Worksheet 69  **Area of composite shapes**

To find areas of composite shapes with straight edges:

- split the shape into rectangles and triangles;
- find the areas of the individual bits;
- add or deduct the areas to get the total area.

We use **formulae** to calculate area.

**Example 1**

**RECTANGLE**

Area = length \times breadth

**SQUARE**

Area = length \times length

**Note**

length and breadth in same units

- If a rectangle measures 5m by 3m, its area is $5 \times 3 = 15 \text{ m}^2$ (square metres).
- If a square is 12 mm along each side, its area is $12 \times 12 = 144 \text{ mm}^2$ (square millimetres).

See how all the measurements are in the same ‘family’ –

- lengths in metres (m) give area in square metres (m$^2$)
- lengths in millimetres (mm) give area in square millimetres (mm$^2$).

**Hint**

Keep the units the same.
More complicated shapes can often be split into rectangles, like this:

Area A = 6 \times 4 = 24 \text{ m}^2
Area B = 3.5 \times 1.8 = 6.3 \text{ m}^2
Area C = 3 \times 3.8 = 11.4 \text{ m}^2
Total area = A + B + C = 41.7 \text{ m}^2
Or we can treat them as larger rectangles with smaller rectangles or squares removed, as below.

Shaded area = area of large rectangle – (total area of A + B + C)

Area of large rectangle = 13 \times 12 = 156 \text{ m}^2

Area A = 3 \times 3.5 = 10.5 \text{ m}^2

Area B = 3 \times 3.5 = 10.5 \text{ m}^2

Area C = 3 \times 3 = 9 \text{ m}^2

Total area of A + B + C = 30 \text{ m}^2

Area of shaded area = 156 \text{ m}^2 - 30 \text{ m}^2 = 126 \text{ m}^2
Make sketches of these diagrams and calculate the shaded areas.

Where there are decimals in an answer, round the final answer to two decimal places. In some cases, you may have to work out missing measurements before you start.
**Area of a triangle**

Sometimes, the shapes might be triangular.

It is quicker to work out the area of a triangle by this rule:

**Area of triangle = \( \frac{1}{2} \times \text{base} \times \text{height} \)**

The base can be any side.

The height is the line from the base to the opposite corner.

Example:

\[
\text{Area of triangle} = \frac{1}{2} \times 10 \times 3
\]

\[
= \frac{1}{2} \times 30
\]

\[
= 15 \text{ cm}^2
\]

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**Exercise 2**

1. Find the areas of these triangles.

(a)  
(b)  

\[
\begin{align*}
\text{Area of triangle} & = \frac{1}{2} \times 8 \times 2 \\
& = \frac{1}{2} \times 16 \\
& = 8 \text{ cm}^2
\end{align*}
\]

\[
\begin{align*}
\text{Area of triangle} & = \frac{1}{2} \times 12 \times 25 \\
& = \frac{1}{2} \times 300 \\
& = 150 \text{ cm}^2
\end{align*}
\]
2. Find the total areas of these shapes.

(a) 
\[
\text{Triangle with base 5 m and height 4 m.}
\]

(b) 
\[
\text{Rectangle with base 3.5 m and height 8 m.}
\]

(c) 
\[
\text{Octagon with side 2 m and height 3 m.}
\]

Exercise 3

Find the area of the gable end of this building.

\[
\text{Building with base 6 m and height 5 m.}
\]

Find the area of the gable end of this building.
Area of a circle

Use the formula: \( \pi \times \text{radius} \times \text{radius} \)

The radius is \( 2.5 \div 2 = 1.25 \text{ m.} \)

The surface area of the table is:

\[ \pi \times \text{radius} \times \text{radius} \]
\[ 3.14 \times 1.25 \times 1.25 \]
\[ = 4.90625 \text{ m}^2. \]

Exercise 4

Calculate the surface area of the table above using \( \pi = 3.142 \) (to 3 decimal places).
Sometimes you have composite shapes that consist of, say, rectangles and circles (or semi-circles). For example, an ironing board:

Find the surface area of the shape below, using $\pi = 3.142$.

The two ends are semi-circular, with diameter 90 cm = 0.9 m.

1. Area of rectangle = $1.6 \times 0.9 = 1.44$ m$^2$
2. Area of semi-circles = area of a full circle with radius $0.9 \div 2 = 0.45$ m.

$$A = \pi r^2 = 3.142 \times 0.45 \times 0.45 = 0.64$ m$^2$ (2 decimal places)

Total area = $1.44 + 0.64 = 2.08$ m$^2$

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**Exercise 5**

Find the surface of the ironing board shown below. (Use $\pi = 3.142$.)

Note the change to common units of measurement.