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AUSTRALIA

Volumes, Areas, and Lengths

Perimeters

A plane figure or shape is a two-dimensional, flat shape. This means that any plane shape has an outside and an inside. The *perimeter* of a plane shape literally means the measurement *(meter)* around *(peri)* the boundary of that shape. In other words, you could walk all around the shape, exactly on the boundary, counting your paces as you walk. When you reach your starting point, the number of paces would be the perimeter of the shape!

Of course, if you then compared YOUR measurement (using your paces) to someone else's measurement (in their paces), the two results are hardly likely to be the same and so we generally measure perimeter in any standard unit of length such as metres (m), centimetres (cm), millimetres (mm), or kilometres (km). (If you know how long your pace is, you could convert your number of paces to a standard measure.)

Special case: the perimeter of a circle is its *circumference*.

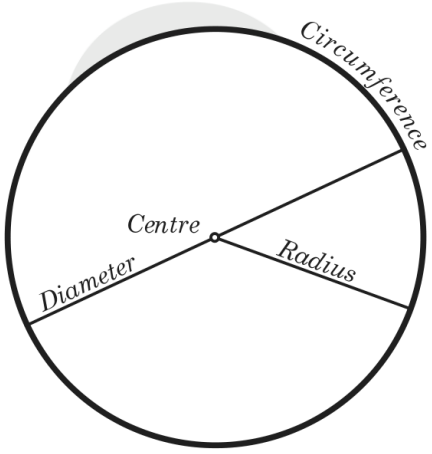


Diagram retrieved 22 January 2013 from http://en.wikipedia.org/wiki/Circle

There is a formula to calculate the length of the circumference (that is, the perimeter of a circle). It is $C = 2\pi r$, where C is the length of the circumference and r is the length of the radius. π is the number that results when you divide the length of the circumference of a circle by the length of the diameter of that circle and is 3.141592654 ....

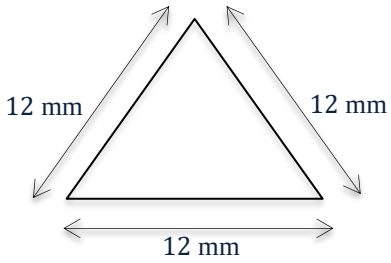
If you use the diameter instead of the radius to calculate the circumference the formula is given by $C = \pi d$, where the length of the diameter is d and the length of the circumference is C.

When calculating the perimeter of a *polygon*, that is a plane figure that has straight sides, we can add the lengths of all the sides together, making sure that they are all stated using a consistent unit of measurement (no mixing of cm, mm, m etc).

Examples

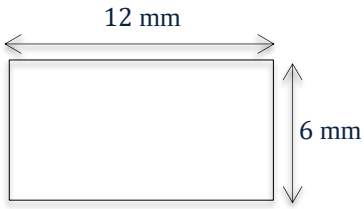
Calculate the perimeters of these figures.

1.



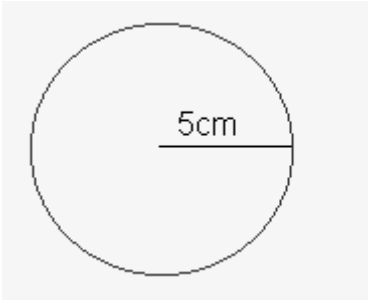
$$\text{Perimeter} = 12\text{ mm} + 12\text{ mm} + 12\text{ mm}$$
$$= 36\text{ mm}$$

2.



$$\text{Perimeter} = 12\text{ mm} + 6\text{ mm} + 12\text{ mm} + 6\text{ mm}$$
$$= 36\text{ mm}$$

3.



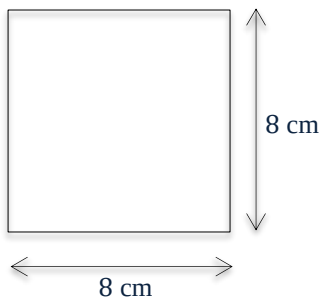
$$Perimeter\ (circumference) = 2\pi r$$
$$= 2 \times \pi \times 5\text{ cm}$$
$$= 31.416\text{ cm (rounded)}$$

If the figure consists of more than one shape, just remember that the perimeter is found by walking around the outside – pretend you can do that on the paper. Try these following exercises; you can check your results with the solutions at the end of this handout.

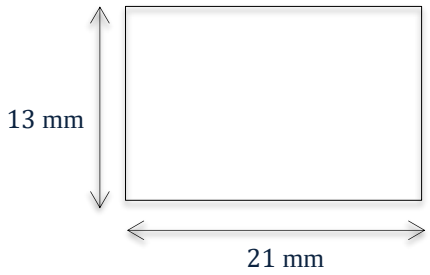
EXERCISES

Find the perimeters of each of the following plane shapes. (The diagrams are not drawn to scale).

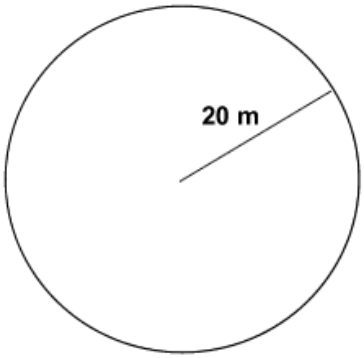
1.



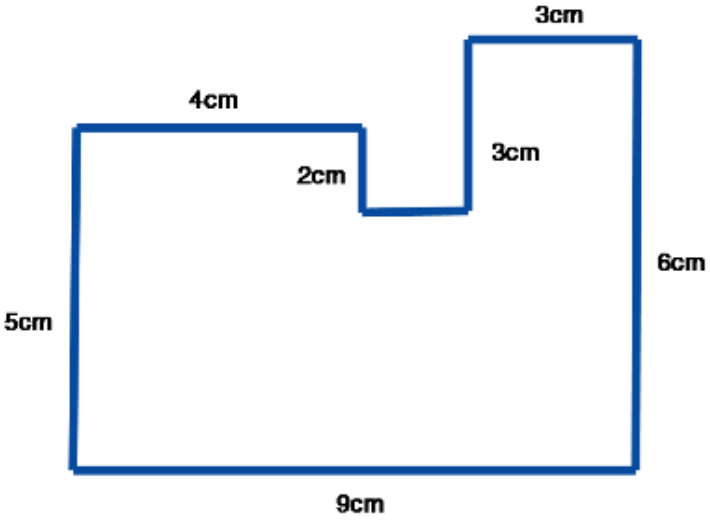
2.



3.



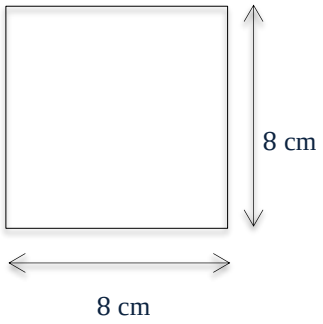
4.



One last problem to think about: True or false? All rectangles that have the same area must have the same perimeter. *(Hint: Draw some rectangles that all have an area of* 24 cm^2*, for example, and work out their perimeter.)*

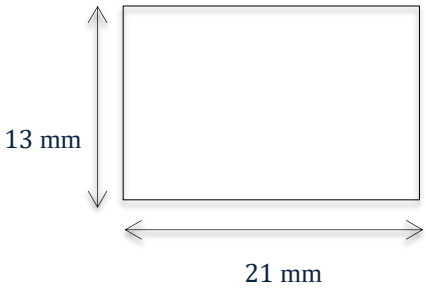
SOLUTIONS TO EXERCISES

1.



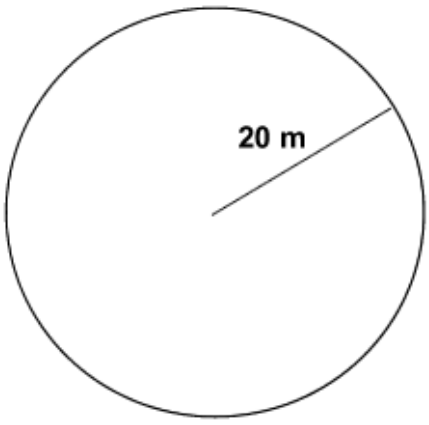
$$\text{Perimeter} = 8\text{ cm} + 8\text{ cm} + 8\text{ cm} + 8\text{ cm}$$
$$= 32\text{ cm}$$

2.



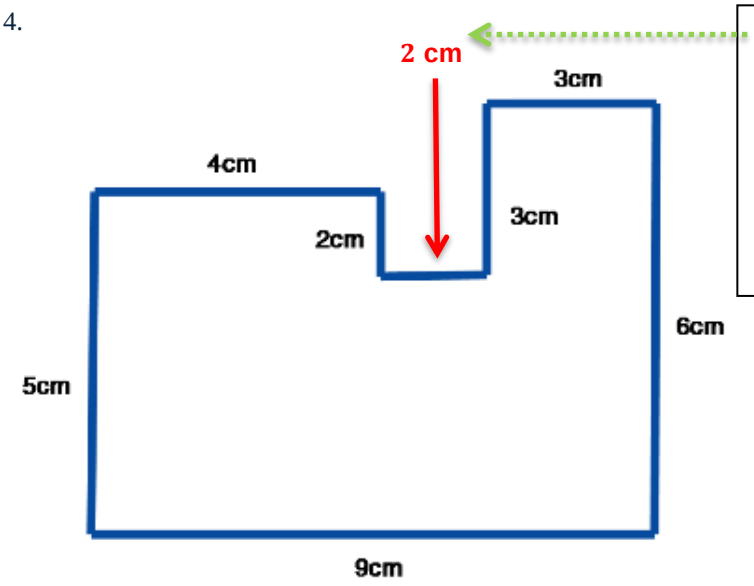
$$\text{Perimeter} = 13\text{ mm} + 21\text{ mm} + 13\text{ mm} + 21\text{ mm}$$
$$= 68\text{ mm}$$

3.



$$Perimeter\ (circumference) = 2\pi r$$
$$= 2 \times \pi \times 20\text{ m}$$
$$= 125.664\text{ m (rounded)}$$

4.



The 2 cm is because the total length of the top of the shape has to be the same as the bottom length because it was originally a rectangle. We actually do not need to calculate it though because we know the total length across the top is 9 cm!

Now we can add all the lengths together. For the top and the bottom, we get 9 cm each. The right side is 6 cm, the left is 5 cm. It is only the pieces in between we need to worry about! Therefore

$$\begin{aligned}\text{Perimeter} &= 9\text{ cm} + 9\text{ cm} + 6\text{ cm} + 5\text{ cm} + 2\text{ cm} + 3\text{ cm} \\ &= 34\text{ cm}\end{aligned}$$