Perimeter and area

Year 11 General Maths
Units 1 and 2

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Learning Objectives

By the end of the lesson, I hope that you understand and can apply the following to a range of questions from the Unit 1 and 2 General Mathematics course.

- To be able to determine the perimeters and areas of regular shapes, such as rectangles, parallelograms, trapeziums and triangles.
- To be able to find the perimeter and area of composite shapes.
- To be able to find the circumference and area of a circle when given its radius.

Recap

This is the next part of the Year 11 General Maths course looking at Measurement, Scale and Similarity. In the last two lessons we have looked at how to round to decimal places and significant figures alongside learning how to use scientific notation.

We have also looked at how to use Pythagoras' Theorem to find the missing side lengths of right angled triangles.

Now it's time to look (once again) at how to find the perimeters and areas of common shapes.

Perimeter fences

I don't know why … but it really worries me that there is a (rather large) jail located in the CBD here in Melbourne. I mean … what if there was a prison break? What if I was outside? I'm not butch enough to be able to do anything other than stand and cry!

Thankfully, the jail has a perimeter fence.

And this is how I remember what perimeter is … it is something which goes all the way around something.

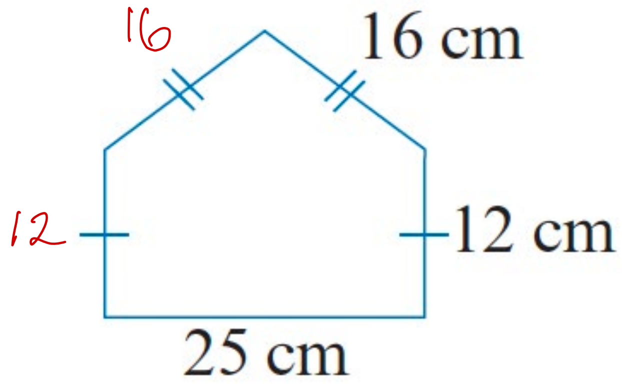
I can find the length of the perimeter by simply **adding all the side lengths together when I walk around the outside once.**

Hiding information from you

Barry is really good at hiding information from you! He uses little marks and lines to try and trick you. But each little mark and line means something in a diagram.

Looking at the example on the right, we can see the little lines tell us some of the sides are the same length.

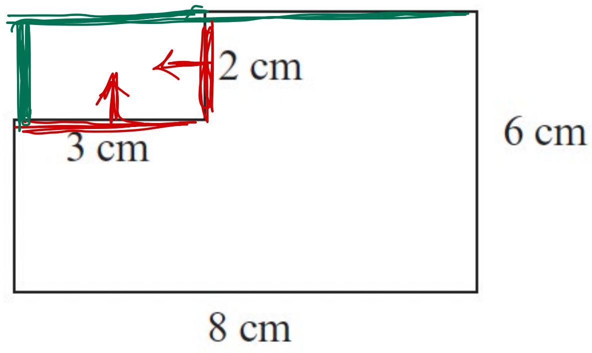
This means we can find all the lengths around the edges and hence find the perimeter.



Example: Finding the perimeter

Here is another example. Can you find the perimeter? Do they give you enough information?

Note: This is a standard question and can be answered really quickly when you see the trick!



$P = 8 + 6 + 8 + 6$

$= 28\text{cm}$

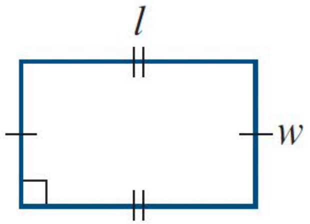
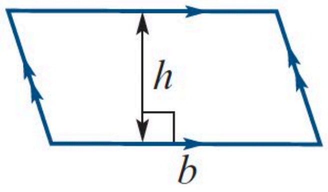
Areas of shapes: Rectangles and Parallelograms

The area is the space which can be held inside a 2D shape.

There are a lot of shapes which have areas and you need to know how to find the areas of a number of them.

Thankfully, Cambridge have created a really useful table which we can use!

I have split it over a number of slides as I want to show you the dance moves I use to remember them.

Shape	Area	Perimeter
Rectangle 	$A = lw$	$P = 2l + 2w$ or $P = 2(l + w)$
Parallelogram 	$A = bh$	Sum of four sides

Areas of shapes: Trapezium

The area is the space which can be held inside a 2D shape.

There are a lot of shapes which have areas and you need to know how to find the areas of a number of them.

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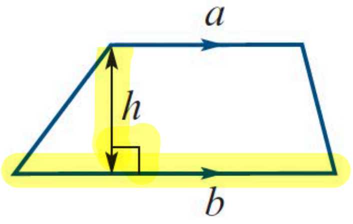
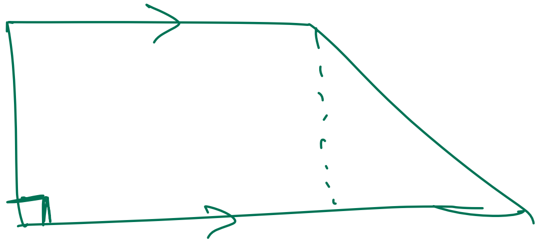
Shape	Area	Perimeter
Trapezium 	$A = \frac{1}{2}(a+b)h$	Sum of four sides



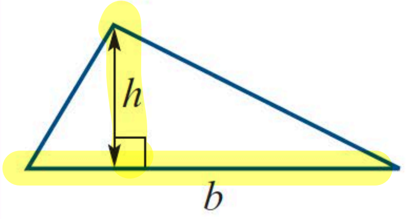
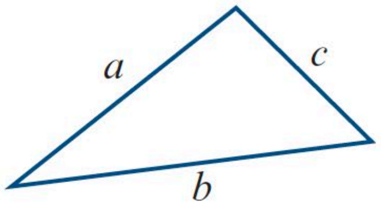
Areas of shapes: Triangle

The area is the space which can be held inside a 2D shape.

There are a lot of shapes which have areas and you need to know how to find the areas of a number of them.

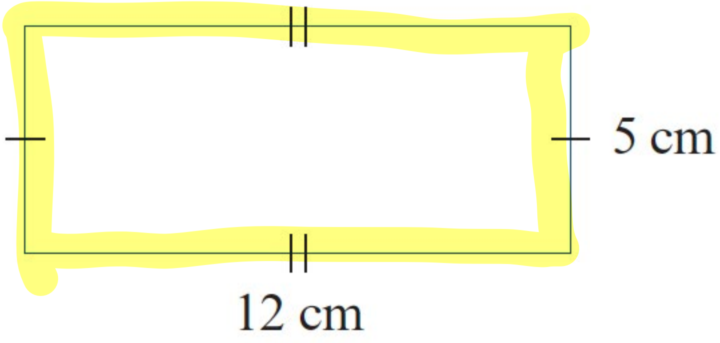
Thankfully, Cambridge have created a really useful table which we can use!

I have split it over a number of slides as I want to show you the dance moves I use to remember them.

Shape	Area	Perimeter
Triangle 	$A = \frac{1}{2}bh$	Sum of three sides
Heron's formula for finding the area of a triangle with three side lengths known. 	$A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$ (s is the semi-perimeter)	$P = a + b + c$

Example: Finding the perimeter of a rectangle

Find the perimeter of the rectangle shown

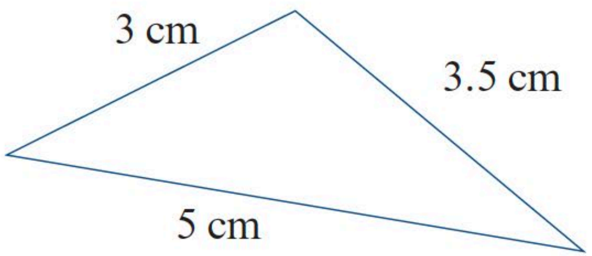


$$P = 12 + 5 + 12 + 5$$

$$= \underline{\underline{34\text{cm}}}.$$

Example: Finding the area of a triangle using Heron's formula

Find the area of the following triangle. Give your answer to two decimal places.



$$s = \frac{3 + 3.5 + 5}{2}$$

$$= 5.75$$

$$A = \sqrt{5.75 \times (5.75 - 3) \times (5.75 - 3.5) \times (5.75 - 5)}$$

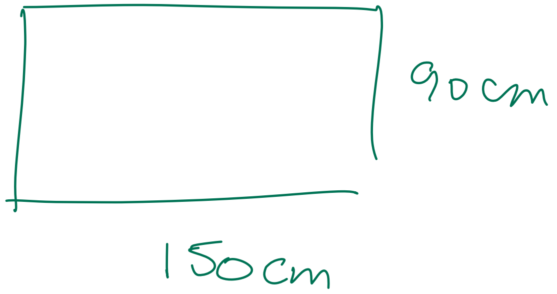
$$= \underline{5.17 \text{ cm}^2}$$

Example: Finding the area and perimeter in a practical problem

A display board for a classroom measures 150 cm by 90 cm.

a If ribbon costs \$0.55 per metre, how much will it cost to add a ribbon border around the display board?

b The display board is to be covered with yellow paper. What is the area to be covered? Give you answer in m^2 to two decimal places.



a) $P = 150 + 90 + 150 + 90$

$= \underline{480 \text{ cm}} \quad \div 100$

$= \underline{4.8 \text{ m}}$

$\text{cost} = 4.8 \times 0.55 = \underline{\$2.64}$

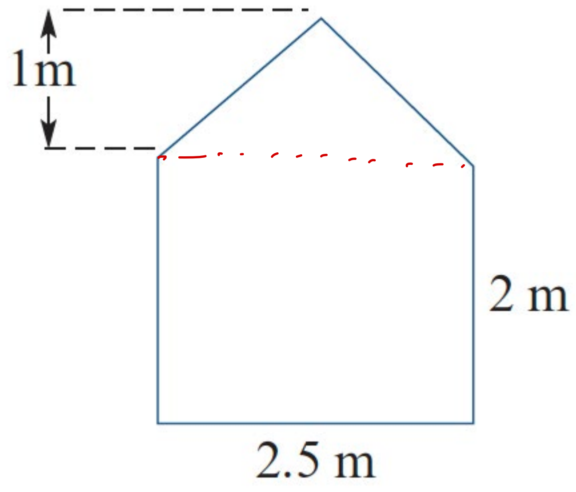
b) $\text{Area} = 1.5 \times 0.9 = \underline{1.35 \text{ m}^2}$

Composite shapes

A composite shape is a shape which can be split into other more "recognisable" shapes.

For example, the following shape is created using a rectangle and a triangle.

Once we know this, we can find perimeters and areas using the formulae we have been given.

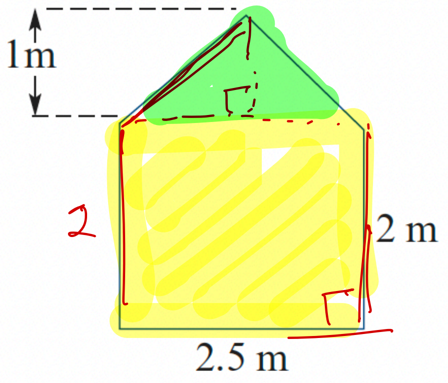


An example: Composite shapes

A gable window at a reception venue is to have LED lights around its perimeter (but not along the bottom of the window). The window is 2.5 m wide and the height of the room is 2 m. The height of the gable is 1 m, as shown in the diagram.

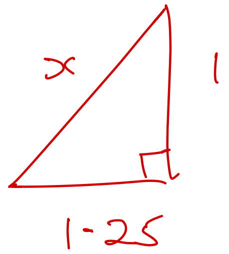
a Calculate the length of LED lights needed to two decimal places.

b The glass in the window needs to be replaced. Find the total area of the window to two decimal places.



Note: We will need to use Pythagoras' Theorem in this question.

$$c^2 = a^2 + b^2$$



$x^2 = 1^2 + 1.25^2$

$x^2 = 2.5625$

$x = \underline{\underline{1.6m}}$

$\therefore$ a) $P = 2 + 1.6 + 1.6 + 2 = \underline{\underline{7.2m}}$

b) $A = 2 \times 2.5 + 2.5 \times 1 \times 0.5$

$= \underline{\underline{6.25}}\,m^2$

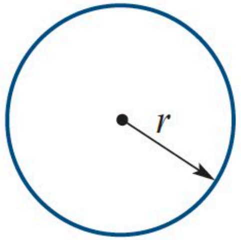
Circles

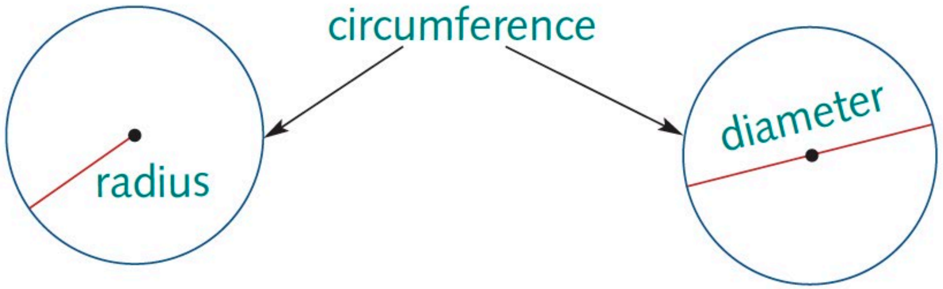
I love circles! They are so well rounded.

Bad joke …. But it's true.

Again, there are formulae we can use to find the area and circumference. Yup! Barry has been at it again and rather than call it the perimeter … he wants to trick us and call it the circumference.

It's important to know what the main parts of a circle are called too.

	Area	Circumference
Circle 	$A = \pi r^2$ where r is the **radius**	$C = 2\pi r$ or $C = \pi d$ where d is the **diameter**

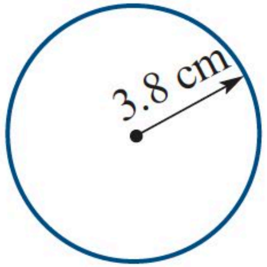


Example: Finding the circumference and area of a circle

For the circle shown, find:

a the circumference to one decimal place

b the area to one decimal place.



$$C = 2 \times \pi \times r$$
$$= 2 \times \pi \times 3.8$$
$$= \underline{\underline{23.9}} \text{ cm}$$

$$A = \pi \times r^2$$
$$= \pi \times 3.8^2$$
$$= \underline{\underline{45.4 \text{ cm}^2}}$$

Work to complete

The work I am asking to be completed for this topic is shown below.

This is the minimum work which should be completed. The more questions which are answered the better your chance of success in exams. Questions towards the end of the exercises and in the Chapter Review are the best practice you can do.

Questions to complete:
Exercise 10C: 1, 2, 3, 4abcefj, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17

Extension: 19