10 The shape, shown shaded in the diagram, is the region between two semicircles.


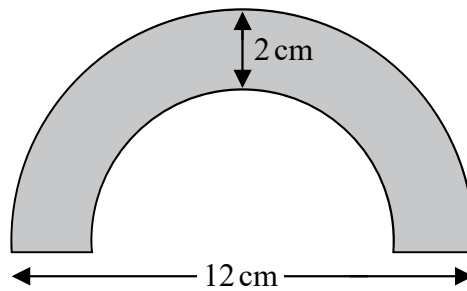
2 cm

Diagram **NOT** accurately drawn

12 cm

The diameter of the outer semicircle is 12 cm.
The shape has constant thickness 2 cm.

Calculate the area of the shape.
Give your answer as a multiple of $\pi$.

.................................................. cm$^2$

**(Total for Question 10 is 3 marks)**

**11** The diagram shows sector *OPQ* of a circle, centre *O*
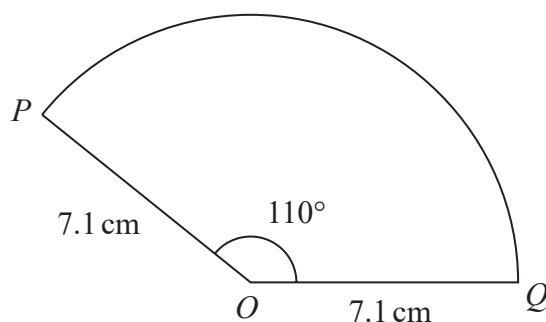


Diagram **NOT** accurately drawn

*OP* = *OQ* = 7.1 cm
Angle *POQ* = 110°

Calculate the area of sector *OPQ*
Give your answer correct to one decimal place.

.................................................... cm$^2$

**(Total for Question 11 is 2 marks)**

*P 6 8 7 2 7 A 0 1 4 3 2*

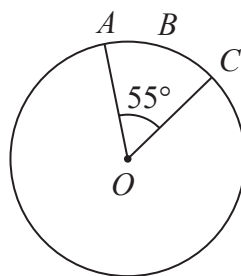**16** The diagram shows a circle with centre $O$

*A* *B*

*C*

55°

*O*

Diagram **NOT**
accurately drawn

$A$, $B$ and $C$ are points on the circle so that the length of the arc $ABC$ is 5 cm.

Given that angle $AOC = 55°$

work out the area of the circle.
Give your answer correct to one decimal place.

.................................................... cm$^2$

**(Total for Question 16 is 4 marks)**

**16** *OAPB* is a sector of a circle, centre *O*

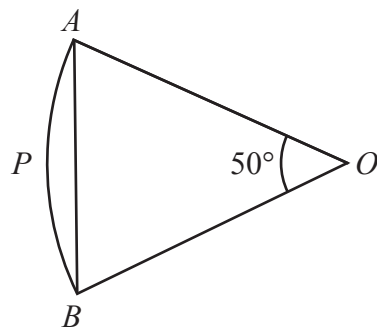

Diagram **NOT** accurately drawn

Angle *AOB* = 50°

Area of triangle *OAB* = 120 cm²

Work out the area of the sector *OAPB*
Give your answer correct to 3 significant figures.

.............................................................. cm²

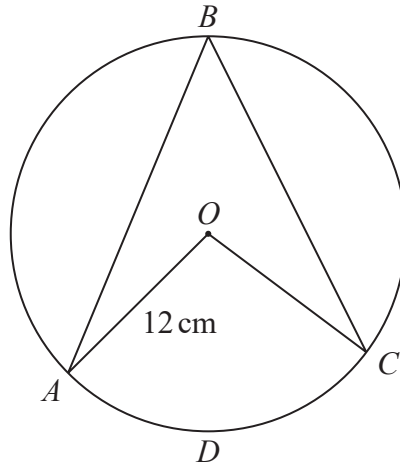**(Total for Question 16 is 4 marks)**

**19**



Diagram **NOT** accurately drawn

$A$, $B$, $C$ and $D$ are points on a circle with centre $O$ and radius 12 cm.

The area of the sector $OADC$ of the circle is 100 cm$^2$

Work out the size of angle $ABC$.
Give your answer correct to 3 significant figures.

.............................................. °

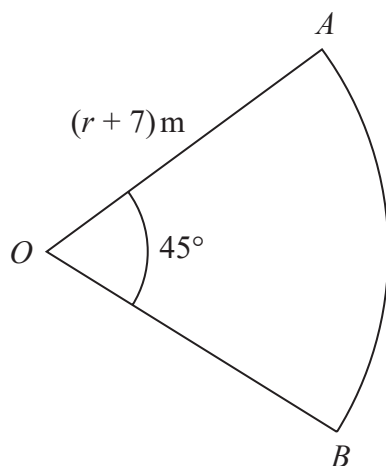**(Total for Question 19 is 4 marks)**

*P 6 4 6 9 3 A 0 1 8 2 8*

**19**



Diagram **NOT** accurately drawn

*OAB* is a sector **S** of a circle with centre *O* and radius (*r* + 7) metres.
Angle *AOB* = 45°

A circle **C** has radius (*r* − 2) metres.

The area of sector **S** is twice the area of circle **C**

Find the value of *r*
Show your working clearly.

*r* = .......................................................

**(Total for Question 19 is 5 marks)**

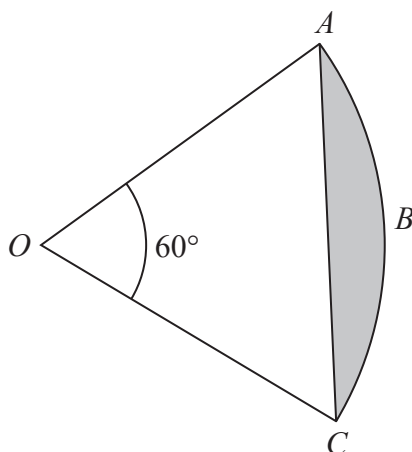**20** The diagram shows a sector *OABC* of a circle centre *O*



Diagram **NOT**
accurately drawn

Angle *AOC* = 60°

The area of the shaded segment *ABC* is $38 \, \text{cm}^2$

Work out the perimeter of the shaded segment *ABC*
Give your answer correct to one decimal place.

............................................................ cm

**(Total for Question 20 is 4 marks)**

**21** The diagram shows the cross section of a circular water pipe.
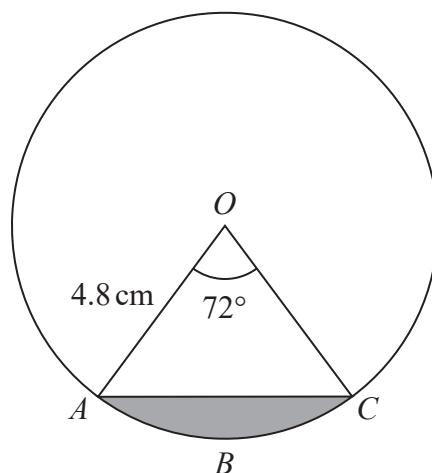


$O$

4.8 cm
$72°$

$A$
$B$
$C$

Diagram **NOT** accurately drawn

*OABC* is a sector of the circle, centre *O*

The shaded region in the diagram represents the water flowing in the pipe.

The water flows at 14 cm/s in the pipe.

Work out the volume of water that has flowed through the pipe in 3 minutes.
Give your answer in cm$^3$ correct to 3 significant figures.

....................................................... cm$^3$

**(Total for Question 21 is 5 marks)**

**22**
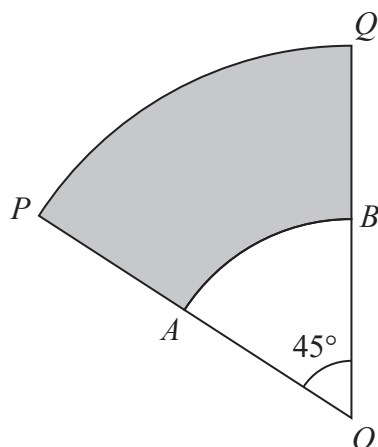


Diagram **NOT** accurately drawn

*OPQ* is a sector of a circle, centre *O*
*OAB* is a sector of a circle, centre *O*

*A* is the point on *OP* such that *OA* : *AP* = 3 : 2
*B* is the point on *OQ* such that *OB* : *BQ* = 3 : 2
Angle *POQ* = 45°

The area of the shaded region is $\dfrac{81}{2}\pi$ cm²

Work out the perimeter of the shaded region.
Give your answer in terms of $\pi$.

.................................................... cm

**(Total for Question 22 is 6 marks)**

**25** The diagram shows two circles such that the region **R**, shown shaded in the diagram, is the region common to both circles.
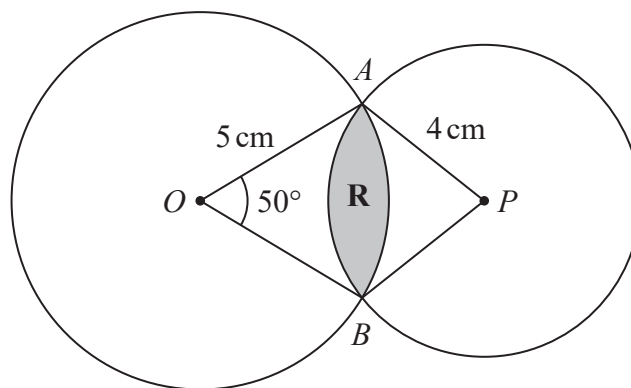


Diagram **NOT** accurately drawn

One of the circles has centre $O$ and radius 5 cm.
The other circle has centre $P$ and radius 4 cm.
Angle $AOB = 50°$

Calculate the area of region **R**.
Give your answer correct to 3 significant figures.

....................................................... cm$^2$

**(Total for Question 25 is 6 marks)**