



EXAM PAPERS PRACTICE

GCSE OCR Math J560

Circle Sectors & Arcs

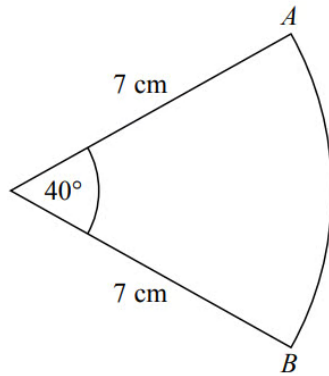
Answers

*"We will help you to
achieve A Star "*



Answer 1

The diagram shows a sector of a circle of radius 7 cm.



Work out the length of arc AB .
Give your answer correct to 3 significant figures.

$$\text{Arc is } \frac{40}{360} \text{ OF CIRCUMFERENCE}$$

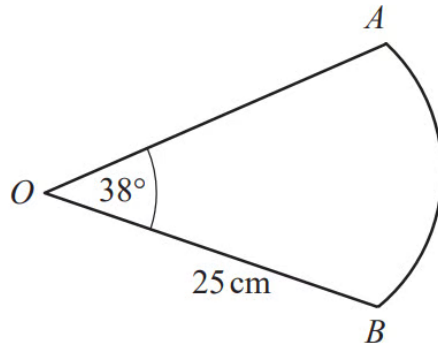
$$\text{Arc} = \frac{40}{360} \times 2 \times \pi \times 7$$

$$= \underline{\underline{4.89 \text{ cm}}}$$

CIRCLE
CIRCUMFERENCE
 $C = \pi d (= 2\pi r)$



Answer 2



NOT TO
SCALE

The diagram shows a sector of a circle, centre O , radius 25 cm .
The sector angle is 38° .

Calculate the length of the arc AB .
Give your answer correct to 4 significant figures.

The circumference of a circle is $2\pi r$.

Therefore, the circumference of the total circle that this sector has been cut from is:

$$2\pi(25) = 50\pi\text{ cm.}$$

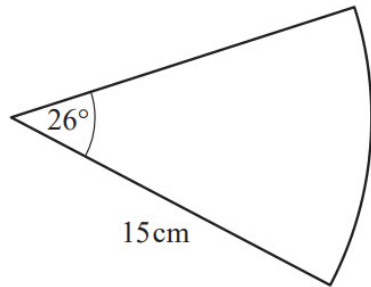
The arc of the sector is a fraction of the circumference of the whole circle.

To work out the fraction:

$$\begin{aligned} \text{arc } AB &= \frac{\text{angle } AOB}{\text{total angle of a circle}} \times 50\pi = \frac{38^\circ}{360^\circ} \times 50\pi \\ &= \mathbf{16.58\text{ cm (4 sf)}} \end{aligned}$$



Answer 3



NOT TO
SCALE

The diagram shows a sector of a circle with radius 15cm.

Calculate the perimeter of this sector.

The perimeter of a sector is the sum of two radii and the arc length of the semi-circle.

The arc length is the circumference of the circle multiplied by the ratio of the sector angle and 360°.

$$\left(2\pi r \times \frac{\text{sector angle}}{360^\circ}\right).$$

$$r + r + 2\pi r \times \frac{\text{sector angle}}{360^\circ}$$

$$15\text{cm} + 15\text{cm} + 2\pi \times 15\text{cm} \times \frac{26^\circ}{360^\circ}$$

Add the terms to get the perimeter of the sector.

36.3cm



Answer 4

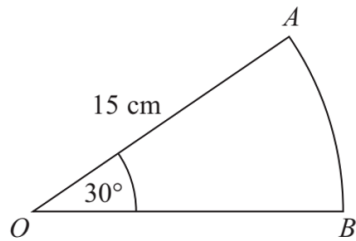


Diagram **NOT**
accurately drawn

OAB is a sector of a circle, centre O .
The radius of the circle is 15 cm.
The angle of the sector is 30° .

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

$$A = \frac{30}{360} \times \pi \times 15^2$$
$$= \underline{\underline{58.9 \text{ cm}^2}}$$

AREA OF SECTOR

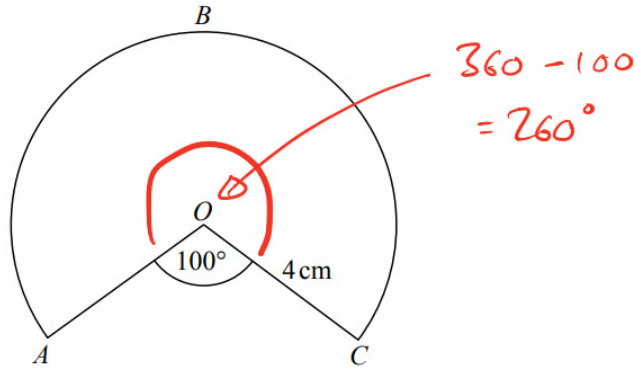
A hand-drawn diagram of a sector with radius r and angle θ . The diagram is enclosed in a blue rectangular box.

$$A = \frac{\theta}{360} \times \pi r^2$$



Answer 5

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



Work out the length of the arc ABC .
Give your answer correct to 3 significant figures.

$$\begin{aligned} \text{Arc } ABC &= \frac{260}{360} \times 2 \times \pi \times 4 \\ &= 18.1514 \dots \\ &\quad \downarrow \\ &\quad \geq 5 \\ &\quad \downarrow \text{Round UP} \\ &= \underline{\underline{18.2 \text{ cm}}} \end{aligned}$$

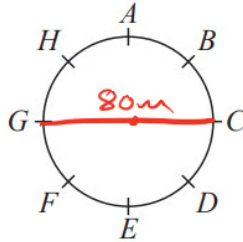
SECTOR OF A CIRCLE

$$\text{ARC LENGTH} = \frac{\theta}{360} \times 2\pi r$$
$$\text{SECTOR AREA} = \frac{\theta}{360} \times \pi r^2$$



Answer 6

Hasmeet walks once round a circle with diameter 80 metres.

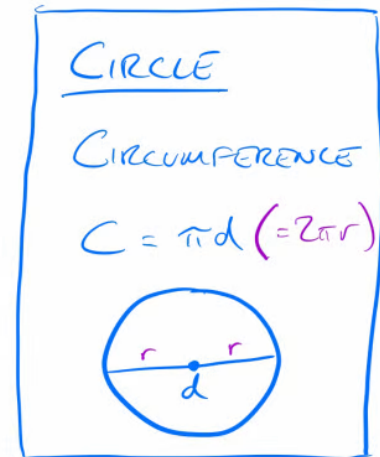


There are 8 points equally spaced on the circumference of the circle.

(a) Find the distance Hasmeet walks between one point and the next point.

$$\begin{aligned} \text{CIRCUMFERENCE} &= \pi \times d \\ &= \pi \times 80 \\ &= \underline{\underline{80\pi \text{ m}}} \end{aligned}$$

$$\begin{aligned} AB &= \frac{80\pi}{8} \\ &= 10\pi \\ &= \underline{\underline{31.4 \text{ m}}} \end{aligned}$$

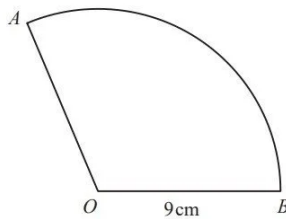




Answer 7

AB is an arc of a circle, centre O , radius 9 cm.
The length of the arc AB is 6π cm.
The area of the sector AOB is $k\pi$ cm².

Find the value of k .



NOT TO
SCALE

The length of an arc is given by

$$l = r\theta$$

Where r is the radius and θ is the angle of the sector. Using this we have

$$6\pi = 9 \times \theta$$

$$\theta = \frac{6\pi}{9}$$

$$\theta = \frac{2}{3}\pi$$

The area of a sector is given by

$$A = \frac{1}{2}r^2\theta$$

So, using our known values, we have

$$A = \frac{1}{2}(9)^2 \times \frac{2}{3}\pi$$

$$A = \frac{1}{2} \times 81 \times \frac{2}{3}\pi$$

$$A = \frac{81}{3}\pi$$

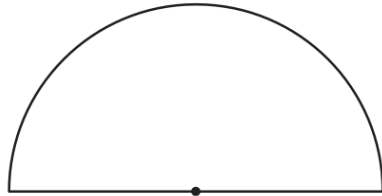
$$A = 27\pi$$

$$k = 27$$



Answer 8

(b)



The length of the arc of the semi-circle is 15cm.

Calculate the area of the semi-circle.

The length of an arc of the semi-circle is πr where r is the radius of the semi-circle.

The length of the arc is 15cm.

$$15\text{cm} = \pi r$$

Divide both sides by π to get the radius.

$$r = \frac{15}{\pi} \text{cm}$$

The area of the semi-circle is given as: $\frac{1}{2}\pi r^2$

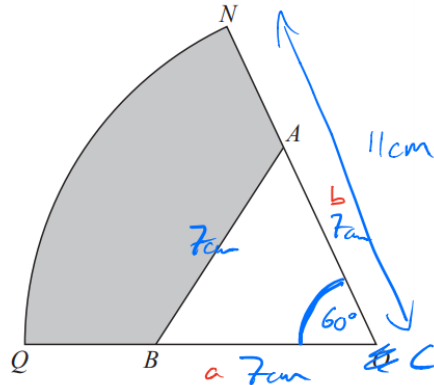
$$\text{Area} = \frac{1}{2}\pi \left(\frac{15}{\pi} \text{cm}\right)^2$$

Use a calculator to get the value of the area:

$$\text{Area} = 35.8\text{cm}^2$$




Answer 9



ONQ is a sector of a circle with centre O and radius 11 cm.

A is the point on ON and B is the point on OQ such that AOB is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector ONQ .
Give your answer correct to 1 decimal place.

SHADDED AREA = 

$$= \frac{60}{360} \times \pi \times 11^2 - \frac{1}{2} \times 7 \times 7 \times \sin 60$$
$$= 42.1378 \dots \rightarrow \text{Ans}$$

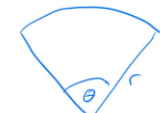
PERCENTAGE = $\frac{42.1378 \dots}{\frac{60}{360} \times \pi \times 11^2} \times 100$

$$= 66.510 \dots$$

↓
≤ 5
Round Down

$$= \underline{\underline{66.5\%}}$$

SECTOR OF A CIRCLE



ARC LENGTH = $\frac{\theta}{360} \times 2\pi r$

SECTOR AREA = $\frac{\theta}{360} \times \pi r^2$

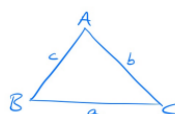
SINE RULE

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

COSINE RULE

$$a^2 = b^2 + c^2 - 2bc \cos A$$

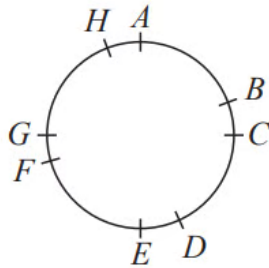
AREA

$$\text{AREA} = \frac{1}{2} ab \sin C$$




Answer 10

Four of the points are moved, as shown in the diagram below.



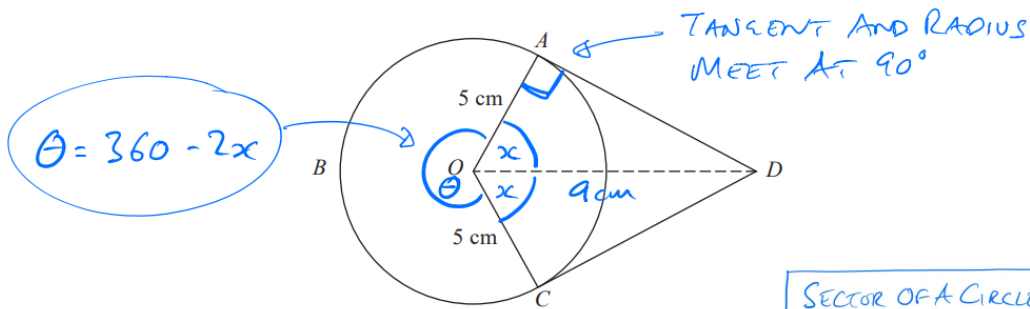
Hasmeet walks once round the circle again.

- (b) Has the mean distance that Hasmeet walks between one point and the next point changed?
You must give a reason for your answer.

No. As TOTAL DISTANCE SAME (80π)
No OF CARDS SAME (8)

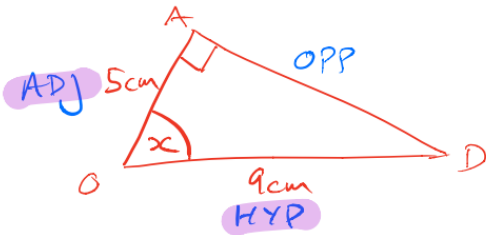


Answer 11



A, B and C are points on a circle of radius 5 cm, centre O.
DA and DC are tangents to the circle.
DO = 9 cm

Work out the length of arc ABC.
Give your answer correct to 3 significant figures.



$$\cos \theta = \frac{\text{ADJ}}{\text{HYP}}$$

$$\cos x = \frac{5}{9}$$

$$x = \cos^{-1}\left(\frac{5}{9}\right)$$

$$= 56.25 \dots \rightarrow \text{Ans}$$

$$\theta = 360 - 2 \times 56.25$$

$$= 247.49 \dots \rightarrow \text{Ans}$$

$$\text{Arc Length} = \frac{247.49}{360} \times 2 \times \pi \times 5$$

$$= 21.59827 \dots$$

Round up

$$= \underline{21.6 \text{ cm}}$$

SECTOR OF A CIRCLE



$$\text{ARC LENGTH} = \frac{\theta}{360} \times 2\pi r$$

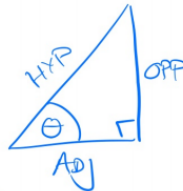
$$\text{SECTOR AREA} = \frac{\theta}{360} \times \pi r^2$$

SOHCAHTOA

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}$$

$$\cos \theta = \frac{\text{ADJ}}{\text{HYP}}$$

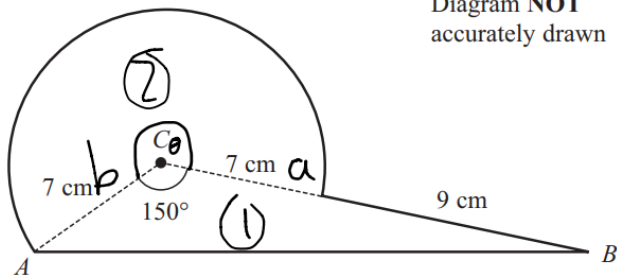
$$\tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$





Answer 12

Here is a shape.



The shape is made from triangle ABC and a sector of a circle, centre C and radius CA .
 $CA = 7$ cm.
 $CB = 16$ cm.
Angle $ACB = 150^\circ$

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

$$\text{Area of a triangle} = \frac{1}{2} a \cdot b \cdot \sin(c)$$

① $a = CB = 16$
 $b = AC = 7$
 $C = \angle ACB = 150^\circ$
Area = $\frac{1}{2} (7)(16)(\sin(150))$
" = $(\frac{1}{2})(7)(16)(\frac{1}{2})$
= 28

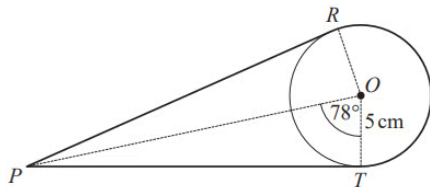
② Area of a sector
= $\pi r^2 \times \frac{\theta}{360}$
 $\theta = 360 - 150$
 210
Area = $\frac{210}{360} \times \pi (7)^2$
" = $\frac{343}{12} \pi$

Total area = area of 1 + area of 2
= 28 + 89.79...
 ≈ 118 (3sf)

118 cm²



Answer 13



NOT TO SCALE

R and T are points on a circle, centre O , with radius 5 cm.
 PR and PT are tangents to the circle and angle $POT = 78^\circ$.

A thin rope goes from P to R , around the major arc RT and then from T to P .

Calculate the length of the rope.

We can use the tan rule to calculate PT

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\rightarrow PT = 5 \tan 78$$

Note that

$$PR = PT$$

and

$$ROT = POT = 78$$

The arc is calculated using

$$l_{\text{arc}} = r \frac{\theta \pi}{180}$$

$$= 5 \times (360 - 2 \times 78) \times \frac{\pi}{180}$$

$$= \frac{17\pi}{3}$$

Hence (since $PR = PT$) we have

$$l = \frac{17\pi}{3} + 2 \times 5 \tan 78$$

$$= 64.8$$



Answer 14

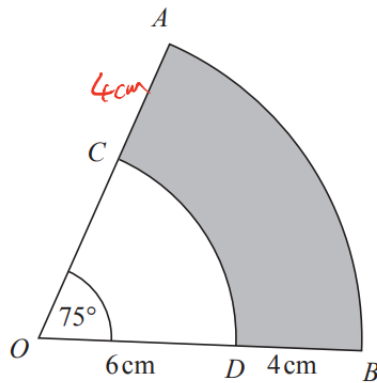
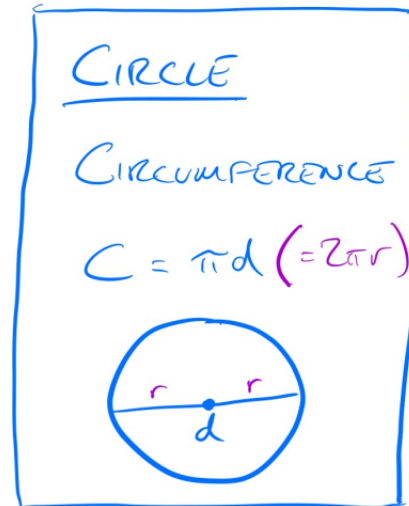


Diagram NOT accurately drawn

OAB is a sector of a circle, centre O .
 OCD is a sector of a circle, centre O .
 OCA and ODB are straight lines.

Angle $AOB = 75^\circ$
 $OD = 6$ cm
 $DB = 4$ cm

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



$$P = AC + CD + DB + BA$$

$$P = 4 + \frac{75}{360} \times 2 \times \pi \times 6 + 4 + \frac{75}{360} \times 2 \times \pi \times 10$$

$$P = 28.94395 \dots$$

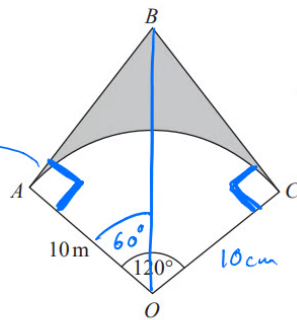
↓ ↓ < 5

$$P = \underline{\underline{28.9 \text{ cm}}}$$



Answer 15

RADIUS AND TANGENT MEET AT 90°



SHADED AREA



OAC is a sector of a circle, centre O, radius 10 m.

BA is the tangent to the circle at point A.
BC is the tangent to the circle at point C.

Angle AOC = 120°

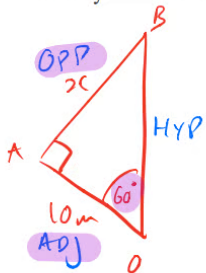
Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

SECTOR OF A CIRCLE

ARC LENGTH = $\frac{\theta}{360} \times 2\pi r$

SECTOR AREA = $\frac{\theta}{360} \times \pi r^2$



$$\tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$

$$10 \times \tan 60 = \frac{x}{10}$$

$$x = 10 \tan 60$$

$$x = 10\sqrt{3}$$

know $\tan 60 = \sqrt{3}$

SOHCAHTOA

$\sin \theta = \frac{\text{OPP}}{\text{HYP}}$

$\cos \theta = \frac{\text{ADJ}}{\text{HYP}}$

$\tan \theta = \frac{\text{OPP}}{\text{ADJ}}$

$$\text{SHADED AREA} = 2 \times \triangle - \text{SECTOR}$$

$$= 2 \times \frac{1}{2} \times 10 \times 10\sqrt{3} - \frac{120}{360} \times \pi \times 10^2$$

$$= 68.485 \dots$$

Round Up

$$= \underline{68.5 \text{ m}^2}$$