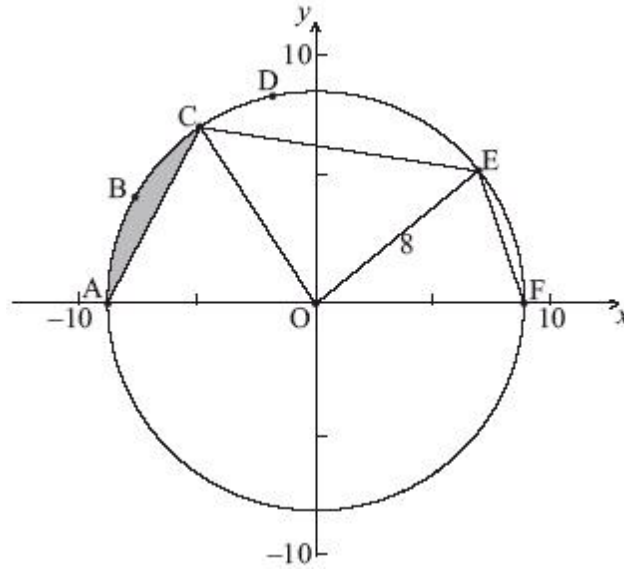1.)   The diagram below shows a circle with centre O and radius 8 cm.

diagram not to scale

The points A, B, C, D, E and F are on the circle, and [AF] is a diameter. The length of arc ABC is 6 cm.

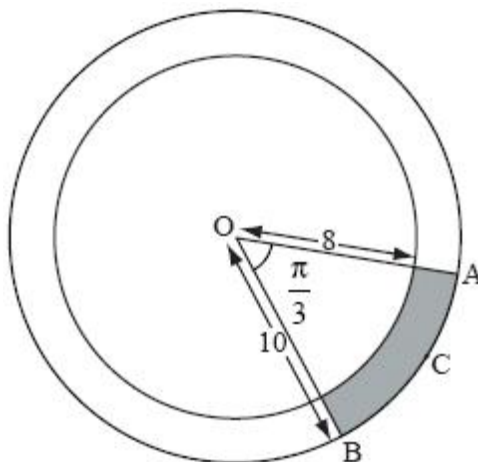(a)   Find the size of angle AOC.

(2)

(b)   Hence find the area of the shaded region.

(6)

The area of sector OCDE is 45 cm².

(c)   Find the size of angle COE.

(2)

(d)   Find EF.

(5)

(Total 15 marks)

2.)   The diagram shows two concentric circles with centre O.

The radius of the smaller circle is 8 cm and the radius of the larger circle is 10 cm.

Points A, B and C are on the circumference of the larger circle such that $A\hat{O}B$ is $\dfrac{}{3}$ radians.

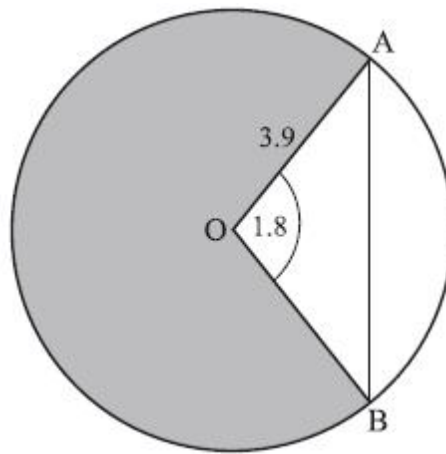(a)   Find the length of the arc ACB.

(2)

(b)   Find the area of the shaded region.

(4)

(Total 6 marks)

3.)   The circle shown has centre O and radius 3.9 cm.

diagram not to scale

Points A and B lie on the circle and angle AOB is 1.8 radians.
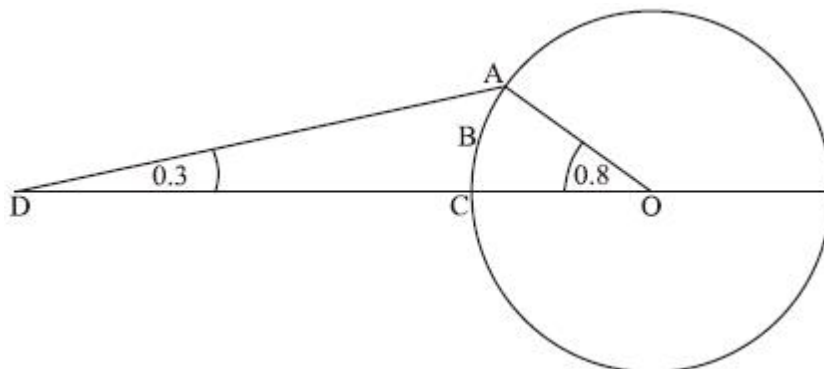
(a)   Find AB.

(3)

(b)   Find the area of the shaded region.

(4)

(Total 7 marks)

4.)   The following diagram shows a circle with centre O and radius 4 cm.

The points A, B and C lie on the circle. The point D is outside the circle, on (OC).
Angle ADC = 0.3 radians and angle AOC = 0.8 radians.

(a)   Find AD.

(3)

(b)   Find OD.

(4)

(c)   Find the area of sector OABC.

(2)

(d)   Find the area of region ABCD.

(4)
(Total 13 marks)

5.)   The following diagram shows a semicircle centre O, diameter [AB], with radius 2.

Let P be a point on the circumference, with $P\hat{O}B$ = q radians.
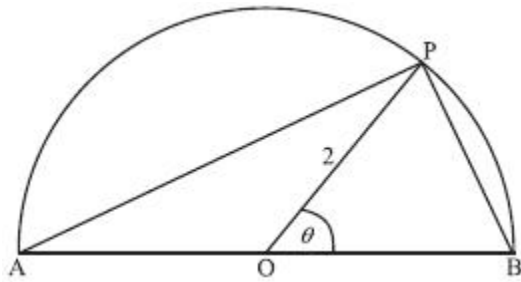
(a)   Find the area of the triangle OPB, in terms of q.

(2)

(b)   Explain why the area of triangle OPA is the same as the area triangle OPB.

(3)

Let *S* be the total area of the two segments shaded in the diagram below.
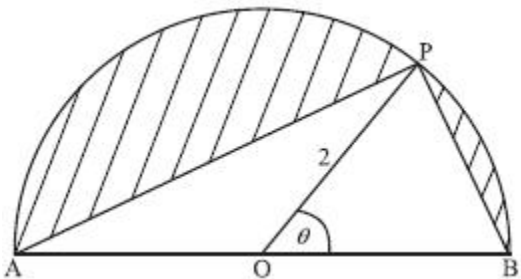
(c)   Show that $S = 2(\pi - 2 \sin q)$.

(3)

(d)   Find the value of q when *S* is a local minimum, justifying that it is a minimum.

(8)

(e)   Find a value of q for which *S* has its greatest value.

6.)   The diagram below shows a circle centre O, with radius *r*. The length of arc ABC is 3π cm and $A\hat{O}C$ = $\frac{2}{9}$.
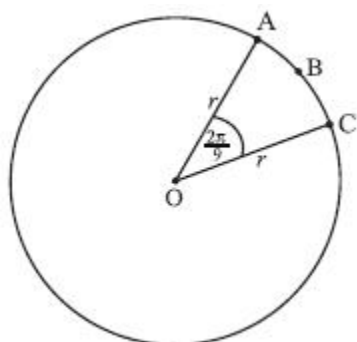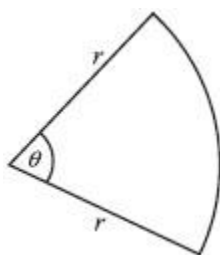

diagram not to scale

(a)   Find the value of *r*.

(2)

(b)   Find the perimeter of sector OABC.

(2)

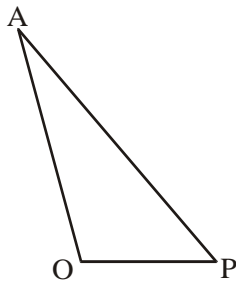(c)   Find the area of sector OABC.

(2)
(Total 6 marks)

7.)   The following diagram shows a sector of a circle of radius *r* cm, and angle q at the centre. The perimeter of the sector is 20 cm.

(a)   Show that $q = \dfrac{20 - 2r}{r}$.

(b)   The area of the sector is 25 cm^2. Find the value of *r*.

(Total 6 marks)

8.)   The following diagram shows the triangle AOP, where OP = 2 cm, AP = 4 cm and AO = 3 cm.

A

diagram not to scale

O   P

(a)   Calculate $\hat{AOP}$, giving your answer in radians.

(3)

The following diagram shows two circles which intersect at the points A and B. The smaller circle C_1 has centre O and radius 3 cm, the larger circle C_2 has centre P and radius 4 cm, and OP = 2 cm. The point D lies on the circumference of C_1 and E on the circumference of C_2. Triangle AOP is the same as triangle AOP in the diagram above.
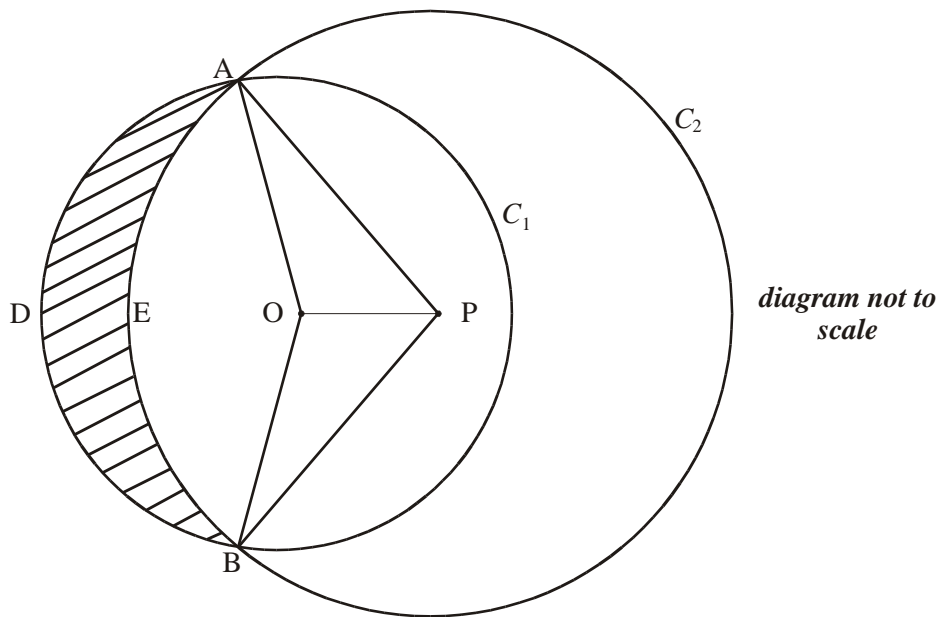
diagram not to scale

(b)   Find $\hat{AOB}$, giving your answer in radians.

(2)

(c)   Given that $\hat{APB}$ is 1.63 **radians**, calculate the area of

    (i)   sector PAEB;

    (ii)   sector OADB.

(5)

(d)   The area of the quadrilateral AOBP is 5.81 cm^2.

    (i)   Find the area of AOBE.
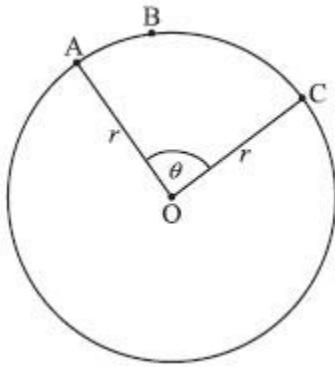
    (ii)   Hence find the area of the shaded region AEBD.

(4)
(Total 14 marks)

9.) The following diagram shows a circle with radius r and centre O. The points A, B and C are on the circle and $A\hat{O}C = q$.
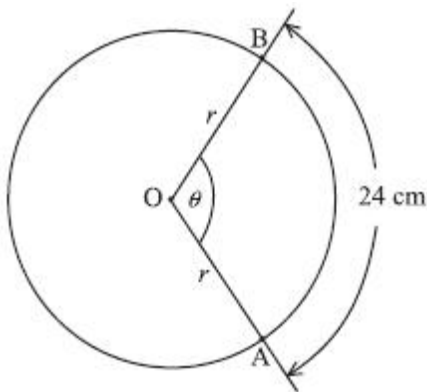

The area of sector OABC is $\dfrac{4}{3}\pi$ and the length of arc ABC is $\dfrac{2}{3}\pi$.

Find the value of r and of q.

(Total 6 marks)

**10.)** The diagram below shows a circle of radius r and centre O. The angle $A\hat{O}B = q$.

24 cm

The length of the arc AB is 24 cm. The area of the sector OAB is 180 cm^2.

Find the value of r and of q.

(Total 6 marks)

11.) The following diagram shows two semi-circles. The larger one has centre O and radius 4 cm. The smaller one has centre P, radius 3 cm, and passes through O. The line (OP) meets the larger semi-circle at S. The semi-circles intersect at Q.
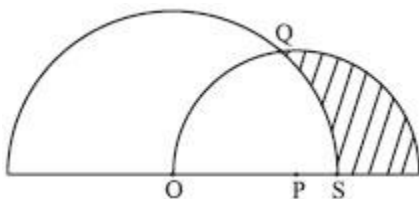
(a)   (i)   Explain why OPQ is an isosceles triangle.

(ii) Use the cosine rule to show that $\cos \hat{OPQ} = \dfrac{1}{9}$.

(iii) Hence show that $\sin \hat{OPQ} = \dfrac{\sqrt{80}}{9}$.

(iv) Find the area of the triangle OPQ.

(7)

(b) Consider the smaller semi-circle, with centre P.

(i) Write down the size of $\hat{OPQ}$.

(ii) Calculate the area of the sector OPQ.

(3)

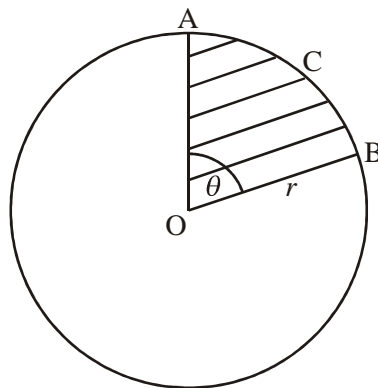(c) Consider the larger semi-circle, with centre O. Calculate the area of the sector QOS.

(3)

(d) Hence calculate the area of the shaded region.

(4)

(Total 17 marks)

12.) The following diagram shows a circle of centre O, and radius r. The shaded sector OACB has an area of 27 cm^2. Angle $\hat{AOB} = \ = 1.5$ radians.

(a) Find the radius.

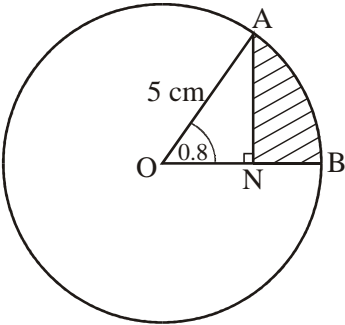(b) Calculate the length of the minor arc ACB.

Working:

Answers:

(a) ....

(b) ....

(Total 6 marks)

13.)   The diagram below shows a circle of radius 5 cm with centre O. Points A and B are on the circle, and AÔB is 0.8 radians. The point N is on [OB] such that [AN] is perpendicular to [OB].

Find the area of the shaded region.

Working:

Answer:
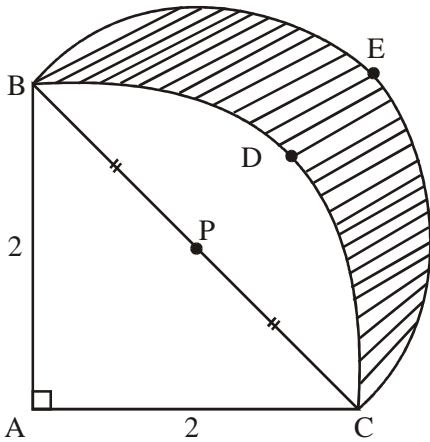
14.)   The diagram below shows a triangle and two arcs of circles.

The triangle ABC is a right-angled isosceles triangle, with AB = AC = 2. The point P is the midpoint of [BC].

The arc BDC is part of a circle with centre A.

The arc BEC is part of a circle with centre P.

(a)   Calculate the area of the segment BDCP.
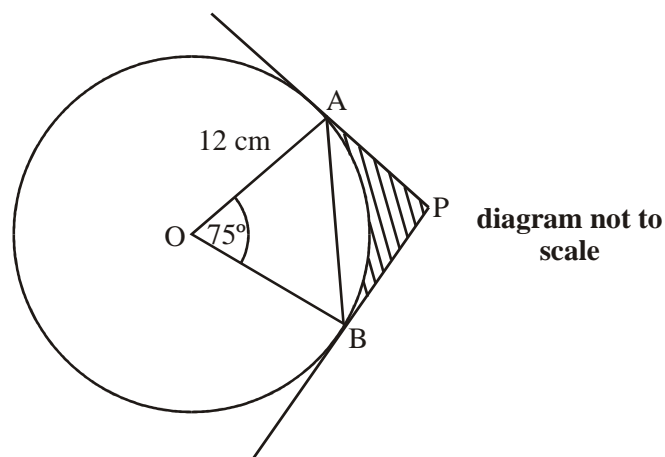
(b)   Calculate the area of the shaded region BECD.

Working:

Answers:

(a)   ....

(b)   ....

(Total 6 marks)

15.)   The diagram below shows a circle, centre O, with a radius 12 cm. The chord AB subtends at an angle of 75° at the centre. The tangents to the circle at A and at B meet at P.

diagram not to scale

(a) Using the cosine rule, show that the length of AB is $12\sqrt{2(1-\cos 75°)}$.

(2)

(b) Find the length of BP.

(3)

(c) Hence find

    (i)   the area of triangle OBP;

    (ii)   the area of triangle ABP.

(4)

(d) Find the area of **sector** OAB.

(2)

(e) Find the area of the shaded region.

(2)
(Total 13 marks)

16.) The following diagram shows a circle of centre O, and radius 15 cm. The arc ACB subtends an angle of 2 radians at the centre O.
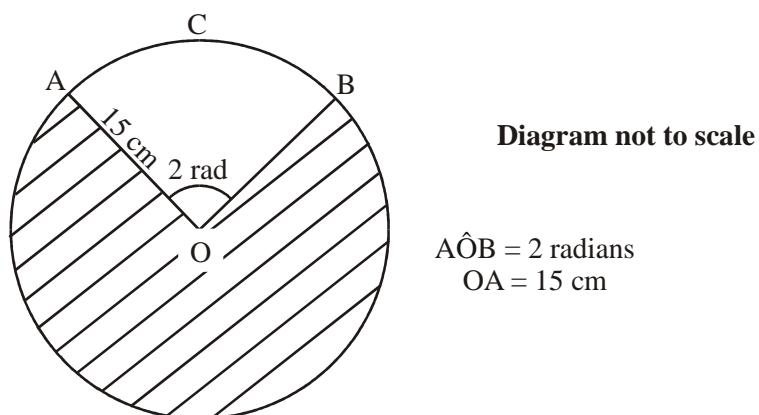
Diagram not to scale

$\hat{AOB} = 2$ radians
OA $= 15$ cm

Find

(a) the length of the arc ACB;

(b) the area of the shaded region.

17.)   In the following diagram, O is the centre of the circle and (AT) is the tangent to the circle at T.
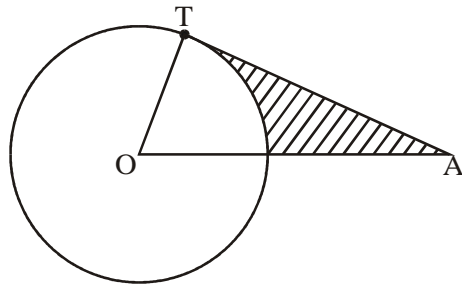
Diagram not to scale

If OA = 12 cm, and the circle has a radius of 6 cm, find the area of the shaded region.

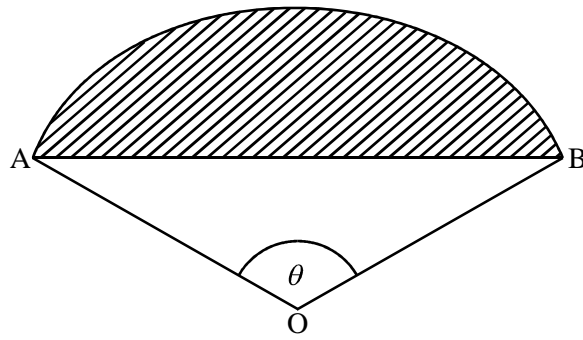18.)   The diagram below shows a sector AOB of a circle of radius 15 cm and centre O. The angle q at the centre of the circle is 2 radians.

Diagram not to scale

(a) Calculate the area of the sector AOB.
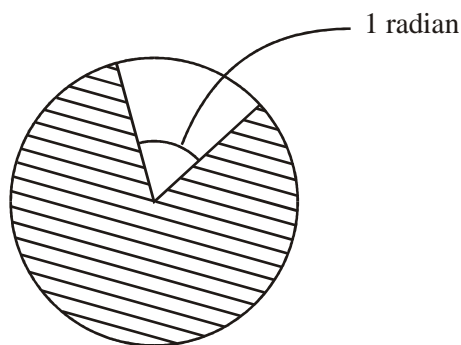
(b) Calculate the area of the shaded region.

Working:

Answers:

(a) ....

(b) ....

(Total 4 marks)

19.) The diagram shows a circle of radius 5 cm.

1 radian

Find the perimeter of the shaded region.

Working:

Answer:

....
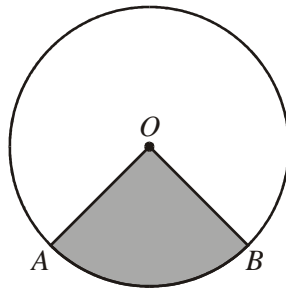
(Total 4 marks)

20.)   *O* is the centre of the circle which has a radius of 5.4 cm.

The area of the shaded sector *OAB* is 21.6 cm^2. Find the length of the minor arc *AB*.

Working:
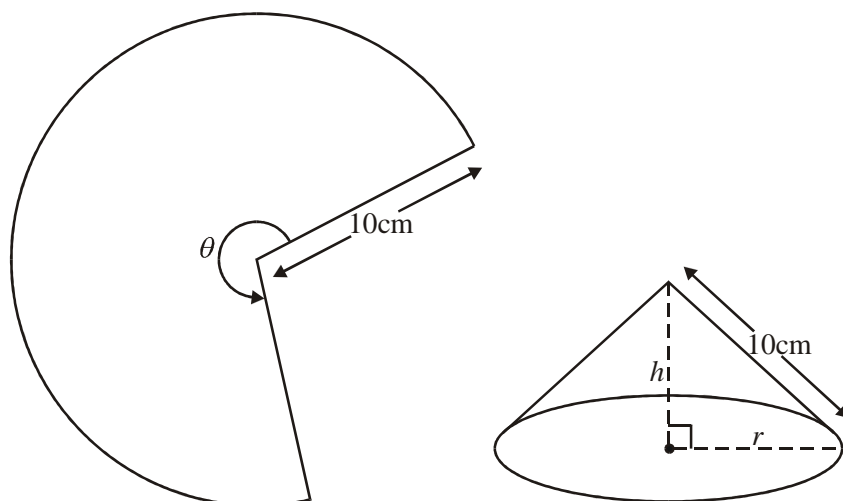
Answer:

....

(Total 4 marks)

21.)   The diagrams show a circular sector of radius 10 cm and angle   radians which is formed into a cone of slant height 10 cm. The vertical height *h* of the cone is equal to the radius *r* of its base. Find the angle   radians.

10cm

θ

h   10cm

r

Answer:

....

(Total 4 marks)