WorkBook

AREA

Using a method and/or a formula

WorkNotes

WorkBook

AREA OF PLANAR SHAPES

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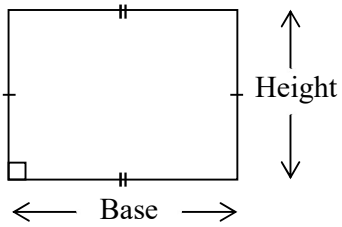
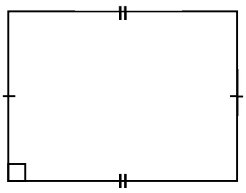
Rectangle

- opposite sides are equal.
- all angles are 90°.
- The area is calculated multiplying the length by the width. Or $\boldsymbol{A = bh}$, where b is the base and h is the height.



- The use of **Area = base × height** for rectangles, squares, parallelograms and rhombuses is acceptable unless you are asked to write the specific formula for a square or rhombus.

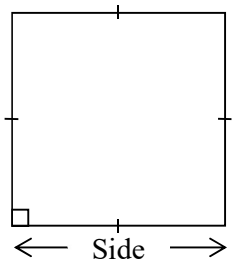
Eg Find the area of the following rectangle.



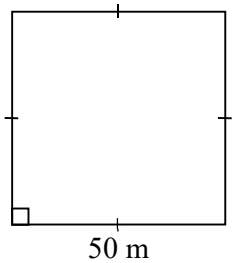
$A = bh$
$= 10 \times 8$
$= 80$
$\therefore$ Area is 80 cm^2

Square

- all sides are equal.
- all angles are 90°.
- The area is calculated multiplying the length by the width. Or $\boldsymbol{A = s^2}$ where s is the length of the side. Note: $A = bh$, can also be used.



Eg
Find the area of the following square.



$A = s^2$
$= 50^2$
$= 2500$
$\therefore$ Area is 2500 m^2

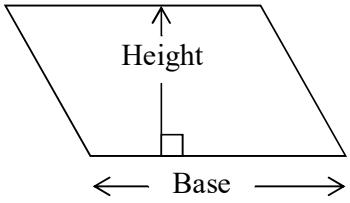
OR

$A = bh$
$= 50 \times 50$
$= 2500$
$\therefore$ Area is 2500 m^2

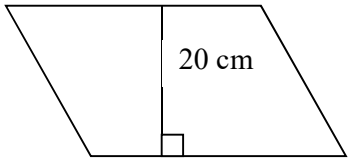
WorkBook

Parrallelogram

- opposite sides are equal.
- opposite angles are equal.
- The area is calculated multiplying the width by the height. Or $\boldsymbol{A = bh}$, where b is the base and h is the height.



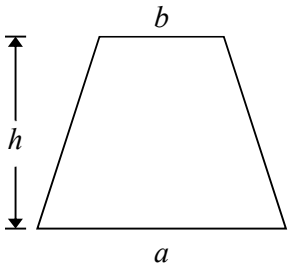
Eg
Find the area of the following parallelogram.



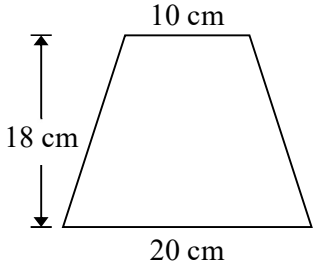
$A = bh$
$= 30 \times 20$
$= 600$
$\therefore$ Area is 600 cm^2

Trapezium

- One pair of parallel sides.
- The area is calculated multiplying the <u>average width</u> by the height.
  Or $\boldsymbol{A = \frac{1}{2}(a + b)h}$, where a and b are the parallel sides and h is the height.



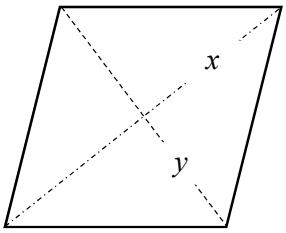
Eg
Find the area of the following parallelogram.



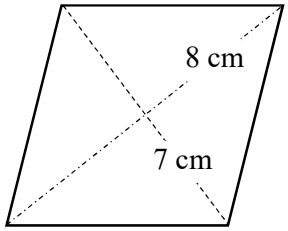
$A = \frac{1}{2}(a + b)h$
$= \frac{1}{2} \times (20 + 10) \times 18$
$= \frac{1}{2} \times 30 \times 18$
$= 270$
$\therefore$ Area is 270 cm^2

Rhombus

- all sides are equal.
- opposite angles are equal.
- The area of a rhombus is calculated using the formula $\boldsymbol{A = \frac{1}{2}xy}$ where $\boldsymbol{x}$ and $\boldsymbol{y}$ are the diagonals of the rhombus.
- The area can also be calculated using $\boldsymbol{A = bh}$, where the base and height are given instead of the diagonals. See **Area of a Parallelogram** for this method.



Eg
Find the area of the following rhombus.



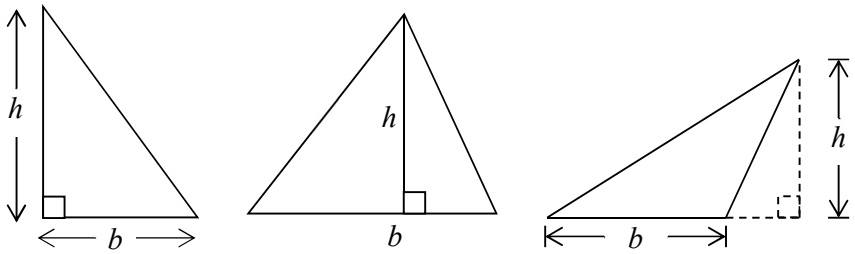
$A = \frac{1}{2}xy$
$= \frac{1}{2} \times 7 \times 8$
$= 28$
$\therefore$ Area is 28 cm^2

Others

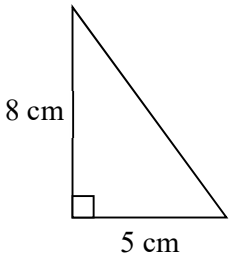
- Irregular quadrilaterals are treated individually depending on the information provided.

Triangles

- A triangle can be considered as being half of a quadrilateral and hence the formula.
- The area of a triangle is calculated using the formula $\boldsymbol{A = \frac{1}{2}bh}$.
- There are three basic types of triangles when calculating areas.



Eg
Find the area of the following triangle.

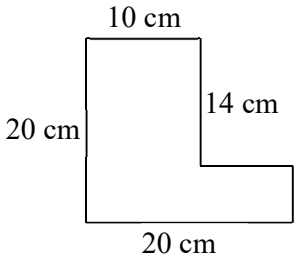


$A = \frac{1}{2}bh$
$= \frac{1}{2} \times 5 \times 8$
$= 20$
$\therefore$ Area is 20 cm^2

Composite shapes

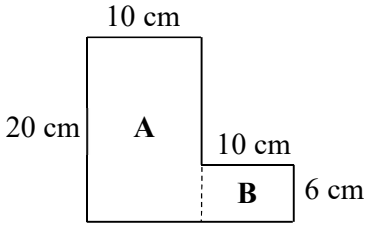
- There are two basic types of questions when calculating composite areas.
  - You **add the parts**.
  - You **subtract the parts**.
- You calculate the parts using the appropriate method then add or subtract to find the required area.
- **Always describe the parts in your solution.**

Eg. **Add the parts**
Find the area of the following shape.



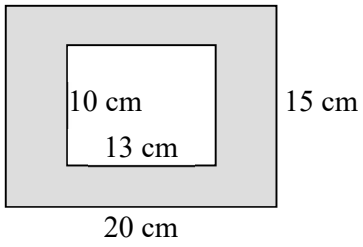
- Divide the shape into the two parts as shown.
- Note: There are other ways to divide this shape.
- Calculate the length of the sides of each part.

Part **A** is already labelled as 10 cm by 20 cm.
Part **B**: Width. 20 – 10 = 10. So 10 cm
Height. 20 – 14 = 6. So 6 cm



A = 2 rectangles
= Part **A** + Part **B**
= $BH + bh$ (Different case for each rectangle)
= $10 \times 10 + 10 \times 6$
= 100 + 60
= 160
∴ Area is 160 cm^2

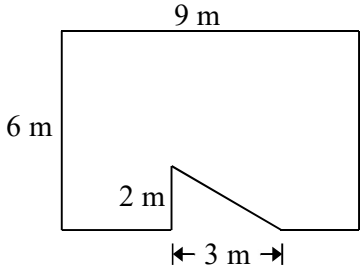
Eg. **Subtract the parts**
Find the shaded area of the following shape.



- Shaded areas are usually calculated by subtracting the parts.
- Always describe the parts in your solution.

A = Large rectangle – small rectangle
= $BH - bh$ (Different case for each rectangle)
= $20 \times 15 - 13 \times 10$
= 300 - 130
= 170
∴ Area is 170 cm^2

Eg. **Subtract the parts**
Find the area of the following shape.



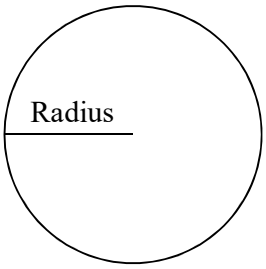
- Divide the shape into the two parts.
- Always describe the parts in your solution.

A = Rectangle – triangle
= $bh - \frac{1}{2}bh$
= $9 \times 6 - \frac{1}{2} \times 3 \times 2$
= 54 - 3
= 51
∴ Area is 51 m^2

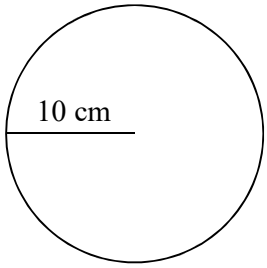
WorkBook

Circles

- The area of a circle is calculated using the formula $\boldsymbol{A = \pi r^2}$ where r is the radius of the circle.
  Remember to halve the diameter if the diameter is given.



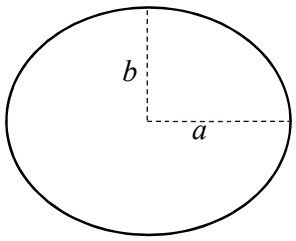
Eg
Find the area of the following circle correct to 1 decimal place.



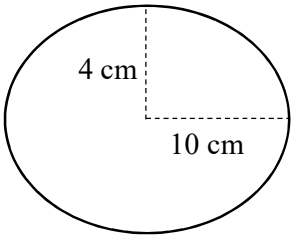
$A = \pi r^2$
$= \pi \times 10^2$
$= \pi \times 100$
$= 314.159265358979$
$\therefore$ Area is 314.2 cm^2

Area of ellipses

- Unlike a circle that has only one diameter, an ellipse has two axes. They are the **major axis** and **the minor axis**. Area is calculated using half the length of these axes, that is the **semi-major axis** and the **semi-minor axis** the ellipse.
- The area of an ellipse is calculated using the formula $\boldsymbol{A = \pi ab}$ where $\boldsymbol{a}$ is the length of the **semi-major axis** and $\boldsymbol{b}$ is the length of **semi-minor axis** of the ellipse.
  Remember to halve the whole axes if the whole axes are given.



Eg
Find the area of the following ellipse correct to 1 decimal place.



$A = \pi ab$
$= \pi \times 10 \times 8$
$= \pi \times 80$
$= 251.327412287183$
$\therefore$ Area is 251.3 cm^2

More composite shapes

- The area of all composite shapes is easily calculated once you describe the composition of the composite shape
- Then calculate each part you are adding and/or subtracting using the appropriate formula.