

AREA

Areas apply to two-dimensional shapes, i.e. those with a length and width but no depth. This means that you can have the area of a sheet of paper or a wall, but not the area of a solid shape since this has three dimensions. You can have the **surface area** of a three-dimensional object since this is the area of the outside or inside surfaces, and the surfaces are two-dimensional.

Firstly we will cover regular shapes

- Rectangles and squares
- Parallelograms
- Triangles
- Circles

Then there will be a short section on calculating the areas of irregularly shaped objects

Area of Regular Shapes

Rectangles and Squares

A rectangle is a regular four sided shape with each of the four angles being a right angle, (90^0). Squares are rectangles whose four sides are the same length.

The area of a rectangle is calculated by multiplying the length by the width, with the area being measured in square units. To do this you must first make sure that the length and width are in the same units of measurement.

Example 1

A room is 8 metres long by 5 metres wide, so its floor area is $8 \times 5 = 40 \text{ m}^2$

A drawing pad is 32cm long and 24cm wide, so the area of a sheet is $32 \times 24 = 768 \text{ cm}^2$

A roll of paper is 52cm wide and 6.4m long, so the area of the roll is $52/100 \times 6.4 = 3.328 \text{ m}^2$

Exercise 1

Calculate the area of the following shapes

1. A wall of height 2.1metres and width 5.2 metres
2. A square 3.5 inch floppy disc
3. A roll of wallpaper 50cm wide and 15m long
4. A picture of width 3 feet and height 2 feet 6 inches

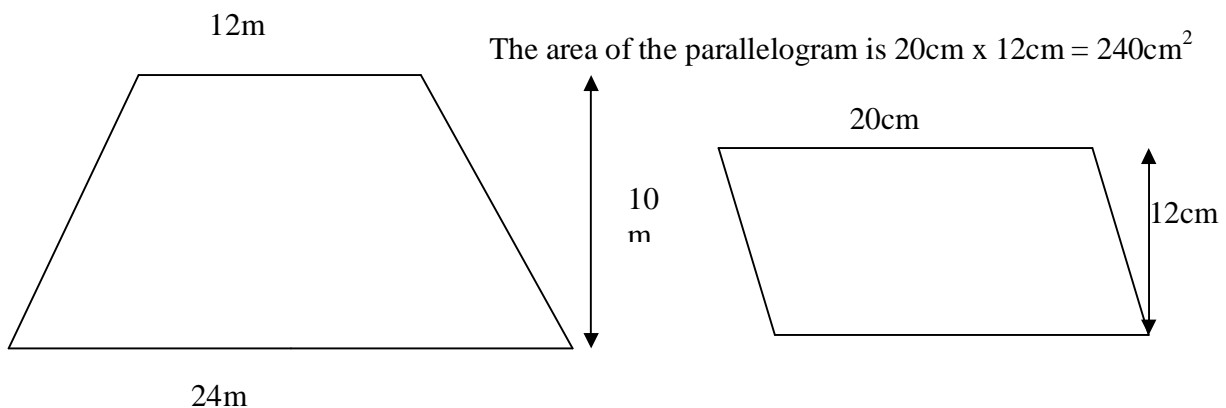
Parallelograms and Trapeziums

Some four-sided figures do not have angles of 90^0 , and this makes their area more difficult to calculate. If the shape has two sides which are parallel, (they are a constant distance apart), then the shape is a parallelogram or trapezium and its area can be calculated by-

- adding the two parallel sides together and dividing by two, (if it is a trapezium)
- then multiplying the answer by the vertical height of the shape.

To calculate the area you must make the units of measurement the same, (i.e. they must all be in either metres, cm, feet etc.).

Example 2 The area of the trapezium is $\frac{12 + 24}{2} \times 10 = 18 \times 10 = 180\text{m}^2$

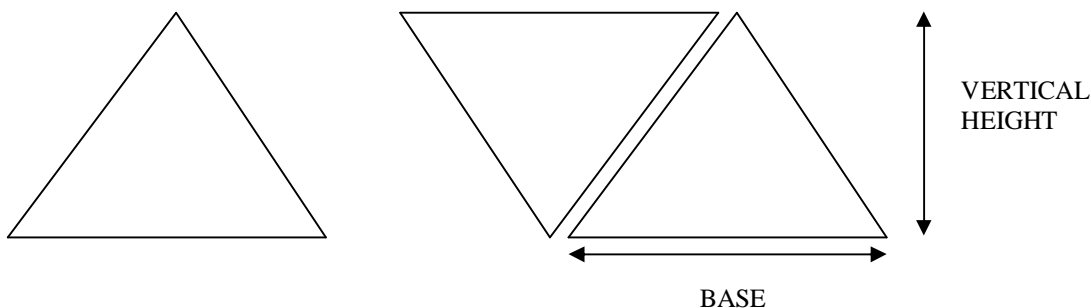


Exercise 2

1. A parallelogram has sides of 14cm, and a vertical height of 8cm. What is its area?
2. A parallelogram has sides of 1m, and a vertical height of 50cm. What is its area?
3. A trapezium has sides of 6 inches and 10 inches, and a vertical height of 1 foot. What is its area?

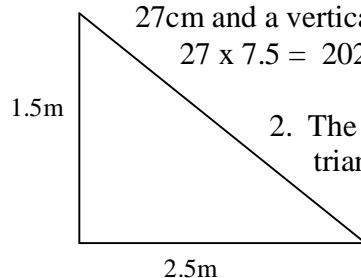
Triangles

Triangles are three sided figures. If two of them are placed side by side you can see that they will make a parallelogram or rectangle. This means that the area of the triangle is half the area of the rectangle or parallelogram, which is half the base multiplied by the vertical height

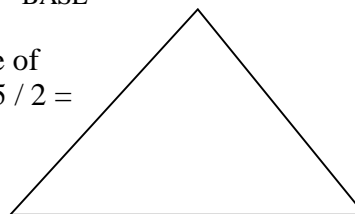


Example 3

1. The area of a triangle shown on the right with a base of 27cm and a vertical height of 15cm is $\frac{27 \times 15}{2} = 27 \times 7.5 = 202.5\text{cm}^2$.

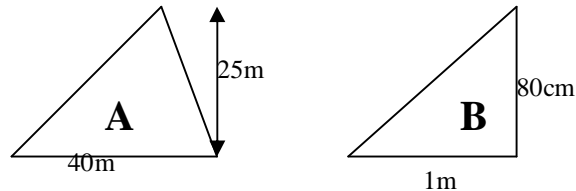


2. The area of a right angle triangle shown to the left is $\frac{1.5 \times 2.5}{2} = 1.5 \times 1.25 = 1.875\text{m}^2$.



Exercise 3

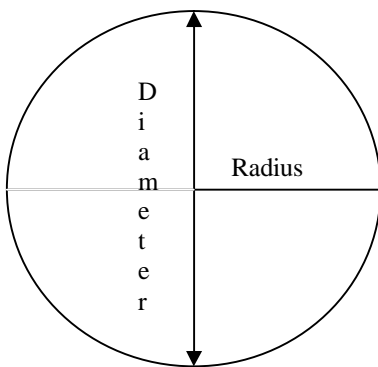
1. What is the area of a triangle with a base of 20cm and a vertical height of 30cm?
2. What is the area of a triangle with a base of 1.2m and a vertical height of 50cm?
3. What is the area of triangle A?
4. What is the area of triangle B?

**CIRCLES**

The area of a circle is found by using the equation

$$\text{AREA} = \text{Pr}^2$$

Where P (pi) is a constant of 3.14 and r is the radius (the distance from the centre of the circle to the edge of the circle).



The **diameter** is the distance across the circle and is twice the radius in length. The **perimeter** is the distance around the outside of the circle.

Example 4

1. The area of a circle of radius 32cm is found using Pr^2 , so the area is $3.14 \times 32 \times 32 = 3.14 \times 1024 = 3215.4\text{cm}^2$.
2. The area of a circle of diameter 800m is found using Pr^2 , where the radius is half the diameter. Since the diameter is 800m, the radius will be $800/2 = 400\text{m}$. The area of the circle will be $3.14 \times 400 \times 400 = 3.14 \times 160,000 = 502,400\text{m}^2$.

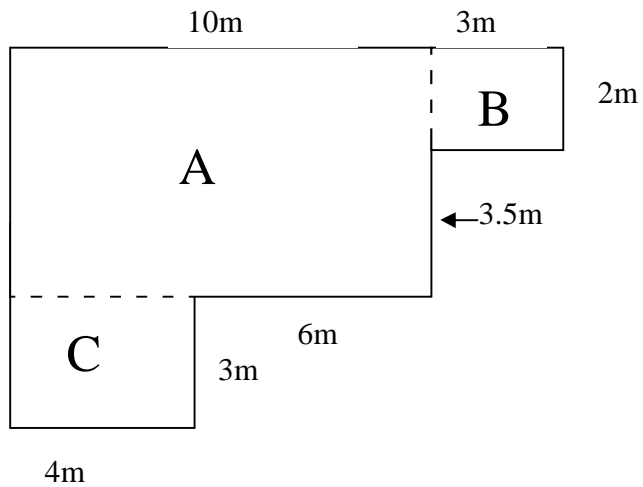
Exercise 4

1. What is the area of a circle of radius 10cm?
2. What is the area of a circle of radius 160m?
3. What is the area of a circle of diameter 8 inches?
4. What is the area of a circle of diameter 12.8m?

Area of Irregular Shapes

It is more difficult to calculate the area of irregularly shaped objects since you cannot just use a simple equation for the calculation. It is still possible to calculate, but you might need to think about the problem before you start calculating.

The area of irregular shaped rectangular objects can be measured by dividing the shape up into rectangles and calculating the area of each part. The areas of each of the parts is then added together to give the area of the whole.



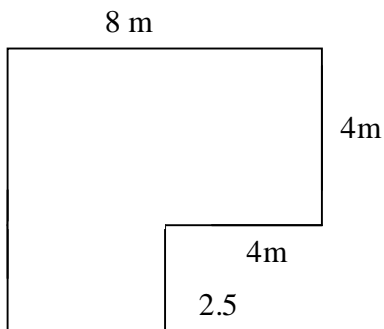
The plan of a room shown on the right has been split into three rectangles. The area of the rectangles can be calculated as shown.

$$\begin{aligned} \text{A } 10\text{m} \times 5.5\text{m} &= 55\text{m}^2 \\ \text{B } 3\text{m} \times 2\text{m} &= 6\text{m}^2 \\ \text{C } 3\text{m} \times 4\text{m} &= 8\text{m}^2 \\ \text{TOTAL} &= 69\text{m}^2 \end{aligned}$$

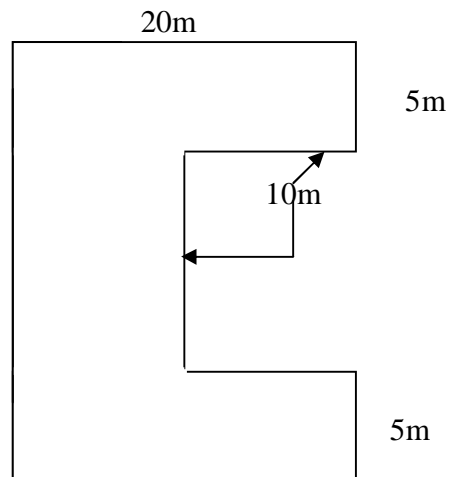
EXERCISE 5

Calculate the areas of the following shapes

1.



2.



3.

