Solutions by
Kenneth Stafford
MATHS TUTOR
ken@kennethstafford.co.uk

GCSE (9-1) Grade 5
Sectors and Arcs



Instructions

Use **black** ink or ball-point pen.
Fill in the boxes at the top of this page with your name.
Answer **all** questions.
Answer the questions in the spaces provided
– there may be more space than you need.
Show all your working out

Information

The marks for **each** question are shown in brackets.
use this as a guide as to how much time to spend on each question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed

Advice

Read each question carefully before you start to answer it
Attempt every question
Check your answers if you have time at the end

1.

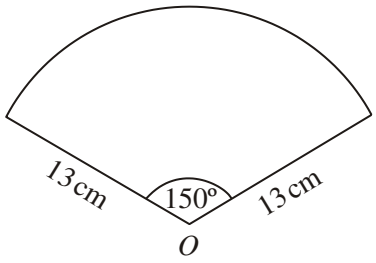


Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre O.
The radius of the circle is 13 cm.
The angle of the sector is 150°.

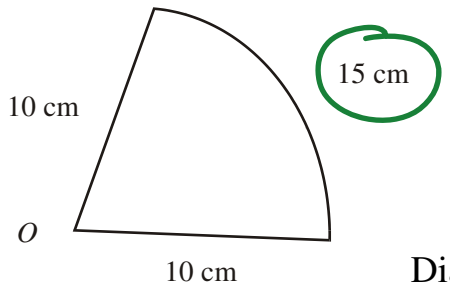
Calculate the area of the sector.
Give your answer correct to 3 significant figures.

$\frac{150}{360} \times 13^2 \times \pi = 221.2204$

221 ..... cm^2

(Total 2 marks)

2.



15 cm

20cm

$C = 20 \times \pi = 20\pi$

$A = 10^2 \times \pi = 100\pi$

Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre O, radius 10 cm.
The arc length of the sector is 15 cm.

Calculate the area of the sector.

$\frac{15}{20\pi} \times 100\pi = 75$

75 ..... cm^2

(Total 4 marks)

3.

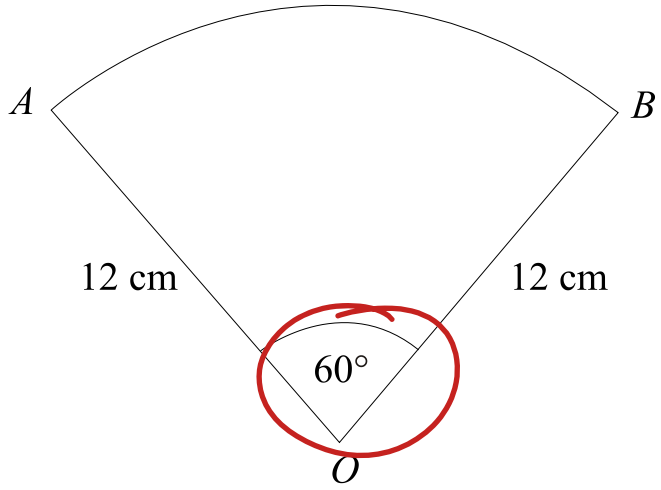
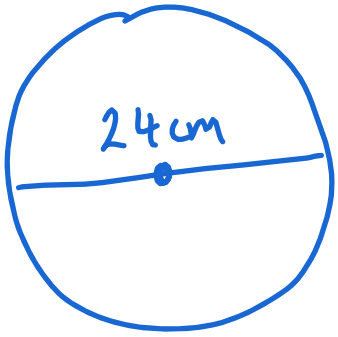


Diagram **NOT** accurately drawn

OAB is a sector of a circle, centre *O*.
Angle *AOB* = 60°.
OA = *OB* = 12 cm.

Work out the length of the arc *AB*.
Give your answer in terms of π.



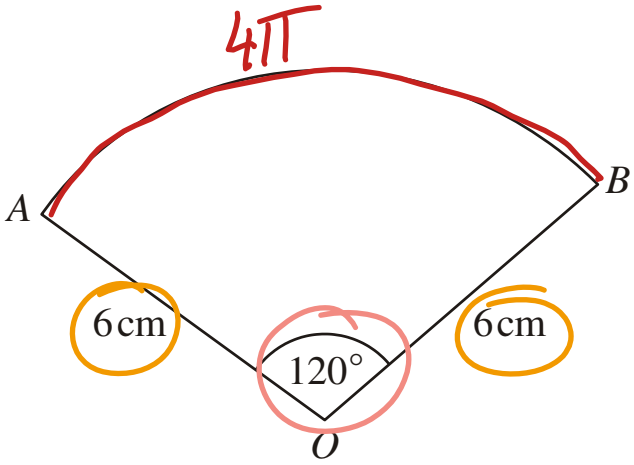
Circumference = 24π

$\frac{60}{360} \times 24\pi = 4\pi$

4π ..... cm

(Total 3 marks)

4.

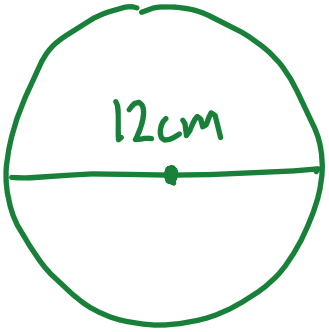


r = 6 cm
d = 12 cm

Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre *O*.
The radius of the circle is 6 cm.
Angle *AOB* = 120°.

Work out the **perimeter** of the sector.
Give your answer in terms of π in its simplest form.



$C = 12\pi$

$\text{Arc length} = \frac{120}{360} \times 12\pi = 4\pi$

$\text{Perimeter} = 4\pi + 6 + 6 = 4\pi + 12$

$4\pi + 12$ ..... cm

(Total 3 marks)

5.

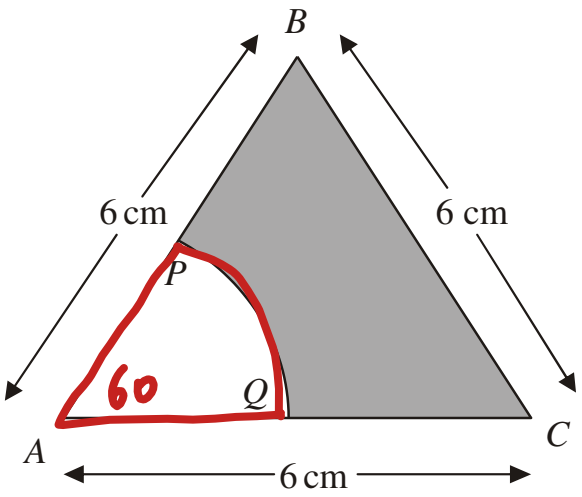
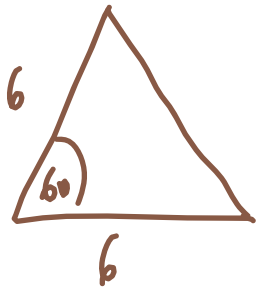


Diagram **NOT** accurately drawn

The diagram shows an equilateral triangle ABC with sides of length 6 cm.

P is the midpoint of AB.
Q is the midpoint of AC.
APQ is a sector of a circle, centre A.

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



Area of triangle $= \frac{1}{2} \times 6 \times 6 \times \sin(60)$

$= 9\sqrt{3}\ cm^2$



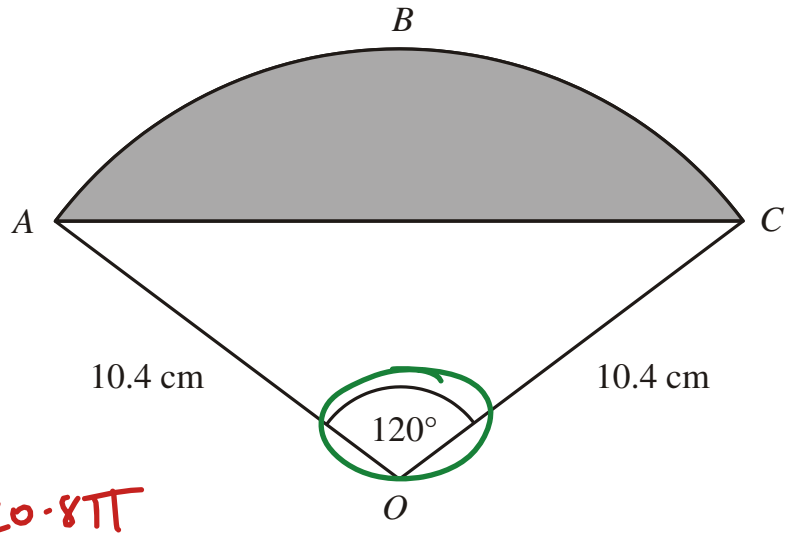
Area of sector $= \frac{60}{360} \times 3^2 \times \pi = 4.712388$

$9\sqrt{3} - 4.712388 = 10.9$ ..... cm^2

(Total 4 marks)

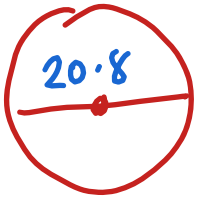
6.

Diagram **NOT** accurately drawn



r = 10·4 cm

d = 20·8 cm



C = 20·8π

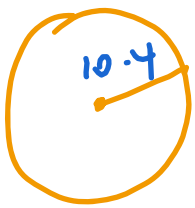
The diagram shows a sector $OABC$ of a circle with centre O.
$OA = OC = 10.4$ cm.
Angle $AOC = 120°$.

(a) Calculate the length of the arc ABC of the sector.
Give your answer correct to 3 significant figures.

$\frac{120}{360} \times 20{\cdot}8\pi = 21.8$ .....cm

(3)

(b) Calculate the area of the shaded segment ABC.
Give your answer correct to 3 significant figures.



Area = $10{\cdot}4^2 \times \pi = 339.79$

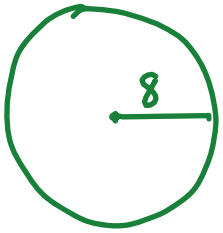
$\frac{120}{360} \times 339{\cdot}79 = 113$ .....cm^2

(4)

(Total 7 marks)

7. The diagram shows a sector of a circle with centre O.
The radius of the circle is 8 cm.

PRS is an arc of the circle.
PS is a chord of the circle.
Angle $POS = 40°$



Area = $8^2 \times \pi$
$= 64\pi$

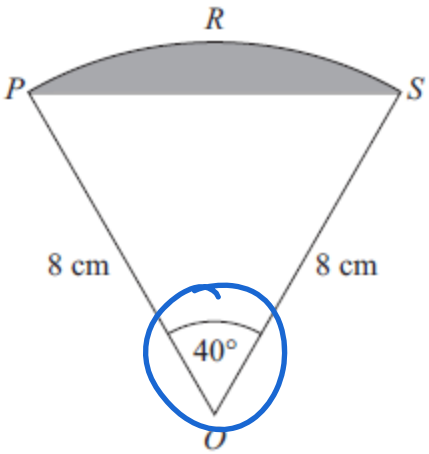
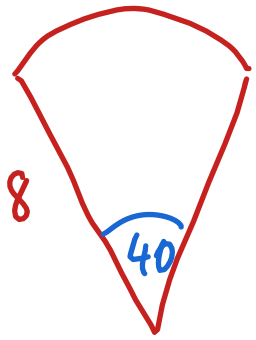
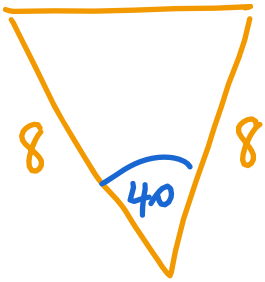


Diagram **NOT** accurately drawn

Calculate the area of the shaded segment.
Give your answer correct to 3 significant figures.



Area of segment = $\frac{40}{360} \times 64\pi = 22.340$



Area of triangle = $\frac{1}{2} \times 8 \times 8 \times \sin(40)$
$= 20.569$

Area of segment = $22.340 - 20.569 =$ 1.77 ..... cm^2

(Total 5 marks)

8.

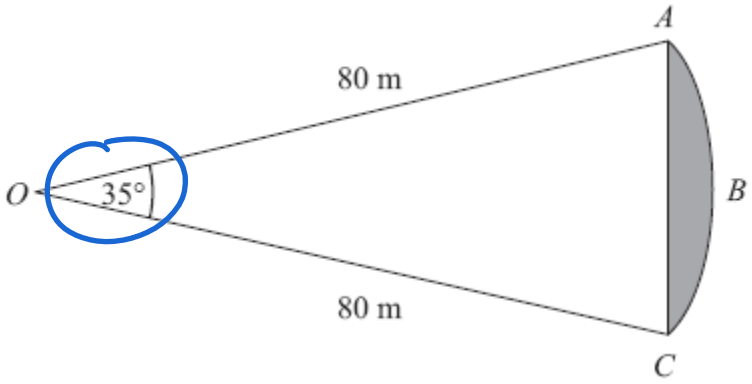
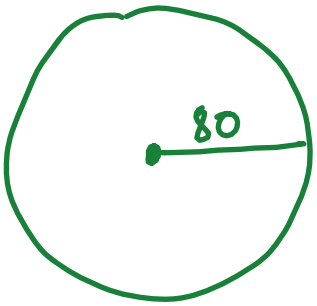


Diagram **NOT** accurately drawn

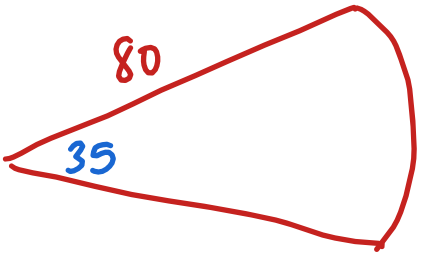
ABC is an arc of a circle centre *O* with radius 80 m.
AC is a chord of the circle.
Angle *AOC* = 35°.

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

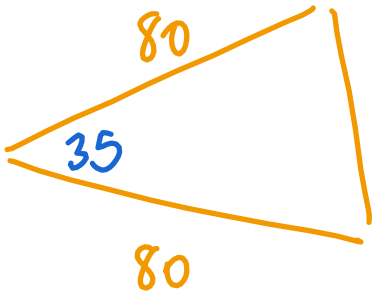


Area = $80^2 \times \pi$

6400π



Area of Segment $= \frac{35}{360} \times 6400\pi = 1954.769$



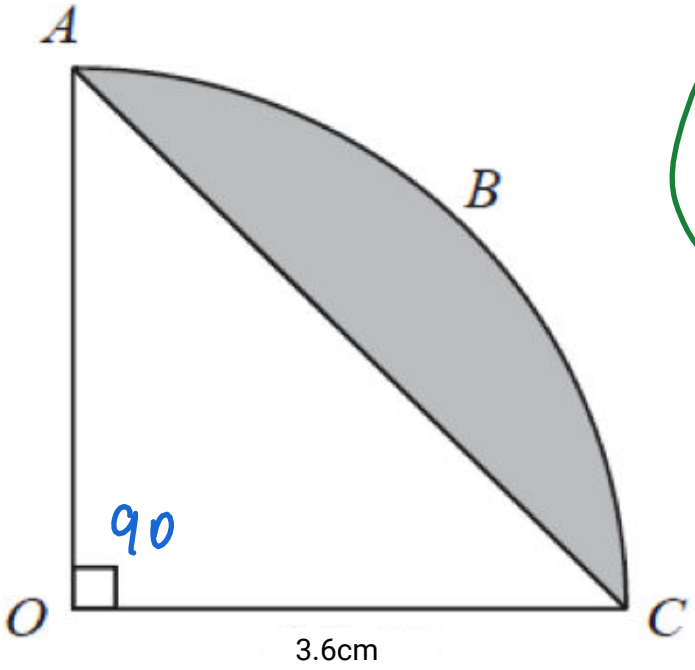
Area of triangle $= \frac{1}{2} \times 80 \times 80 \times \sin(35) =$ 1835.444

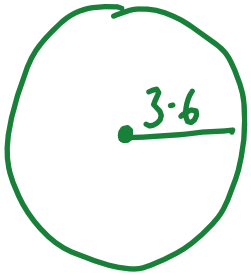
Area of segment = $1954.769 - 1835.444 =$ 119

..... m^2

(Total 5 marks)

9. The arc ABC is a quarter of a circle with centre 0 and radius 3.6cm



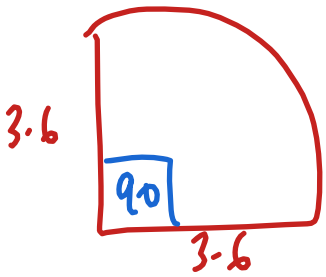


Area = $\pi \times 3.6^2$

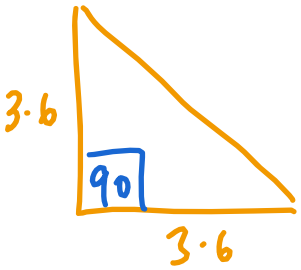
$= 40.715$

AC is a chord of the circle. Work out the area of the shaded segment

Give your answer to 1 decimal place



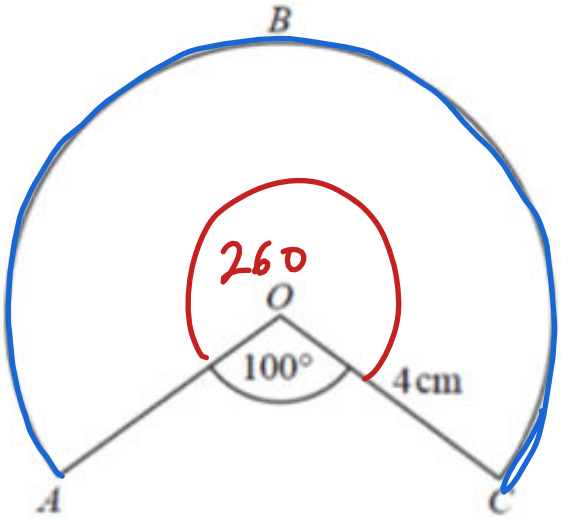
Area of Segment $= \frac{90}{360} \times 40.715 = 10.179$



Area of triangle $= \frac{1}{2} \times 3.6 \times 3.6 = 6.48$

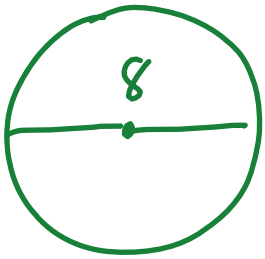
Area of Segment $= 10.179 - 6.48 =$ 3.7cm ..... **(3)**

10. The diagram shows a sector of a circle of radius 4 cm.



Work out the length of arc ABC

Give your answer correct to 3 significant figures.

Circumference of circle = 

$8 \times \pi = 8\pi$ cm

Arc length $= \frac{260}{360} \times 8\pi = 18.151$

18.2 cm ..... **(2)**