PERIMETERS AND AREAS

Perimeters of Triangles and Quadrilaterals
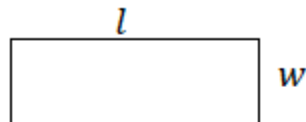
The Perimeters of Triangles and Quadrilaterals

Find the perimeters of triangles and quadrilaterals

Perimeter – is defined as the total length of a closed shape. It is obtained by adding the lengths of the sides inclosing the shape. Perimeter can be measured in m , cm ,dm ,m,km e. t. c
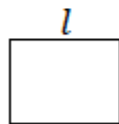
Examples

(i)   A rectangle of length l and width w

$$\text{Perimeter}, P = l + l + w + w = 2l + 2w = 2(l + w)$$

$$\boxed{P = 2(l + w)}$$
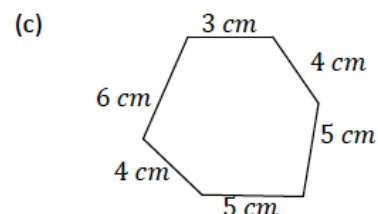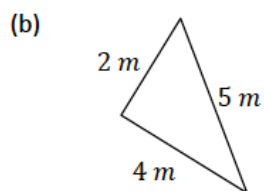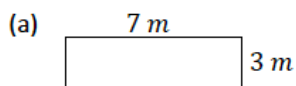
(ii)   A square of side l

$$\text{Perimeter}, P = l + l + l + l = 4l$$

$$\boxed{P = 4l}$$

Example 1

Find the perimeters of the following shapes

(a)   7 m   3 m   (b)   2 m 5 m 4 m   (c)   3 cm 4 cm 6 cm 5 cm 4 cm 5 cm

Solution

a.   Perimeter $= 7m + 7m + 3m + 3m = 20\ m$

b.   Perimeter $= 2m + 4m + 5m = 11\ m$

c.   Perimeter $= 3cm + 6cm + 4cm + 5cm + 5\ cm + 4cm = 27\ cm$

Circumference of a Circle

The Value of Pi (Π)

Estimate the value of Pi (Π)

The number π is a mathematical constant, the ratio of a circle's circumference to its diameter, commonly approximated as **3.14159**. It has been represented by the Greek letter "π" since the mid 18th century, though it is also sometimes spelled out as "pi" (/paɪ/).

The perimeter of a circle is the length of its circumference $i.\ e\ perimeter = circumference.$ Experiments show that the ratio of the circumference to the diameter is the same for all circles

$$i.e \quad \frac{circumference}{diameter} = constant\ number\ called,\ \pi$$

$$\frac{C}{d} = \pi$$

$$\boxed{C = \pi d}$$

Where c $=$ circumference of a circle,   d $=$ diameter of the circle

But $d = 2r$, then

$$\boxed{C = 2\pi r}$$

Where r $=$ radius of the circle

The Circumference of a Circle

Calculate the circumference of a circle

Example 2

Find the circumferences of the circles with the following measurements. Take $\pi = 3.14$

a.   diameter 9 *cm*

b.   radius 3½*m*

c.   diameter 4.5 *dm*

d.   radius 8 *km*

Solution

(a) $C = \pi d = 3.14 \times 9 = 28.26 \ cm$

(b) $C = 2\pi r = 2 \times 3.14 \times 3\frac{1}{2} = 6.28 \times \frac{7}{2} = 21.98 \ m$

(c) $C = \pi d = 3.14 \times 4.5 = 14.13 \ dm$

(d) $C = 2\pi r = 2 \times 3.14 \times 8 = 50.24 \ km$

Example 3

The circumference of a car wheel is 150 *cm*. What is the radius of the wheel?

Solution

Given circumference, $C = 150 \ cm$

$$C = 2\pi r$$

$$r = \frac{C}{2\pi} = \frac{150}{2 \times 3.14} = \frac{150}{6.28} = 23.89 \ cm$$
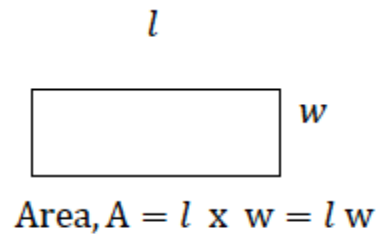
∴ The radius of the wheel is 23.89 *cm*

Areas of Rectangles and Triangles

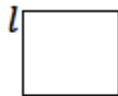## The Area of a Rectangle

Calculate the area of a rectangle

Area – can be defined as the total surface covered by a shape. The shape can be rectangle, square, trapezium e. t. c. Area is measured in mm!, cm!,dm!,m! e. t. c
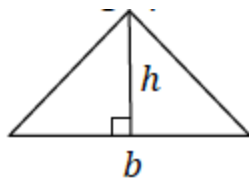
Consider a rectangle of length l and width w

l

w

$$\text{Area}, A = l \text{ x } w = l\,w$$

$$A = lw$$

Consider a square of side l

l

$$\text{Area}, A = l \text{ x } l$$

$$A = l^2$$

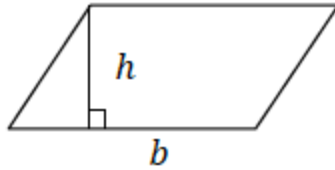Consider a triangle with a height, h and a base, b

h

b

$$Area, A = \frac{1}{2}hb$$

Areas of Trapezium and Parallelogram

The Area of a Parallelogram

Calculate area of a parallelogram

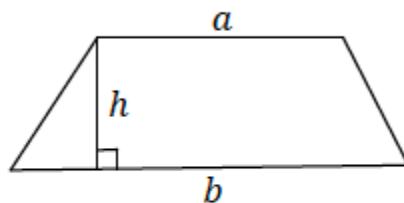A parallelogram consists of two triangles inside. Consider the figure below:

$$Area, A = bh$$

The Area of a Trapezium

Calculate the area of a trapezium

Consider a trapezium of height, h and parallel sides a and b

$$Area, A = \frac{1}{2}h(a + b)$$

Example 4

The area of a trapezium is $120\ m$!. Its height is $10\ m$ and one of the parallel sides is $4\ m$. What is the other parallel side?

Solution

Given area, $A = 120\ m^2$, height, $h = 10\ m$, one parallel side, $a = 4\ m$. Let other parallel side be, b

Then

$$A = \frac{1}{2}h(a + b)$$

$$120 = \frac{1}{2} \ x \ 10 \ x \ (4 + b)$$

$$120 = 5 \ x \ (4 + b)$$

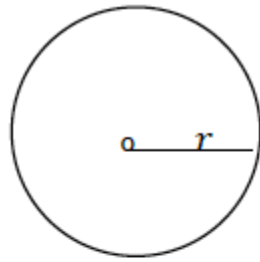$$4 + b = \frac{120}{5}$$

$$4 + b = 24$$

$$b = 24 - 4 = 20$$

∴ The length of other parallel side is $20 \ m$

Area of a Circle

Areas of Circle

Calculate areas of circle

Consider a circle of radius r;

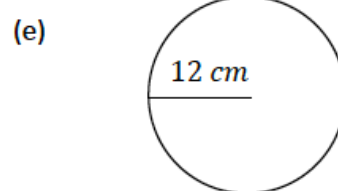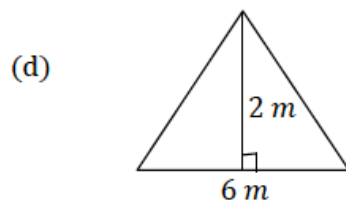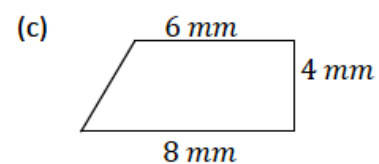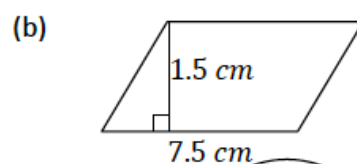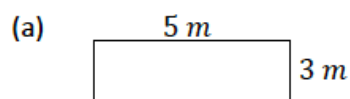$$\boxed{Area, A = \pi r^2}$$

Also $r = \dfrac{d}{2}$, then

$$Area, A = \pi r^2 = \pi \left(\dfrac{d}{2}\right)^2 = \dfrac{\pi d^2}{4}$$

$$\boxed{Area, A = \dfrac{\pi d^2}{4}}$$

Example 5

Find the areas of the following figures

(a)

5 m

3 m

(b)

1.5 cm

7.5 cm

(c)

6 mm

4 mm

8 mm

(d)

2 m

6 m

(e)

12 cm

Solution

(a) $A = lw = 5 \; x \;\; 3 = 15 \; m^2$

(b) $A = bh = 7.5 \; x \; 1.5 = 11.25 cm^2$

(c) $A = \frac{1}{2} h(a + b) = \frac{1}{2} \; x \; 4 \; x \; (6 + 8) = \frac{1}{2} \; x \; 4 \; x \; 14 = 28 \; mm^2$

(d) $A = \frac{1}{2} hb = \frac{1}{2} \; x \;\; 2 \; x \; 6 = 6 \; m^2$

(e) $A = \pi r^2 = \frac{22}{7} \; x \; 12^2 = \frac{22}{7} \; x \; 144 = \frac{3168}{7} = 452.57 \; cm^2$

Example 6

A circle has a circumference of $30 \; m$. What is its area?

Solution

Given circumference, $C = 30 \; m$

$C = 2\pi r$

$$r = \frac{C}{2\pi} = \frac{30}{2 \; x \; 3.14} = \frac{30}{6.28} = 4.78 \; m$$

Then

$$A = \pi r^2 = \frac{22}{7} \; x \; (4.78)^2 = \frac{22}{7} \; x \; 22.85 = \frac{502.7}{7} = 71.81 \; m^2$$