



higher education
& training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA



SUBJECT: FOUNDATIONAL MATHEMATICS

MODULE NAME: 3

UNIT NUMBER : 3

**UNIT NAME : CALCULATE THE AREA OF TWO-DIMENSIONAL
SHAPES**

CALCULATE THE AREA OF TWO-DIMENSIONAL SHAPES

When you have completed this unit you will be able to calculate the area of a:

1. Rectangle
2. Square
3. Triangle
4. Circle
5. Trapezium
6. Parallelogram

CALCULATE THE AREA OF TWO-DIMENSIONAL SHAPES

What does AREA mean in mathematics ?

The area of a figure is the number of unit squares that cover the surface of a closed figure. Area is measured in square centimetres , square feet , square inches.

Area of a Rectangle

The area of a Rectangle

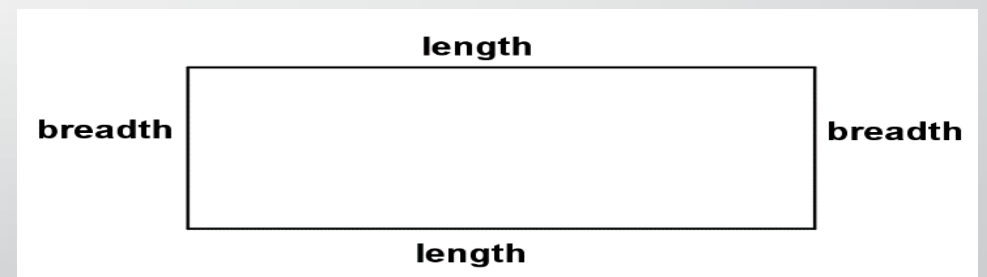
is calculated by using the following formula:

Area = *length* \times *breadth* or just $A = l \times b$

Example

A rectangle is 6 *m* wide and 3 *m* high,
what is its area?

Area = $l \times b = 6 \times 3 = 18 \text{ m}^2$



Area of a Square

The area is the side length squared:

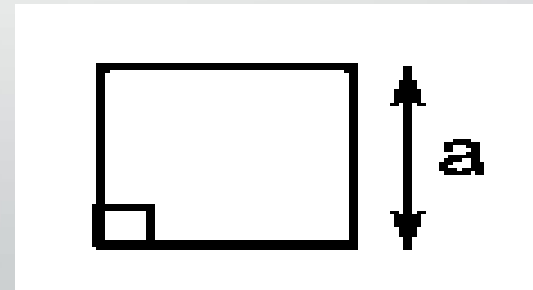
$$\text{Area} = a \times a = a^2$$

A square has a side length of 6 m, what is its area?

$$\text{Area} = a \times a$$

$$= 6 \times 6$$

$$= 36m^2$$



Area of a Triangle

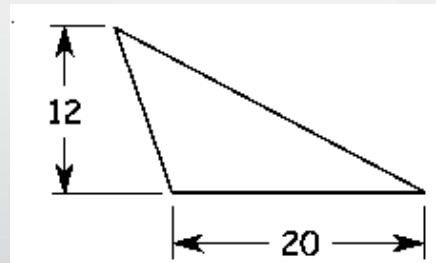
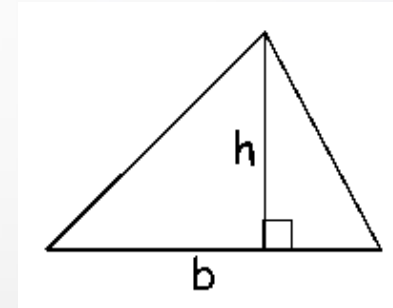
The area is **half of the base times height.**

$$\text{Area} = \frac{1}{2} \times b \times h$$

Example :

What is the area of this triangle?

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 20 \times 12 \\ &= 120 \text{ m}_2\end{aligned}$$



Area of the Circle

The area of a circle is:

$\pi \times$ the radius squared:

$$A = \pi \times r^2$$

or, when you know the diameter: $A = \pi \times \frac{D^2}{4}$ (In Engineering Science we mostly use diameter and not radius in our formulas.)

Area of the Circle

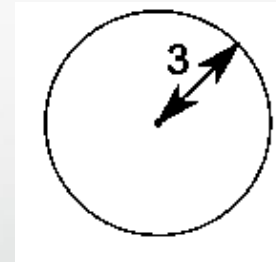
Example:

What is the area of a circle with radius of 3 *m*?

$$\text{Area} = \pi \times r^2$$

$$= \pi \times 3^2$$

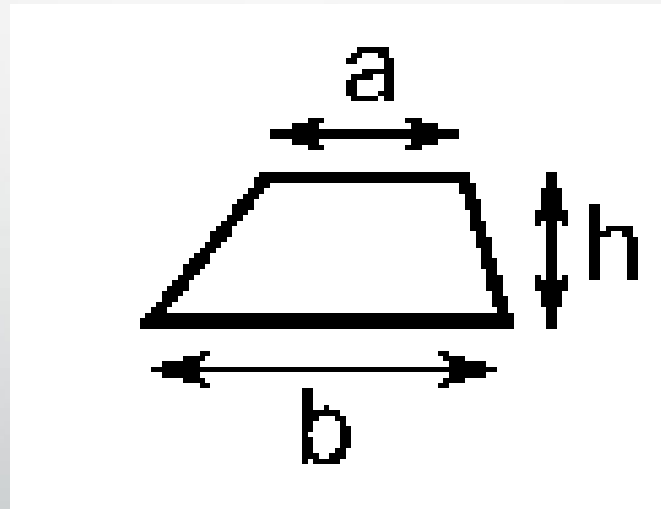
$$= 28,274 \text{ m}^2$$



Area of the Trapezium

The area is the average of the two horizontal lengths times the height:

$$\text{Area} = \frac{a+b}{2} \times h$$



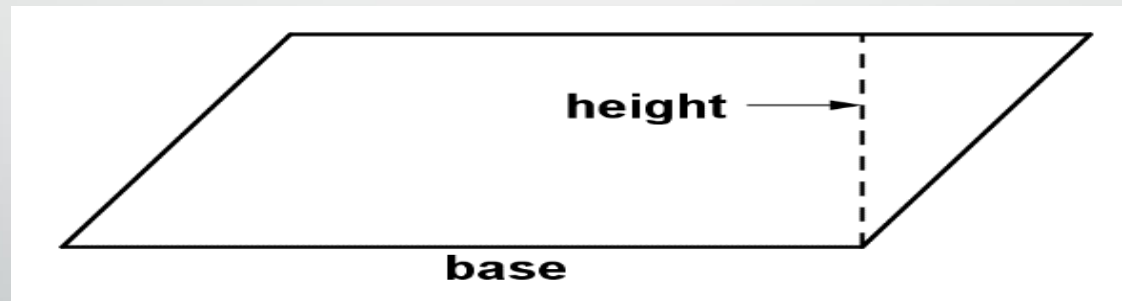
Area of the Trapezium

- A trapezium's two horizontal sides are 6 m and 4 m , and it is 3 m high. What is its area?

$$\begin{aligned}\text{Area} &= \frac{6m+4m}{2} \times 3 \\ &= 5 \times 3 = 15\text{ m}^2\end{aligned}$$

Area of a parallelogram

- The area of a Parallelogram is the **base times the height**:
- Take note that the **height** is the **perpendicular distance between the base and the opposite side of the parallelogram**.
- Area = $b \times h$



Area of a parallelogram

Example:

A parallelogram has a base of 6 *m* and is 3 *m* high.

What is its area?

$$\text{Area} = b \times h$$

$$= 6 \times 3$$

$$= 18 \text{ m}^2$$

Go to your Workbook and do Exercise 3.1 to 3.3 and as classwork or homework.

The Perimeter and Area of Composite Shapes

In this part of the unit, you just have to add areas and perimeters by looking carefully at the sketches provided.

Example 1:

For the figure below, calculate (i) the perimeter and (ii) the area. All measurements are in metres.

The Perimeter and Area of Composite Shapes

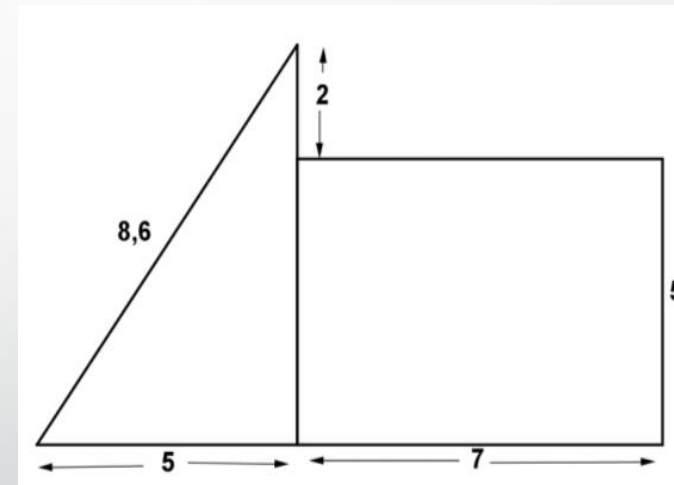
- **Answer:**

(i) $P = 8,6 + 5 + 7 + 5 + 7 + 2 = 34,6 \text{ m}$

(ii) $A = \left(\frac{1}{2} \times b \times h \right) + (l \times b)$

$$= \left(\frac{1}{2} \times 5 \times 7 \right) + (7 \times 5)$$

$$= 52,5 \text{ m}^2$$



Example 2:

For the figure below, calculate (i) the perimeter and (ii) the area. All measurements are in metres.

- **Answer:**

$$(i) P = (2 \times \pi \times 3) + 2(2 + 3)$$

$$= 18,85 + 10$$

$$= 28,85 \text{ m}$$

$$(ii) A = (\pi \times 3^2) + (2 \times 3)$$

$$= 28,274 + 6 = 34,274 \text{ m}^2$$

The Perimeter and Area of Composite Shapes

- Go to your workbook and do exercise 3.4 and do as classwork or homework.

Solve Word Problems by calculating Perimeter and Area

In this part of the unit, you must read the question carefully, then **make your own rough drawing**, to make your calculations.

Example 1:

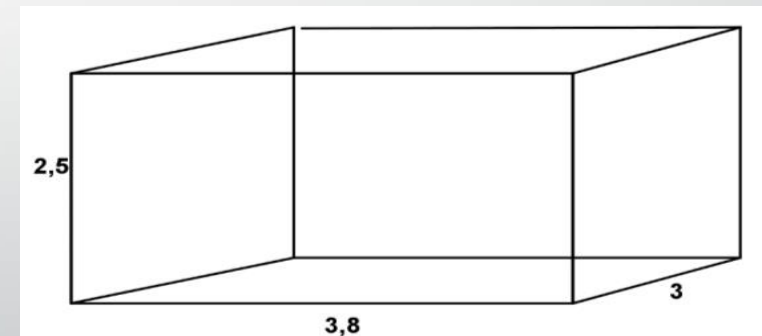
Elvin wants to paint the walls of his bedroom. All the walls are $2,5\text{ m}$ high. On two sides the walls are $3,8\text{ m}$ wide and on the other side the walls are 3 m wide. You must subtract 6 m^2 for the door and windows. Calculate the area that must be painted.

Example 1: Solution

Answer:

Total area = the two larger walls + the two smaller walls – 6

$$\begin{aligned} A &= 2(3,8 \times 2,5) + 2(3 \times 2,5) - 6 \\ &= 2(9,5) + 2(7,5) - 6 \\ &= 28 \text{ m}^2 \end{aligned}$$



Example 2:

Elvin wants to put a carpet in his room.

(This is the same room as in the previous example.) For the carpet, calculate (i) the perimeter and (ii) the area.

Example 2:

- **Answer:**

(i) Floor perimeter $= 2(l+b)$

$$= 2(3+3,8)$$

$$= 2 \times 6,8$$

$$= 13,6 \text{ m}$$

(ii) $A = l \times b$

$$= 3 \times 3,8$$

$$= 11,4 \text{ m}^2$$