**

a As the crow flies, how far is it from your hotel to City Park?

b After watching a cricket match at the Townland Cricket Ground (TCG), you are going to catch McFly in concert at the Townland Arena. How far is it between them?

c Would you walk to the concert or hail a taxi? Why?

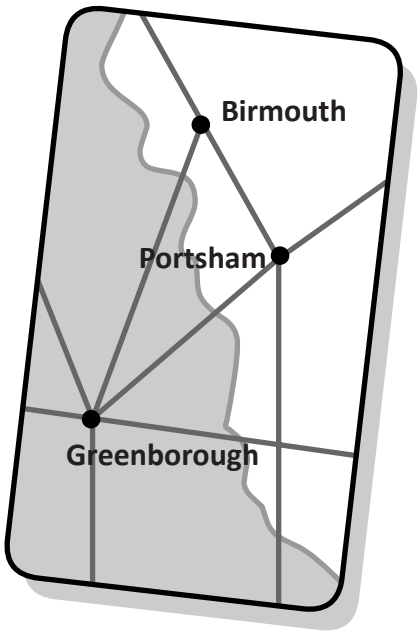
_____

d The next day you decide to get cultural and visit some museums. Come on, stop complaining, it's good for you. You'll head off from your hotel, visit the Natural History Museum, visit the Fire Museum and then end up at Town Hall.
Trace the route on the map, then measure the distance.

e The answer is 1.5 km. What could be the question?

_____

2 **Use the map below to answer the following questions:**



SCALE:

1 cm = 10 km

a What is the distance between Birmouth and Portsham?

b If you travelled from Greenborough to Birmouth via Portsham, what distance would you travel?

c Put a new town on the map that is 15 km from Greenborough. It must sit on an existing road. Choose a name for your town.

_____

d Write a word problem for a friend to solve using your new town.

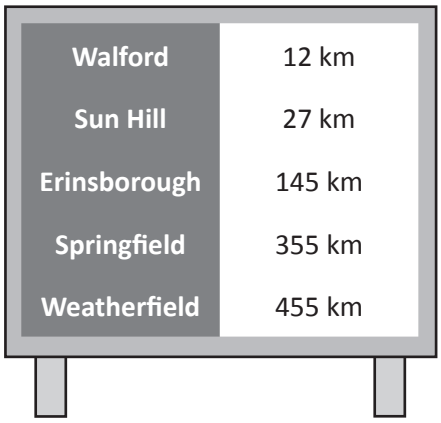
_____

_____

_____

_____

3 **Look at the road sign below. It shows the distances of five towns from your current position.**



a How far is Sun Hill from Springfield?

b Which town is closer to Erinsborough, Springfield or Walford?

c What is the distance between Sun Hill and Weatherfield?

d Your parents have hired a car for the journey. The car costs are as follows:

- £68 per day – base rate
- the first 200 km of the journey are free
- 50p per kilometre thereafter.

How much will it cost you to drive to Weatherfield and back? Assume the trip will take 2 days.

Scale and distance – speed

Speed can be measured in kilometres per hour.
60 km per hour means that it takes 1 hour to travel 60 km and is written as 60 km/h.

1 **Look at these distances and the time it took. Work out the speeds. Express your answer as km/h:**

a 76 km in an hour = ____ km/h

b 82 km in an hour = ____ km/h

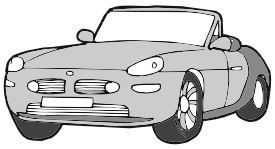
c 100 km in 2 hours = ____ km/h

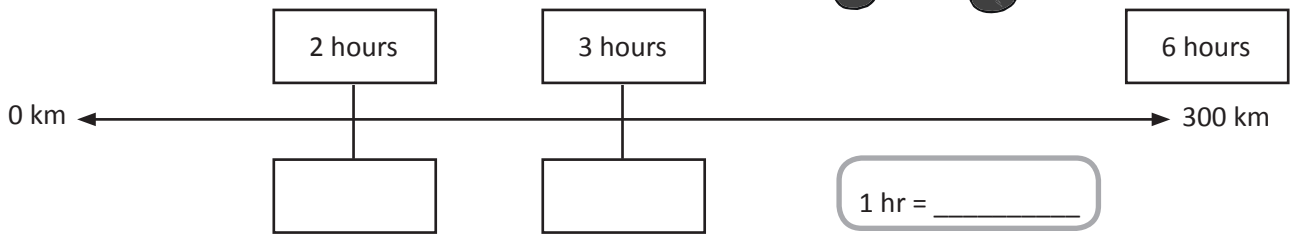
d 130 km in 2 hours = ____ km/h

e 180 km in 3 hours = ____ km/h

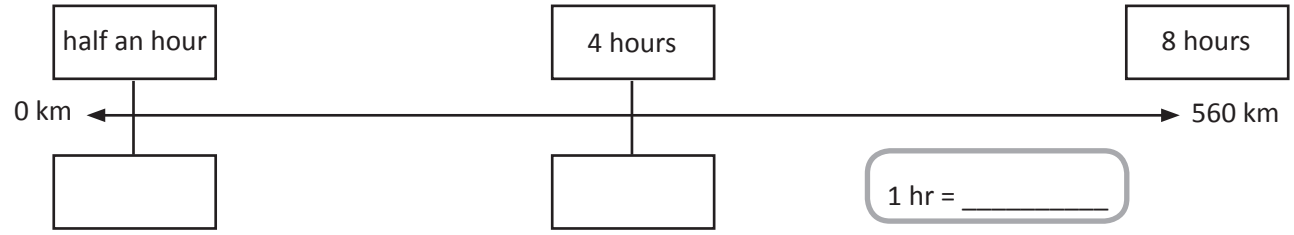
f 240 km in 4 hours = ____ km/h

2 **If a car travelled 300 km in 6 hours, work out how far it travelled in 2 hours and in 3 hours:**

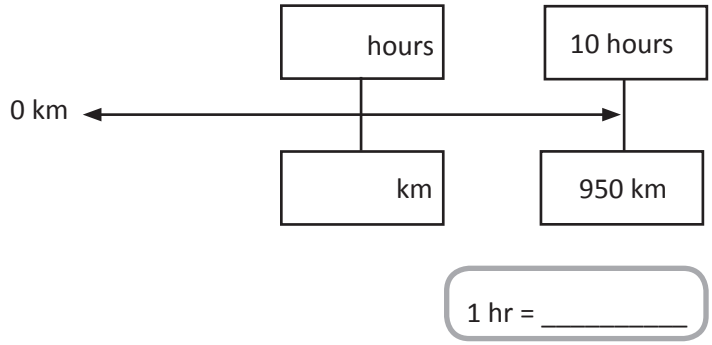


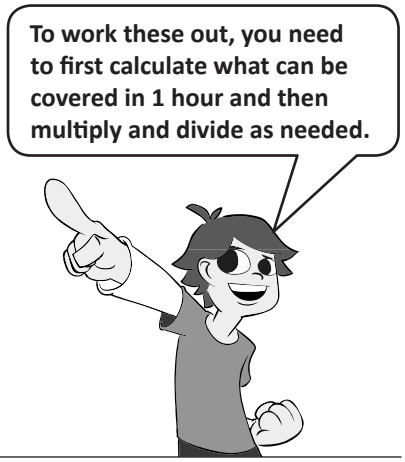


3 **If a car travelled 560 km in 8 hours, work out how far it travelled in half an hour and in 4 hours:**



4 **If a car travelled 950 km in 10 hours, show how long it took to travel half way:**





5 **If a snail travels 6 mm in 10 minutes, how far will it travel in 1 hour?**

6 **If a car was travelling 60 km/h, how far would it have travelled after 10 minutes?**

7 **Harriet walks at a speed of about 4 km/h. How long would it take for her to walk 20 km?**

8 **If a truck was travelling 80 km/h, how long would it take for the truck to travel 560 km?**

9 **Rahed is training for a 40 km marathon. He runs at an average speed of 6 minutes a km. What time can he expect to finish the marathon in?**

Scale and distance – speed, time and distance

Speed can be measured in kilometres per hour.
60 km per hour means that it took 1 hour to travel 60 km and is written 60 km/h.
We divide the distance travelled by the time taken to find the average speed.

1 **What speed am I travelling if I cover:**

a 120 km in 2 hours ☐

b 320 km in 8 hours ☐

c 30 km in 1 hour ☐

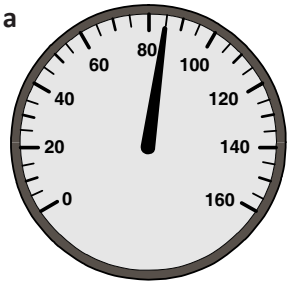
d 130 km in 2 hours ☐

e 480 km in 6 hours ☐

f 45 km in 1 hour ☐

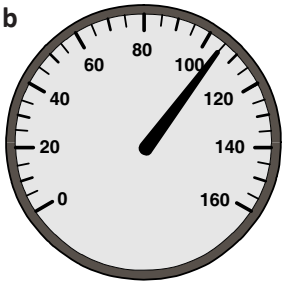
2 **Look at the speedometers and record the speeds below:**

a



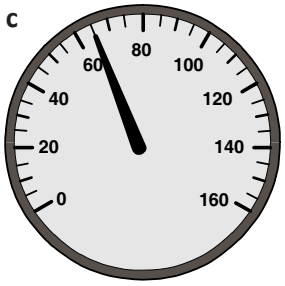
km/h

b



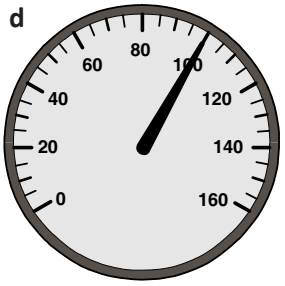
km/h

c



km/h

d



km/h

3 **The odometers below show the length of a journey. Calculate the distance travelled for each journey and how long it would have taken if the car had been travelling at 80 km/h. A calculator could help you find the differences between the start (top row) and the end (bottom row) of the journey.**

a

1	3	5	6	0	0
1	3	5	7	2	0

Distance ☐

Time ☐

b

0	2	0	1	4	9
0	2	0	3	0	9

Distance ☐

Time ☐

c

1	1	0	2	6	2
1	1	0	4	6	2

Distance ☐

Time ☐

d

0	9	9	9	9	9
1	0	0	0	3	9

Distance ☐

Time ☐

4 **Answer the following word problems:**

a A car travels at an average speed of 75 km/h. How far would it travel in 5 hours?

b A train trip totals 450 km. If the trip takes 9 hours, what is the train's average speed?

c A plane flies 600 km in $1\frac{1}{2}$ hours. What is its average speed per hour?

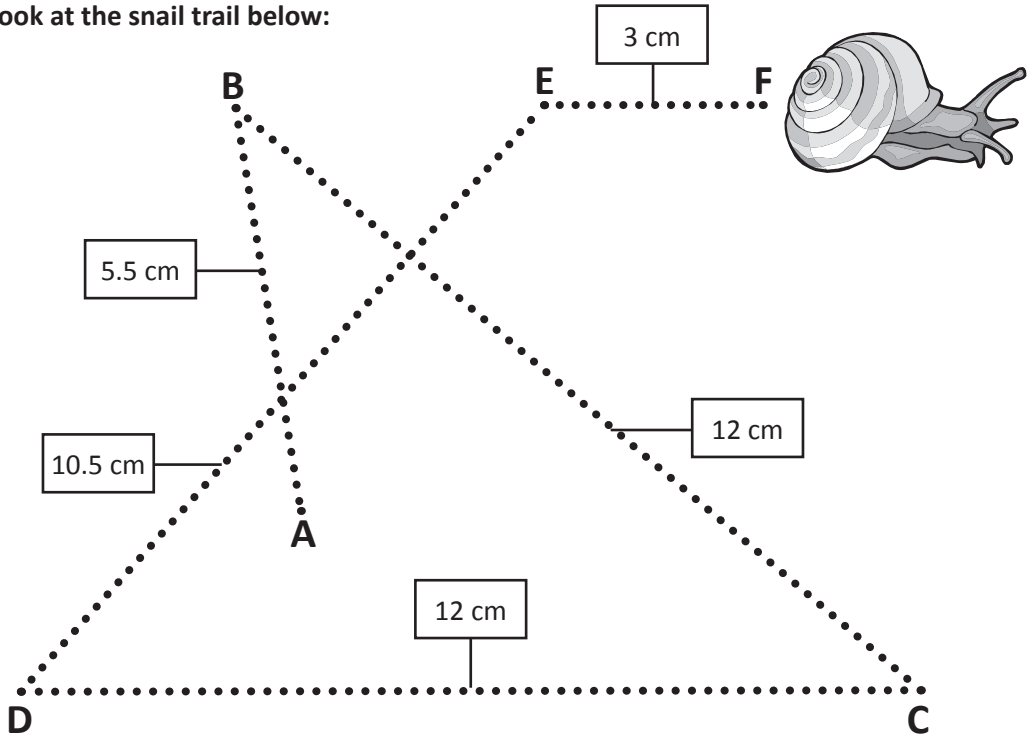
d Muhammed runs 24 km in $1\frac{1}{2}$ hours. What is his average speed per hour?

e A miniature train travels 100 km in $2\frac{1}{2}$ hours. What is its average speed per hour?

$1\frac{1}{2}$ hours can be broken into three 30 minute segments. How far does the plane travel in 30 minutes? How many lots of 30 minutes are in 1 hour?

DISCOVER

5 **Look at the snail trail below:**



a If it took the snail 2 hours to make the trail, what was its average speed per hour? Express your answer in metres/h.

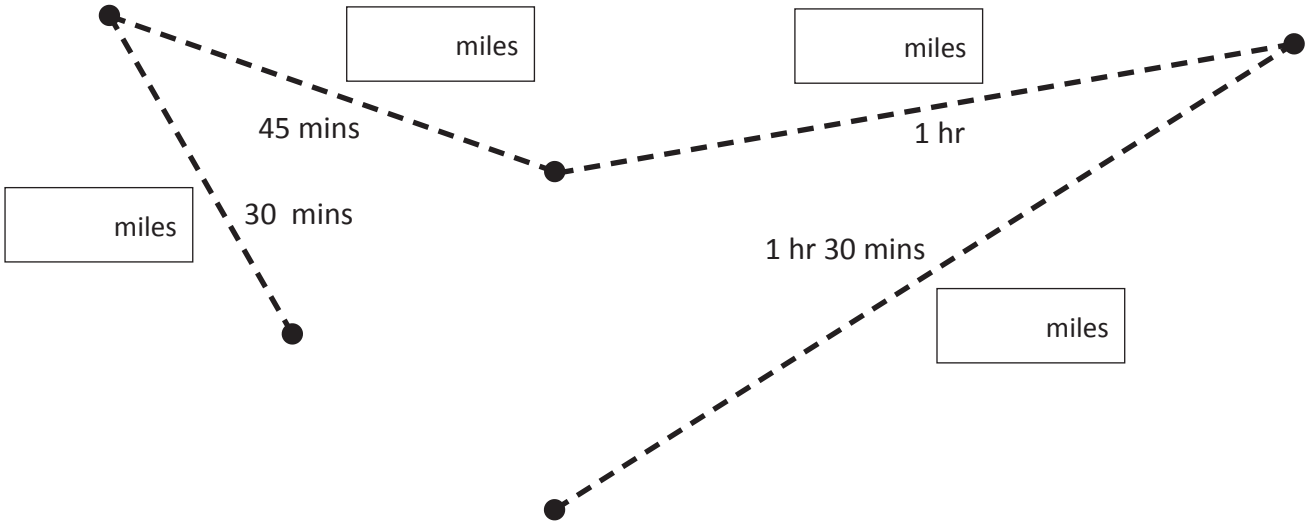
b The snail made a mad dash from point B to C to get away from a hungry looking bird and covered the distance in 15 mins. What was its speed for that stretch?

Scale and distance – speed, time and distance

In the UK, as distances on roads are still indicated in miles rather than kilometres, it is more common to think about long distances in terms of miles, and speed in terms of miles per hour (mph).

6 **Mr Singh drives his car to 4 different meetings in a day. The times of his journeys are indicated below.**

a If his car travelled at an average speed of 32 mph, how many miles was each leg of his journey?



b The following day he drives for a total of 96 miles over 4 hours. What was his average speed? ____ mph

c When his family go on holiday to Cornwall the journey takes 6 hours. If their car's average speed on the journey is 50 mph, how long is their journey? ____ miles

7 **If we assume that 1 mile = 1.6 km, and 1 km = 0.6 miles, are the following statements true or false?**

a 2 miles > 3 km ____ **b** 10 miles = 16 km ____

c 5 miles < 7 km ____ **d** 50 miles > 75 km ____

e 10 km = 7 miles ____ **f** 3 km < 2 miles ____

g 20 km < 11 miles ____ **h** 300 km > 160 miles ____

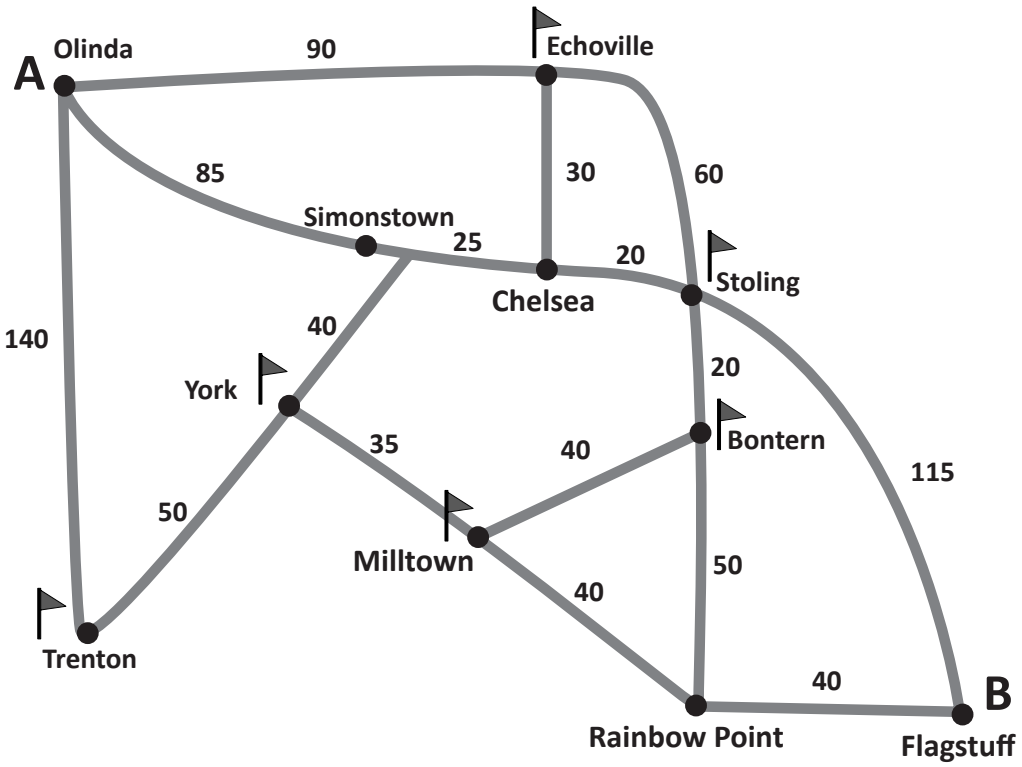
Flag it! apply

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.

All roads lead to Rome

apply

Getting ready

All measurements are in km.

What to do

You are planning a European holiday. You will travel at an average speed of 80 km/h. At this speed, what is the driving time between the following distances?
Use rounding and estimation to help, you don't need to be absolutely precise.

a Naples to Rome?

b Copenhagen to Vienna?

c Marseilles to Rome?

d Milan to Lisbon?

Hmm, if I get a decimal such as 0.54, it is 0.54 of 60 mins, not 100.

I could round this to 0.5, which is 30 mins.

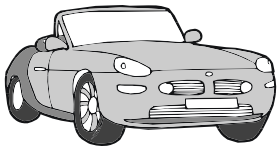
You are now in Vienna and want to make it to Euro Disney in Paris as quickly as you can. Fortunately you are travelling through Germany and can take advantage of the autobahn and its unlimited speed limit.

If you travel the distance in just under $8\frac{1}{2}$ hours, what was your average speed?

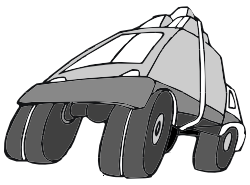
Where will it take you? investigate

Getting ready

Car makers have developed two new cars that they believe are exceptionally environmentally friendly. They predict that the Stomper can travel 10,000 km on one tank of petrol and that the Styler can get 5,000 km from one tank. You have been asked to test drive one of the cars to test their prediction.



Styler



Stomper

What to do

Use a separate piece of paper.

Choose which car you would like to try out. You will need to plan your starting point then track your travels. Plan to cover approximately 1,000 km each day. You'll need an atlas or access to the internet and a program such as Google Maps to assist you. Before you start your journey, predict where you think you will end up.

You need to keep detailed records of the distances you have travelled. Use the table below to record your journey.

Car: _____ **Distance to travel: _____**

Day	Start	End	Distance

Where did you end up? Did you travel more distance or less than you predicted?