

Length

In the metric system, the metre is the basic unit for measuring length. Originally one metre was defined as to be one ten-millionth of the distance from the equator to the North Pole at sea level. All other length measurements are based on the length of 1 metre.

Everything in maths that relates to the 'real world' has units. If there is a point to it there are units attached to it. Sometimes the units could be people, buildings, cars, food, shapes.... Basically, units relate to the **WHAT** in mathematics, and you should **ALWAYS** use them. This helps to convey a clear message to the reader about **WHAT** you are talking about.

Distances are usually measured in one of the following units:

Millimetres (mm)

Centimetres (cm)

Metres (m)

Kilometres (km)

You would be used to most of these through previous experiences in measuring heights, lengths, drawing with your rulers, measuring objects or distances between places.

$$1\text{ cm} = 10\text{ mm}$$

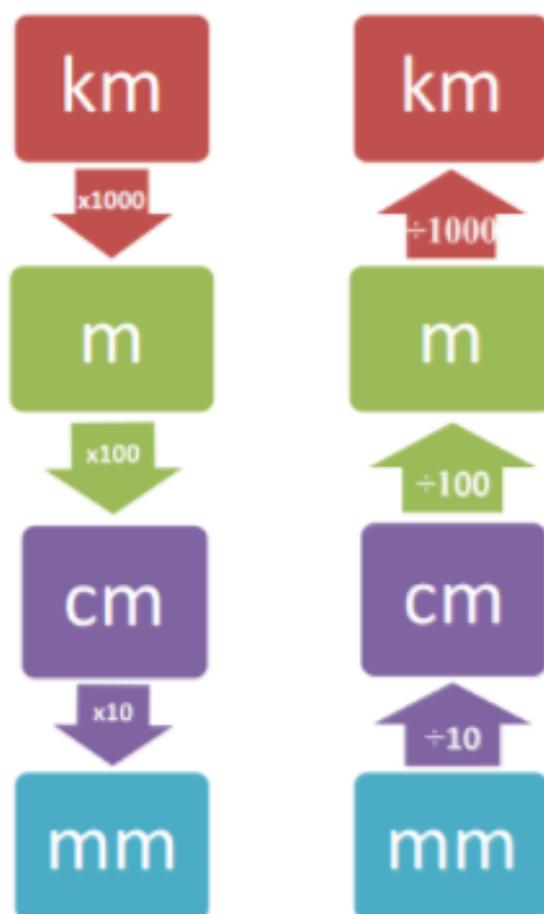
$$1\text{ m} = 100\text{ cm} = 1000\text{ mm}$$

$$1\text{ km} = 1000\text{ m} = 100\,000\text{ cm} = 1\,000\,000\text{ mm}$$

To move from larger length units to smaller length units **multiply** each step.

To move from smaller length units to larger length units **divide** each step.

Follow this flowchart to help you decide what to do when you are converting units:



Standard conversions

Go to mathspace if you want to see more worked examples:

<https://mathspace.co/learn/essential-mathematics-12-au/measurement/length-units-and-conversions-36803/length-units-and-conversions-1170/>

Example:

$$5 \text{ m} = ? \text{ cm}$$

$$5 \times 100 = 500$$

So, $5 \text{ m} = 500 \text{ cm}$

Exercise 1

Q1. For each of these conversions state whether you have to multiply or divide.

a) km to m

b) mm to cm

c) cm to m

d) m to km

e) m to cm

f) m to km

Q2. Complete the following conversions of units.

a) 3 cm = mm

b) 5 m = cm

c) 2 km = m

d) 30 mm = cm

e) 60 cm = mm

f) 250 m = km

g) 4500 m = km

h) 90 m = cm

Q3. When Brent went canoeing he paddled down three 540 metre rapids and two 860 metre rapids.

a) Calculate the length of the rapids in metres.

b) Express the distance in kilometres.

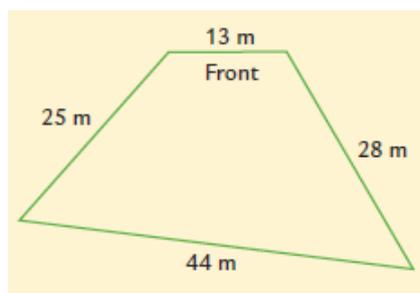
Perimeter

When we measure the distance around the outside of a shape, we measure its perimeter. Home renovators use perimeter calculations to work out quantities of a variety of materials they need to order. For example, most local councils require home owners to fence their block of land. The amount of fencing materials needed and the costs are related to the perimeter of the block of land.

Example

The diagram shows a block of land.

- What is the perimeter of the block?
- The front already has a fence but Alan needs to fence the sides and back of the block. The fencing will cost \$49 per metre. Calculate the total cost of the fence.



Solution

- To calculate the perimeter, just add up all the sides.

$$\text{Perimeter} = 13 \text{ m} + 28 \text{ m} + 44 \text{ m} + 25 \text{ m} = 110 \text{ m}$$

- To calculate the length of new fence, add the three unfenced lengths.

$$\text{Length} = 28 \text{ m} + 44 \text{ m} + 25 \text{ m} = 97 \text{ m}$$

$$\text{Each metre of fence costs } \$49. \text{ Total cost} = \$49 \times 97 = \$4753$$

Perimeter Using Circles

The diameter of a circle is a line that goes from one side of a circle to the other, through the centre. It is always twice as long as the radius, which goes from the centre of the circle to the circular edge.

The perimeter, or the distance around the outside, of a circle is called the circumference. The formula for the circumference of a circle is:

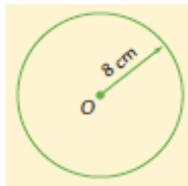
$$C = \pi \times d \text{ or} \\ = 2 \times \pi \times r$$

where d is the diameter and r is the radius.

π is the ratio of the circumference to the diameter of a circle. Its decimal value is 3.141592654.....

Example

Calculate the circumference of this circle, correct to one decimal place.



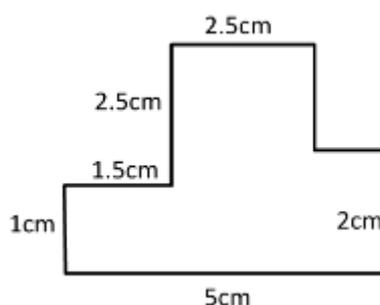
Solution

$$\begin{aligned}r &= 8 \text{ cm and } C = 2 \times \pi \times r \\ &= 2 \times \pi \times 8 \\ &= 50.265 \text{ cm} \\ &= 50.3 \text{ cm, to one decimal place.}\end{aligned}$$

Thus the perimeter of this semi-circle is $50.3 \div 2 = 25.15 \text{ cm}$

Exercise 2

1. Find the perimeter of this shape.



Working:

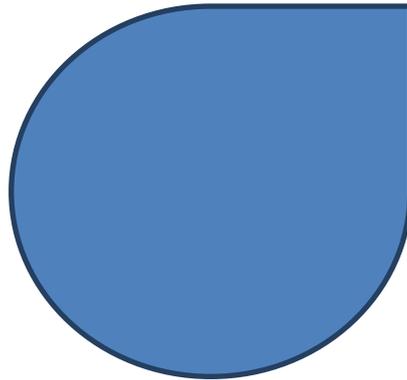
$$1 + 1.5 + 2.5 + 2.5 + \underline{\quad} + \underline{\quad} + 2 + 5 = \underline{\quad} \text{ cm}$$

2. How would you find the perimeter of this regular pentagon? What tools or instruments might you need? Explain your method.

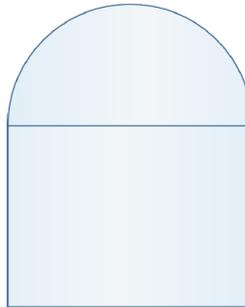


Hint: Find the length of one side to the nearest millimetre:

3. How would you find the perimeter of this shape? What tools or instruments might you need? Find the perimeter of this shape. Explain your method.



4. Find the perimeter of this shape.



The base of the rectangle is 8 cm and the height is 6 cm.

Show your working:

This next task to complete after you have completed the mathspace.co task (Linear Measure) is the INVESTIGATION for the week.

INVESTIGATION #1

What is the perimeter of the school around the main buildings? (We may need to go for a walk around the school before we begin.)

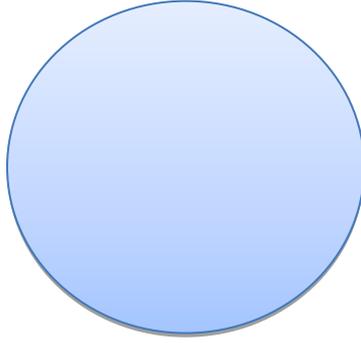
What tools or instruments might you need?

Your estimate (have a guess): ? metres

Class average "estimate" (show working):



Measurement with the trundle wheel:



How close was your guess?

Explain/describe another way (method) that you could use to find the perimeter around the school: