GCSE Maths – Geometry and Measures

Area and Perimeter of 2D Shapes

Worksheet

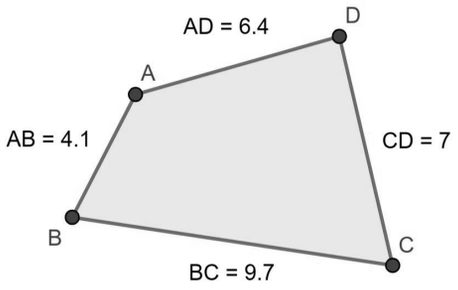
WORKED SOLUTIONS

This worksheet will show you how to work out different types of area and perimeter of 2D shapes questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

Section A

Worked Example

Calculate the perimeter of this 2D shape:

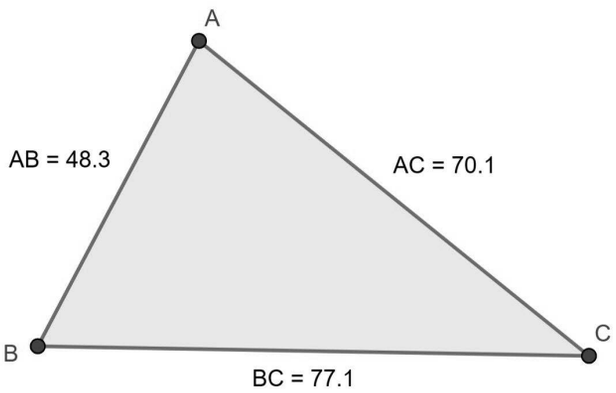


Step 1: Add together the lengths of each side to calculate the perimeter.

$$Perimeter = 4.1 + 9.7 + 7 + 6.4 = 27.2 \text{ units}$$

Guided Example

Calculate the perimeter of this 2D shape:



Step 1: Add together the lengths of each side to calculate the perimeter.

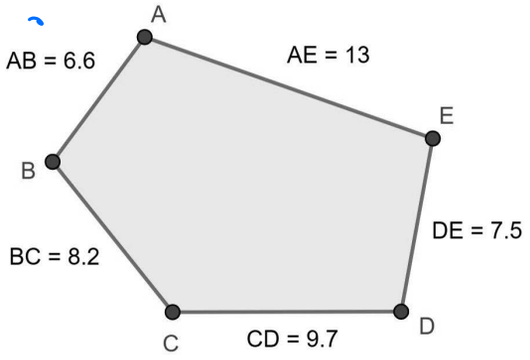
$$\begin{array}{r} 48.3 \\ +\ 70.1 \\ +\ 77.1 \\ \hline 195.5 \end{array}$$

195.5 units

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

1. Calculate:

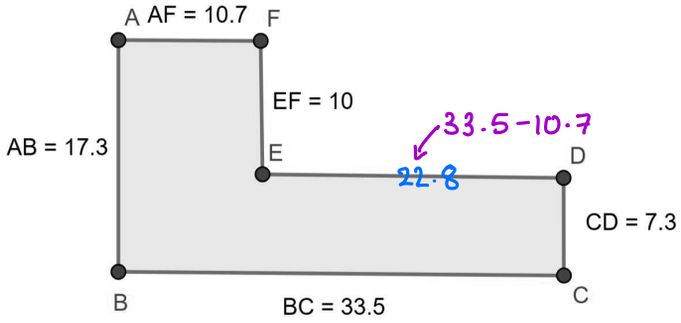
a) the perimeter of this pentagon.



13
6.6
8.2
9.7
$3\ 7_2.5$
45.0

45 units

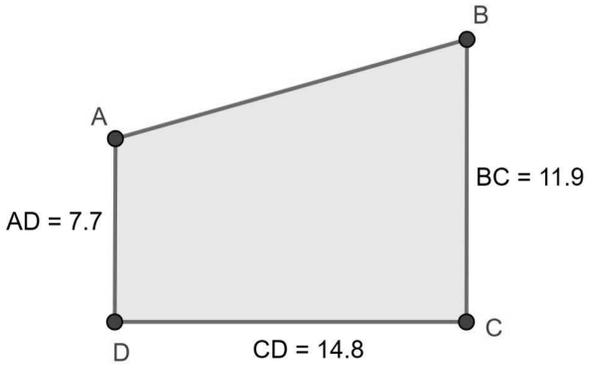
b) the perimeter of this composite shape.



10.7
10
22.8
7.3
33.5
$1_2 7_2.3$
101.6

101.6 units

c) the length AB, given that the perimeter of the whole shape is 49.8 units.



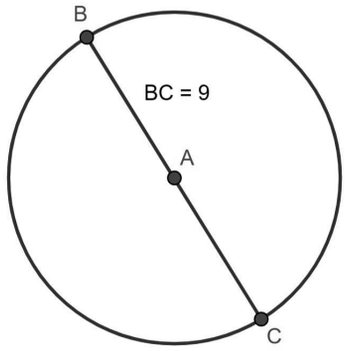
Perimeter (excluding AB)
11.9
+14.8
$+\ 7_2.7$
34.4

AB = 49.8 − 34.4
= 15.4 units

Section B

Worked Example

Calculate the circumference of the given circle:



Step 1: Calculate the diameter of the circle.

The diameter is the distance across the circle, passing through the midpoint. The line BC is the diameter here. It is already given to us as $d = 9$ units.

Step 2: Use the formula to calculate the circumference of the given circle.

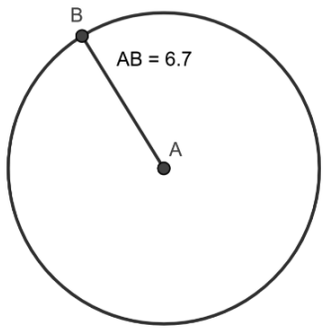
$$Circumference = \pi d = \pi \times 9 = 28.274 \ldots \text{ units}$$

Rounding the answer to 2 decimal places, we have

$$Circumference = 28.27 \text{ units}.$$

Guided Example

Calculate the circumference of the given circle:



Step 1: Calculate the diameter of the circle.

$6.7 \times 2 = 13.4$

Step 2: Use the formula to calculate the circumference of the given circle.

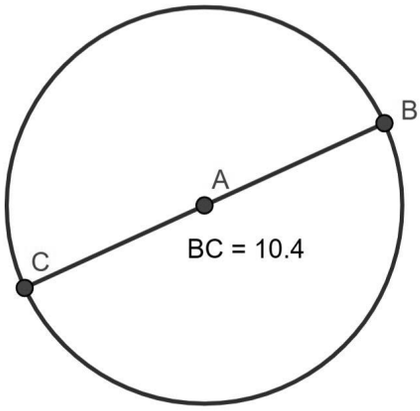
Circumference $= \pi \times d$

$= \pi \times 13.4 =$ 42.1 units (3sf)

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

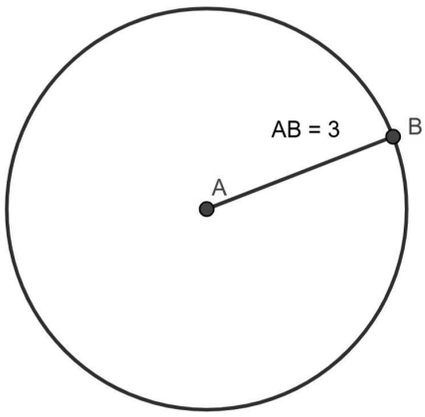
2. Calculate:

a) the circumference of the following circle with $BC = 10.4$.



Circumference = $\pi \times d$
$= \pi \times 10.4$
$= 32.67...$
$= 32.7$ units (3sf)

b) the circumference of the following circle with $AB = 3$.



$d = 3 \times 2 = 6$
Circumference = $\pi \times d$
$= \pi \times 6$
$= 18.84....$
$= 18.8$ units (3sf)

3. A circle has circumference measuring 26.55 cm. Calculate the diameter of the circle. Give your answer to 2 decimal places.

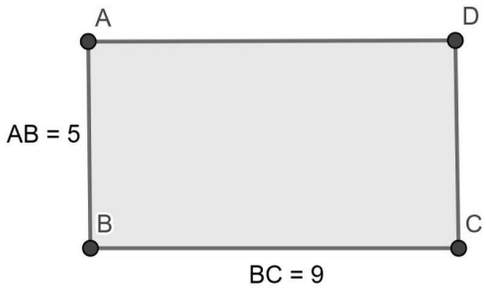
Circumference = $\pi \times d$
$26.55 = \pi \times d$
$\div \pi$
$8.4511... = d$

$d = 8.45$ cm (2dp)

Section C

Worked Example

Calculate the area of the given rectangle:



Step 1: Calculate the length and width of the quadrilateral.

We have been given the length and width:

$$Length = AB = 5$$

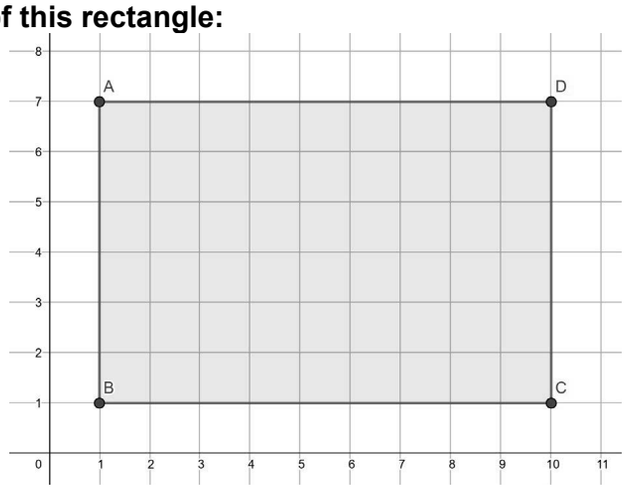
$$Width = BC = 9$$

Step 2: Multiply the length by the width to find the area and use the correct units.

$$Area = Length \times Width = 5 \times 9 = 45 \text{ units}^2$$

Guided Example

Calculate the area of this rectangle:



Step 1: Calculate the length and width of the quadrilateral.

l = 6

w = 9

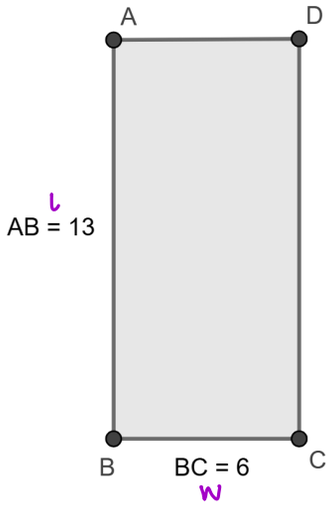
Step 2: Multiply the length by the width to find the area and use the correct units.

6 x 9 = 54 units²

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

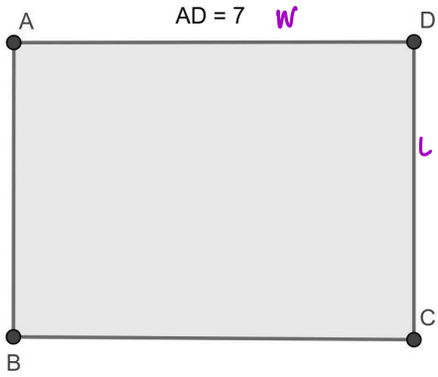
4. Calculate:

a) The area of this rectangle



Area = l x w
= 13 x 6
= 78 units²

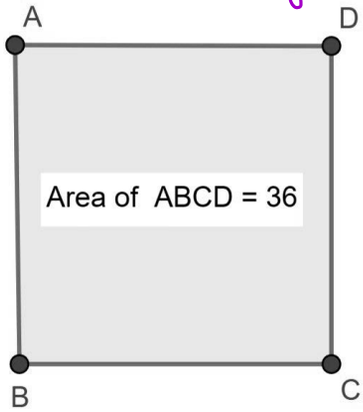
b) The length of AB, if the area of this rectangle is 36.4 units²



Area = l x w
36.4 = l x 7
÷7
l = 5.2 units

c) The length of the sides of a square if its area is 36 cm²

Length = width

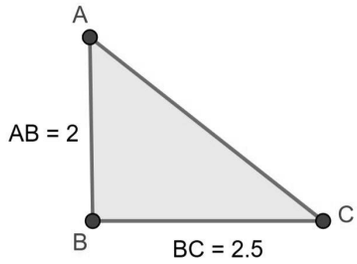


Area = l x w
= l x l
36 = l²
√
l = √36
= 6 cm

Section D

Worked Example

Calculate the area of this triangle:



Step 1: Calculate the base and height of the triangle.

We have been given the base and height:

$$Base = 2.5$$

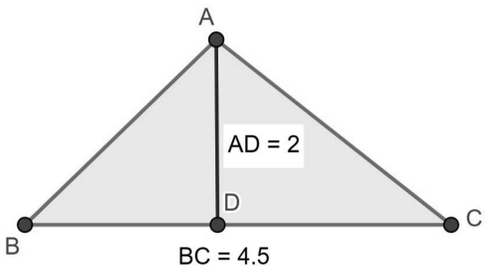
$$Height = 2$$

Step 2: Use the formula to calculate the area of the triangle.

$$Area = \frac{Base \times Height}{2} = \frac{2.5 \times 2}{2} = 2.5 \text{ units}^2$$

Guided Example

Calculate the area of this triangle:



Step 1: Calculate the base and height of the triangle.

$b = 4.5$

$h = 2$

Step 2: Use the formula to calculate the area of the triangle.

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

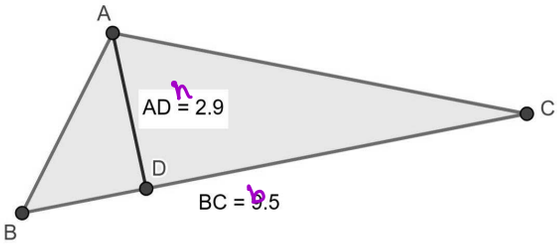
$Area = \frac{1}{2} \times 4.5 \times 2$

$= 4.5 \text{ units}^2$

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

5. Calculate:

a) The area of this triangle

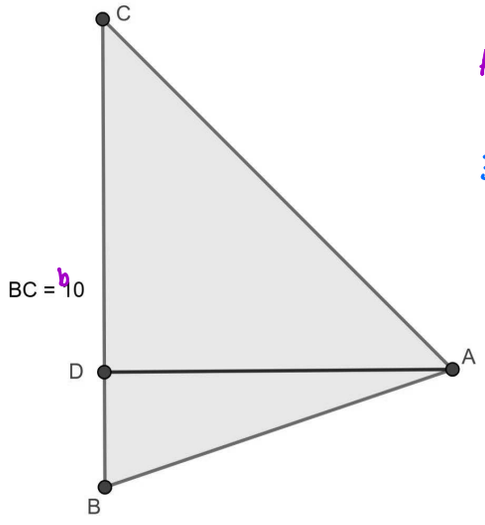


$\text{Area} = \frac{1}{2} b \times h$

$= \frac{1}{2} \times 9.5 \times 2.9$

$= 13.775$ units

b) The height of this triangle if the area is 37.5 units^2



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

$37.5 = \frac{1}{2} \times 10 \times h$

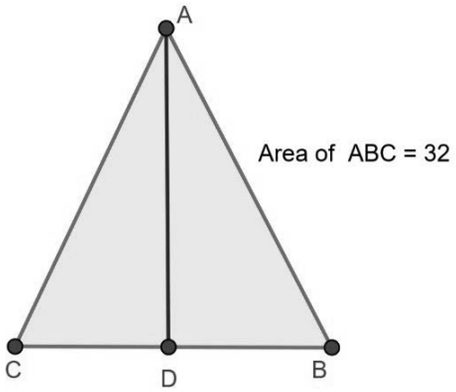
$37.5 = 5h$

$\div 5$

$h = 7.5$ units

c) The base and height of this triangle if the base and height are equal in value and the area is 32 units^2

$b = h$



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

$32 = \frac{1}{2} h^2$

$\times 2$

$64 = h^2$

$\sqrt{\ }$

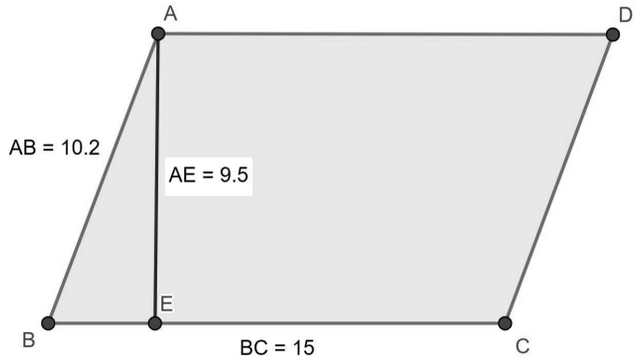
$\sqrt{64} = h$

$h = 8$ units

Section E

Worked Example

Calculate the area of this parallelogram:



Step 1: Calculate the perpendicular height and base of the parallelogram.

We must ensure we use the perpendicular height of the parallelogram, not the length of the sloped side.

$$Perpendicular\ Height = 9.5$$

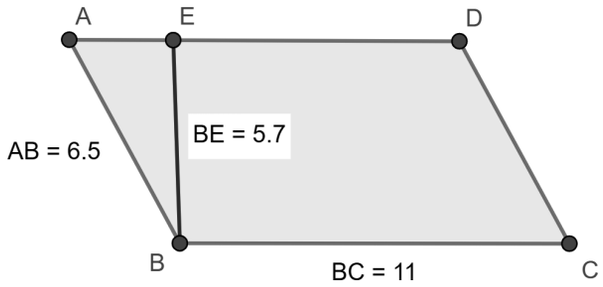
$$Base = 15$$

Step 2: Multiply the base by the perpendicular height to get the area.

$$Area = Base \times Perpendicular\ Height = 9.5 \times 15 = 142.5 \text{ units}^2$$

Guided Example

Calculate the area of this parallelogram:



Step 1: Calculate the perpendicular height and base of the parallelogram.

$h = 5.7$

$b = 11$

Step 2: Multiply the base by the perpendicular height to get the area.

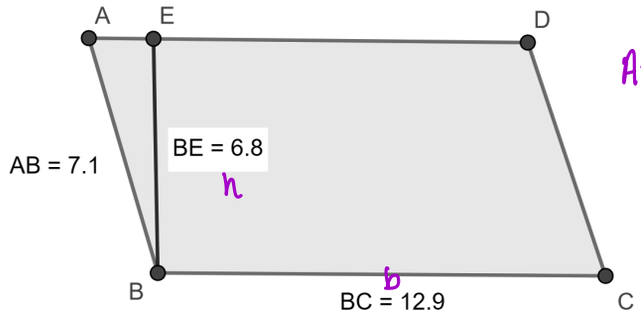
Area = perpendicular height × base

$= 5.7 \times 11 = 62.7 \text{ units}^2$

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

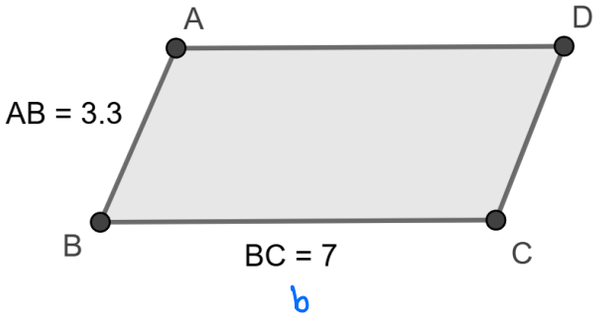
6. Calculate:

a) The area of this parallelogram



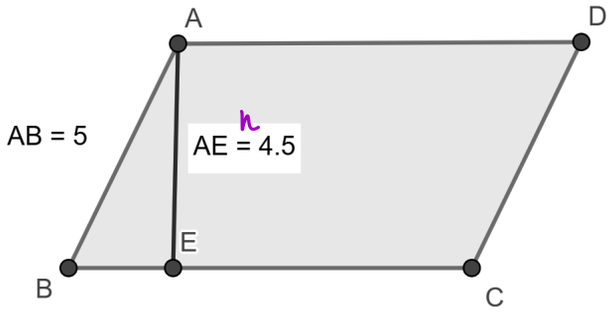
Area = perpendicular height × base
= 6.8 × 12.9
= 87.72 units²

b) The height of this parallelogram if its area is 21 cm²



Area = perpendicular height × base
21 = h × 7
÷7
h = 3 units

c) The base of this parallelogram if its area is 36 cm²

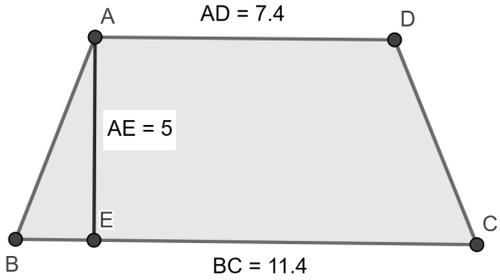


Area = perpendicular height × base
36 = 4.5 × b
÷4.5
b = 8 units

Section F

Worked Example

Calculate the area of this trapezium:



Step 1: Work out the lengths of the parallel sides of the trapezium, as well as the perpendicular height.

We are given the lengths of the parallel sides. We will call them a and b for use in the formula:

$$a = 7.4$$
$$b = 11.4$$

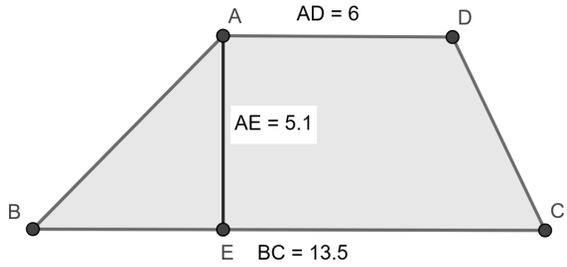
$$Perpendicular\ Height = 5$$

Step 2: Calculate the area of the trapezium using the formula.

$$Area = \frac{1}{2}(a + b) \times h = \frac{1}{2}(7.4 + 11.4) \times 5 = 47 \text{ units}^2$$

Guided Example

Calculate the area of this trapezium:



Step 1: Work out the lengths of the parallel sides of the trapezium, as well as the perpendicular height.

$a = 6$
$b = 13.5$
$h = 5.1$

Step 2: Calculate the area of the trapezium using the formula.

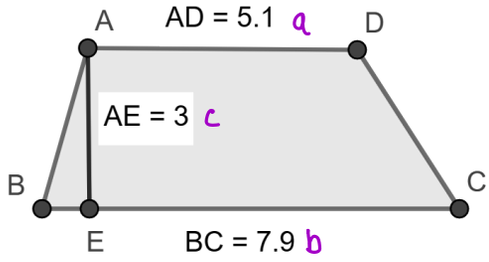
$Area = \frac{1}{2}(a+b)h$ $\quad Area = \frac{1}{2}(6+13.5)\times 5.1$

$= 2.55 \times 19.5 = 49.725$ units^2

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

7. Calculate:

a) The area of this trapezium



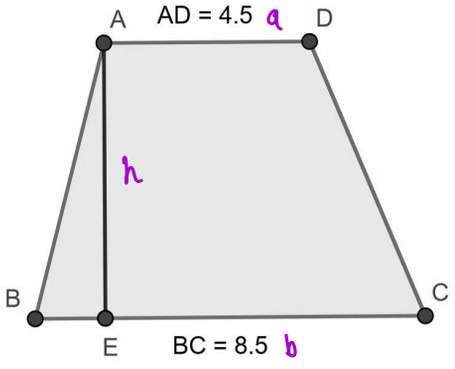
$\text{Area} = \frac{1}{2}(a+b)h$

$= \frac{1}{2}(5.1+7.9)\times 3$

$= 1.5 \times 13$

$= 19.5 \text{ units}^2$

b) The height of this trapezium if the area is 39 cm^2



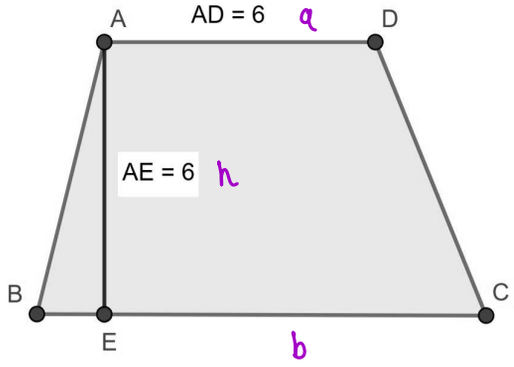
$\text{Area} = \frac{1}{2}(a+b)h$

$39 = \frac{1}{2}(4.5+8.5)\times h$ (×2)

$78 = 13h$ (÷13)

$h = 6 \text{ cm}$

c) The length of BC if the area if 48 cm^2



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

$48 = \frac{1}{2}(6+b)\times 6$

$48 = 3(6+b)$ (÷3)

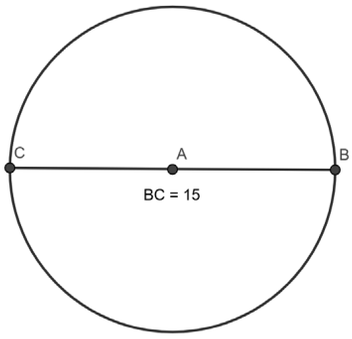
$16 = 6+b$ (−6)

$b = 10 \text{ cm}$

Section G

Worked Example

Calculate the area of this circle:



Step 1: Work out the radius of the circle.

The radius is the distance from the middle of the circle to the circumference. We are given the diameter here – the total distance across the circle. To get the radius, we need to divide the diameter by 2:

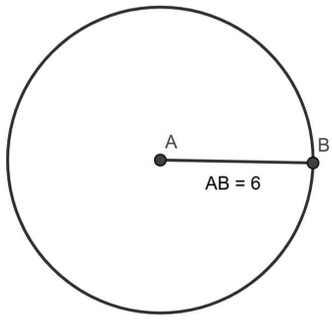
$$Radius = Diameter \div 2 = 15 \div 2 = 7.5$$

Step 2: Use the formula to calculate the area of the circle.

$$Area = \pi r^2 = \pi \times 7.5^2 = 176.7 \text{ units}^2$$

Guided Example

Calculate the area of this circle:



Step 1: Work out the radius of the circle.

$r = 6$

Step 2: Use the formula to calculate the area of the circle.

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

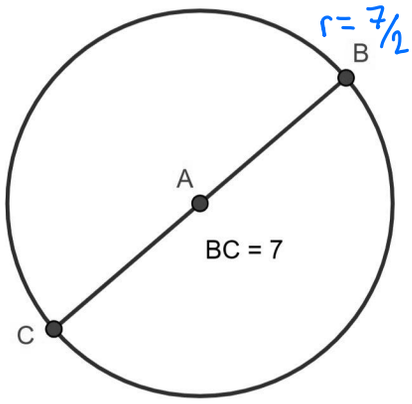
$= \pi \times 6^2$

$= 36\pi = 113.1 \text{ units}^2$ (1dp)

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

8. Calculate:

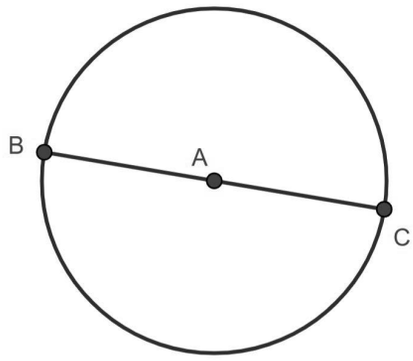
a) The area of this circle



$r = 7/2 = 3.5$

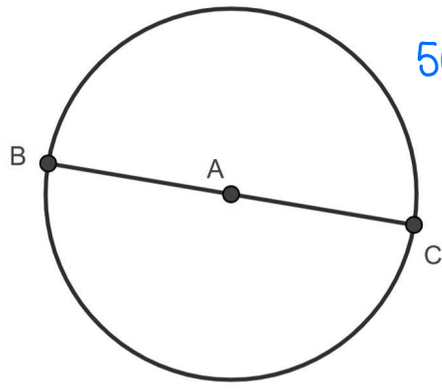
$\text{Area} = \pi r^2$
$= \pi \times 3.5^2$
$= 38.48...$
$= 38.5 \text{ units}^2$ (1dp)

b) The radius of this circle if the area is 95.03 cm^2



$\text{Area} = \pi r^2$
$95.03 = \pi r^2$
$\div \pi$
$r^2 = 30.248...$
$\sqrt{}$
$r = 5.49...$
$r = 5.5 \text{ cm}$ (1dp)

c) The circumference of this circle if its area is 50.23 cm^2



$\text{Area} = \pi r^2$
$50.23 = \pi r^2$
$\div \pi$
$r^2 = 15.988...$
$\sqrt{}$
$r = 3.998...$
$\times 2$
$d = 7.996...$

$\text{Circumference} = \pi \times d$
$= \pi \times 7.996...$
$= 25.123...$
$= 25.1 \text{ cm}$