

ESSENTIAL MATHEMATICS 3

WEEK 1 NOTES AND EXERCISES

Review of Measurement

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.

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

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

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

Exercise Set 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 missing section.

a) $3\text{ cm} = \quad \text{mm}$

b) $5\text{ m} = \quad \text{cm}$

c) $2 \text{ km} = \quad \text{m}$

d) $30 \text{ mm} = \quad \text{cm}$

e) $60 \text{ cm} = \quad \text{mm}$

f) $250 \text{ m} = \quad \text{km}$

g) $4500 \text{ m} = \quad \text{km}$

h) $90 \text{ m} = \quad \text{cm}$

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

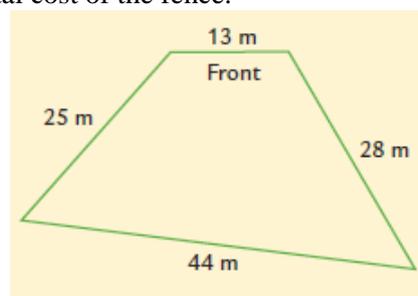
When we measure the distance around the outside of a shape, we measure its perimeter. Home renovators use perimeter calculations to work out quantities of a variety of materials they need to order. For example, most councils require home owners to fence their block of land. The amount of fencing materials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

Example

The diagram shows Alan's block of land.

a) What is the perimeter of the block?

b) 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

a) To calculate the perimeter, just add up all the sides.

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

b) 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:

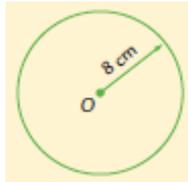
$$C = \pi \times d \text{ or} \\ = 2 \times \pi \times r$$

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

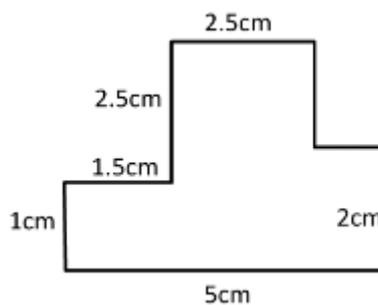
$$r = 8 \text{ cm and } C = 2 \times \pi \times r \\ = 2 \times \pi \times 8 \\ = 50.265 \text{ cm} \\ = 50.3 \text{ cm, to one decimal place.}$$

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

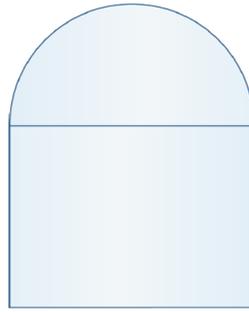
Exercise Set 2

Find the perimeter of these shapes.

Q1.



Q2.



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

AREA

The space found inside a shape is said to be the area of the shape. Just as perimeter is measured in linear units, area is measured in square units.

Common units of area are;

square millimetres mm^2 $1 \text{ mm}^2 = 1 \text{ mm} \times 1 \text{ mm}$

square centimetres cm^2 $1 \text{ cm}^2 = 1 \text{ cm} \times 1 \text{ cm}$

square metres m^2 $1 \text{ m}^2 = 1 \text{ m} \times 1 \text{ m}$

square kilometres km^2 $1 \text{ km}^2 = 1 \text{ km} \times 1 \text{ km}$

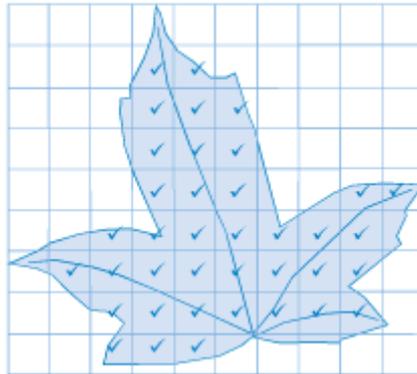
Estimating Area

Just as we can estimate length we need to be able to estimate area. You would only use mm^2 for very small areas and km^2 for very large areas.

One way of estimating area is to determine the number of small squares that cover it.

Example

Estimate the area of this autumn leaf, which is drawn on 1 cm grid.



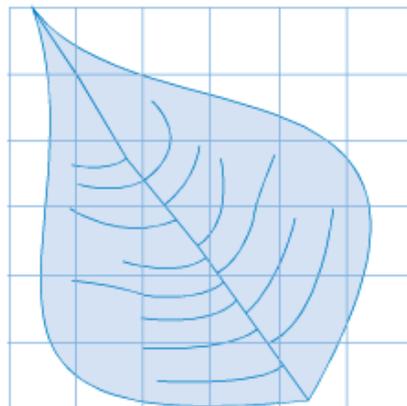
Solution

We need to count how many squares with side 1cm it takes to cover the leaf. We count a square only if more than half of the square is on the leaf, and we will put a tick in the square in the square to show we are counting it. The unit of area will be square cm or cm^2 because we are using square centimetres to cover the leaf.

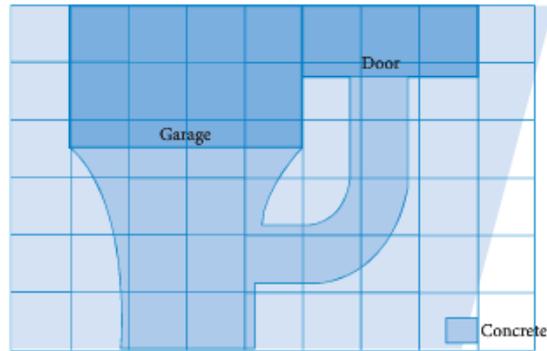
38 squares have ticks in them, so the area is about 38 square cm or 38 cm^2 .

Exercise Set 3

Q1. Estimate the area of this leaf.



Q2. Jon is having the driveway and path of his new house covered in patterned concrete. The concrete company will charge \$65 per square metre. Each square on the plan represents 1 m².



a) Estimate the area of the driveway and path.

b) Approximately how much will the concrete company charge Jon?