Week 1
Term 1
2023

HAWKER COLLEGE
Engage | Inspire | Achieve

EM3
Measurement

Goals

This week we are going to:

- Review metric units of length, their abbreviations, conversions between them, estimation of lengths, and appropriate choice of units (EMA01)
- Calculate perimeters of familiar shapes; for example: triangles, squares, rectangles, polygons, circles, arc lengths, and composites of these (EMA02)

Theoretical Components

Resources:
PDF file: Week 1 Notes and Exercises

Knowledge Checklist

- Review of units of measurement
- Abbreviations and conversions
- Perimeters of familiar shapes
- Metric units of area
- Use formulas to calculate perimeters of familiar shapes

Order

1. Read through the notes and examples
2. Work through the exercises
3. Complete the Portfolio Task
4. Complete the reflection at the end of the booklet
5. Come and see your teacher and make sure you are up to date.

Practical Components

Work through the exercises and show the completed tasks to your teacher.

Be sure to ask for help as you need for the successful completion of all tasks.

Remember to regularly check Google Classroom for messages.

Portfolio Task

Complete the task at the end of the booklet and submit your work for checking. ☺

QFO

Quiz/Forum/Other

Remember to check hawkermaths.com **for each week's learning brief.**

Make sure you have joined Google Classroom. If you have not, see your teacher.

LINEAR MEASURE

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 cm = 10 mm

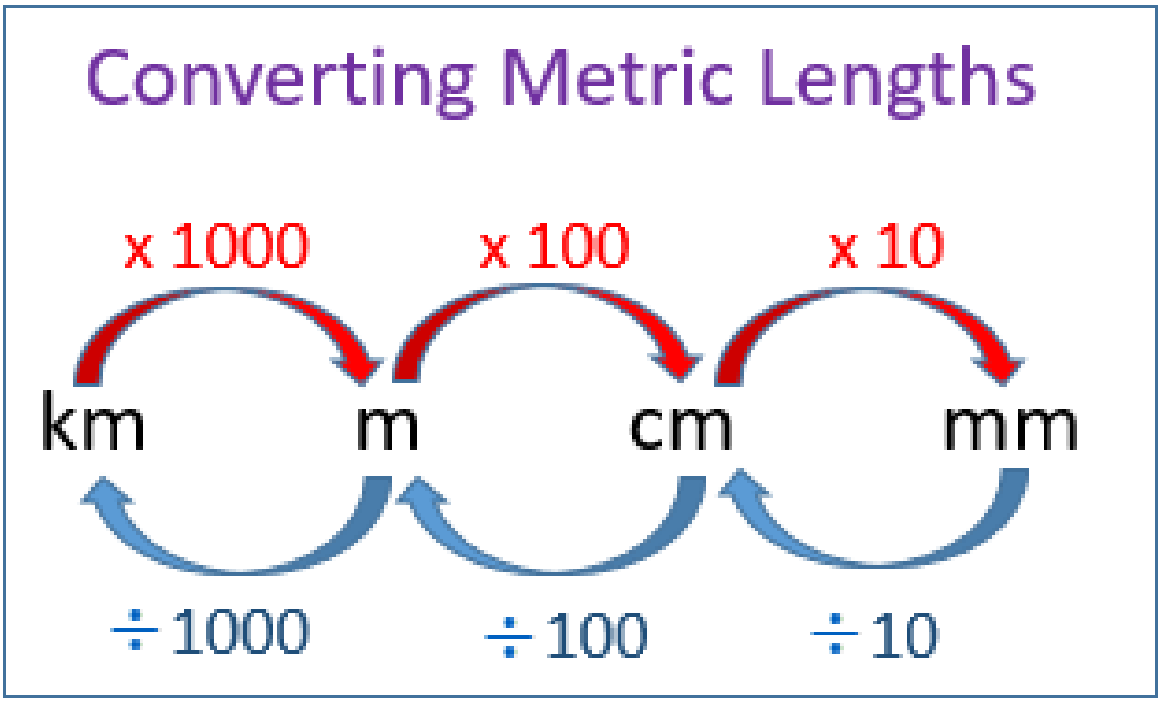
1 m = 100 cm = 1,000 mm

1 km = 1,000 m = 100,000 cm = 1,000,000 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:



Example

Convert 5 m to cm.

Solution

5 m = ? cm

5 x 100 = 500

So, 5 m = 500 cm

EXERCISE 1

1. For each of these conversions, state whether you need 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 mm

2. Complete the following conversions of the 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

3. When Nic 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 this distance in kilometres.

PERIMETER

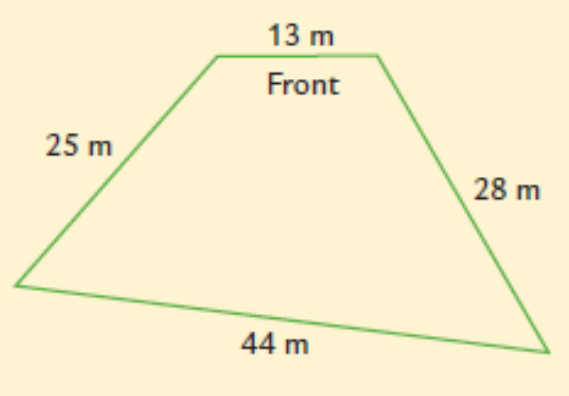
When we measure the distance around the outside of a shape, we measure its perimeter. Home renovators use perimeter calculations to work out quantities of a variety of materials they need to order.

For example, most local councils require homeowners to fence their block of land. The amount of fencing materials required, and the costs are related to the perimeter of the block of land.

Example

The diagram shows a block of land.

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



Solution

a. To calculate the perimeter, we need to add all the sides together.
   Perimeter = 13 m + 28 m + 44 m + 25 m = 110 m

b. To calculate the length of the new fence, add the three unfenced lengths together.
   Length = 28 m + 44 m + 25 m = 97 m
   Each metre of fence costs $49.
   Total cost = $49 x 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 distance around the outside, of a circle is called the **circumference**. The formula for the circumference of a circle is:

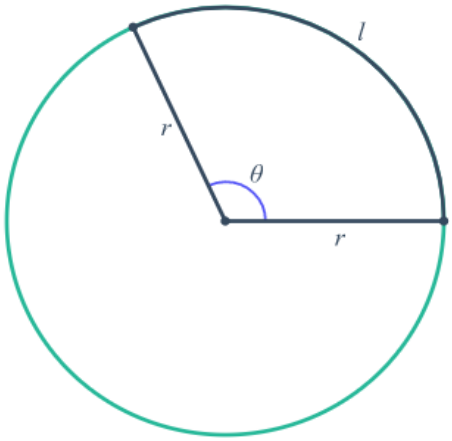
$$C = \pi \times d \text{ or}$$
$$C = 2 \times \pi \times r$$

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…….

Arc length

The diagram below shows a sector of a circle. It has been formed by an angle of size θ centred at the origin and has an arc length (the curved part of the perimeter) of length l.



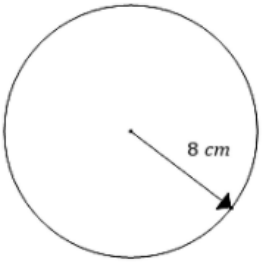
A sector of a circle with arc length l, formed by an angle of θ.

We can see that a certain portion of the area of the circle has been cut out to form the sector. This is the same as the portion of the total angle that has been cut out to form θ, and is also the same as the portion of the circumference that is the arc length l.

In a circle of radius r, we can find the arc l formed by an angle of θ by using the formula $l = 2\pi r \times \frac{\theta}{360°}$

Example

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



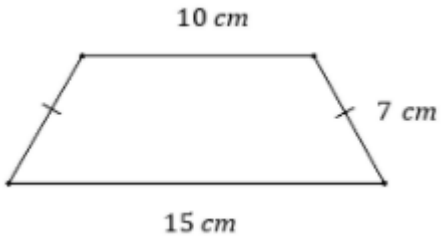
Solution

$r = 8$ cm and $C = 2 \times \pi \times r$
$C = 2 \times \pi \times 8$
$C = 50.2654$ cm
$C = 50.3$ cm, to one decimal place.

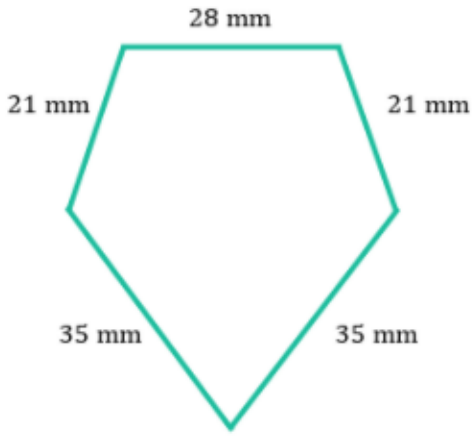
The perimeter of this circle is 50.3 cm.

EXERCISE 2

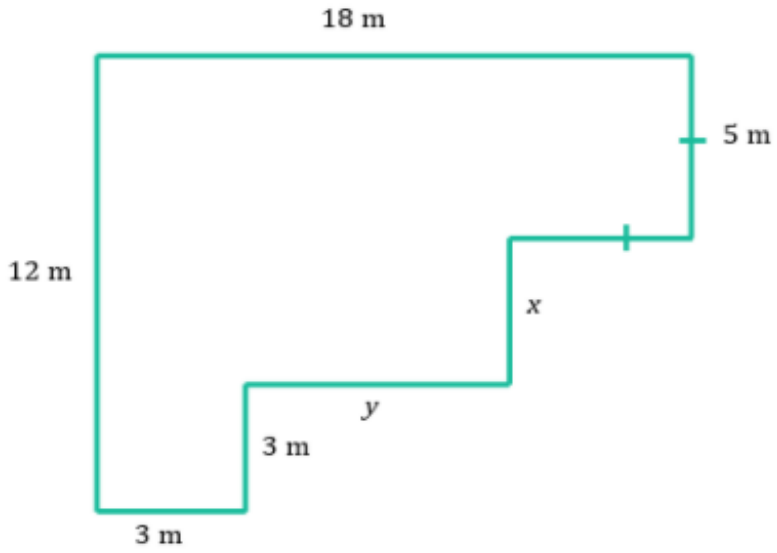
1. Find the perimeter of this shape.



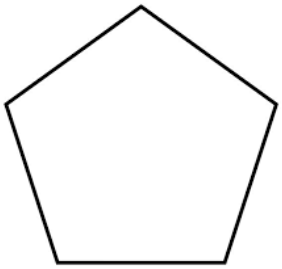
2. Find the perimeter of this shape.



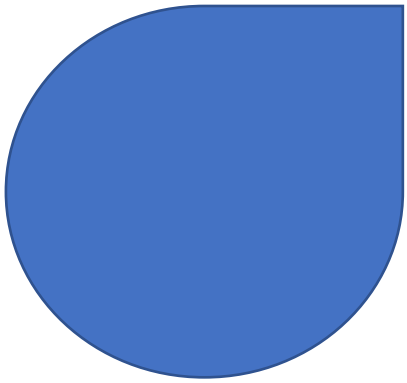
3. Find the perimeter of this shape.



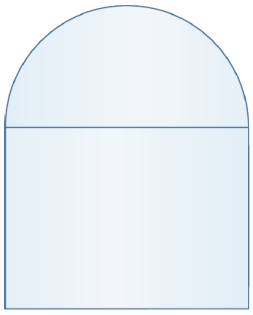
4. How would you find the perimeter of a regular pentagon? What tools or instruments might you need? Explain your method.



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

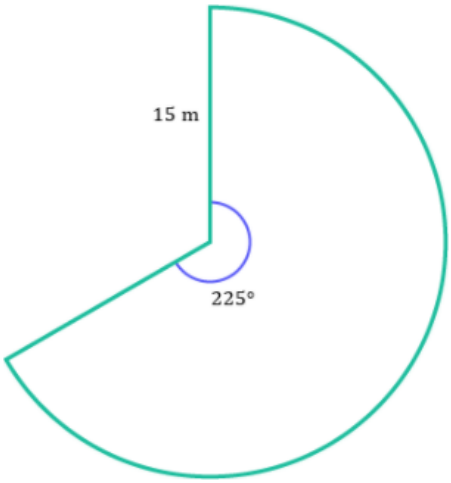


6. Find the perimeter of this shape.

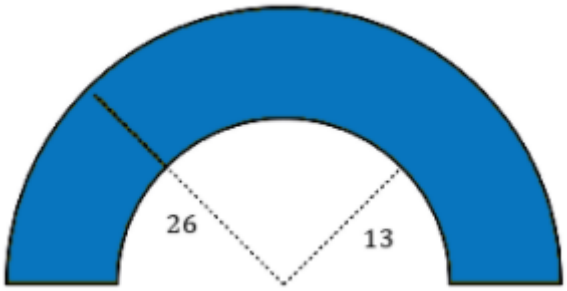


The base of the rectangle is 8 cm, and the height is 6 cm.

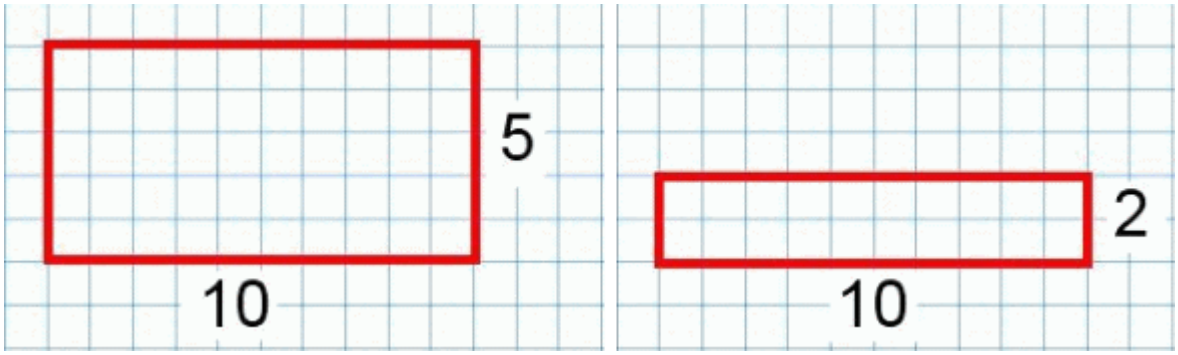
7. Find the arc length of the circle.



8. Find the perimeter of the arch shown. Give your answer to two decimal places,



9. Zoe has been drawing rectangles:



The first rectangle has a perimeter of 30 units and an area of 50 square units.
The second rectangle has a perimeter of 24 units and an area of 20 square units.

Zoe wonders if she could find a rectangle, with a side of length 10 units, whose perimeter and area have the same numerical value,

Hint: Area of rectangles = length x width
Can you find an example of such a rectangle?

WEEK 1 PORTFOLIO TASK

What is the perimeter of the school around the main buildings? (You may need to go for a walk around the school)

1. What tools or instruments might you need?

2. What is your estimate for the perimeter of the school (in metres)? Make sure you write your estimate on the whiteboard for others to see.

3. What is the class average “estimate”? Show your working.

4. Measure the perimeter of the school (you may use the trundle wheel provided). How close was your guess?

5. Explain or describe another method that you could use to find the perimeter around the school.

MARKING RUBRIC

CRITERIA	EXPECTATIONS	POSS	MULT	GIVEN	TOTAL
Practical	Student completes practical work of the brief to an acceptable standard set by the teacher.	**2**	**3**		**/6**
Portfolio Task	Student completes the portfolio task of the brief to an acceptable standard set by the teacher.	**2**	**2**		**/4**
Communication and Reasoning	Student responses are **accurate** and appropriate in presentation of mathematical ideas in different contexts, with **clear** and logical **working out** shown.	**4**	**-**		**/4**
Knowledge and Application	Student submitted work selects and applies **appropriate** mathematical modelling and **problem solving techniques** to solve practical problems, and demonstrates **proficiency** in the use of **mathematical facts, techniques** and **formulae.**	**4**	**-**		**/4**
	Submission Guidelines				
Timeliness	Student submits the exercises and portfolio task by the set deadline. See scoring guidelines for specific details.	**2**	**-**		**/2**
		FINAL			**/20**

Student Reflection:
How did you go with this week's work?

What was interesting?

What did you find easy?

What do you need to work on?