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MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

AREA RELATED TO CIRCLES

Solved Example

1. The circumference of a field is 220m. Find (i) its radius (ii) its area

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2. Find the area of a circular park whose radius is 4.5 m

3. The area of a circular plot is $346.5m^2$. Calculate the cost of fencing the plot at the rate of Rs 6 per metre

4. The diameter of a cycle wheel is 28 cm. How many revolutions will it make in moving 13.2 km?

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5. The circumference of a circle exceeds the diameter by 16.8 cm. Find the radius of the circle.

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6. Find the area of a ring whose outer and inner radii are respectively 20 cm and 15 cm

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7. A race track is in the form of a ring whose inner circumference is 352 m and the outer circumference is 396 m. Find the width of the track.

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8. Two circules touch internally. The sum of their areas is $116\pi cm^2$ and the distance between their centres is 6 cm. find the radii of the circles.

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9. The radius of a wheel of a bus is 45 cm. Determine its speed in kilometres per hour, when its wheel makes 315 revolutions per minute

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10. PQRS is a diameter of a circle of radius 6 cm. The length PQ, QR and RS are equal Semicircle are drawn on PQ and QS as diameters. Find the

area of the shaded region. Find also the length of boundaries of shaded portion.

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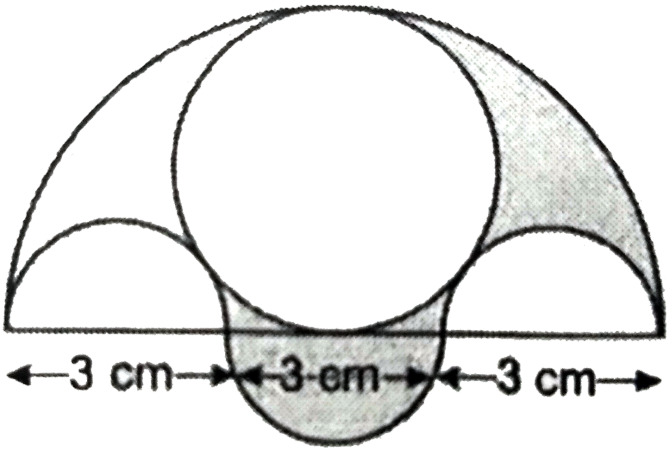
11. Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm and a semicircle of radius 4.5 cm are drawn in the adjoining figure.

Find the area of the shaded region.



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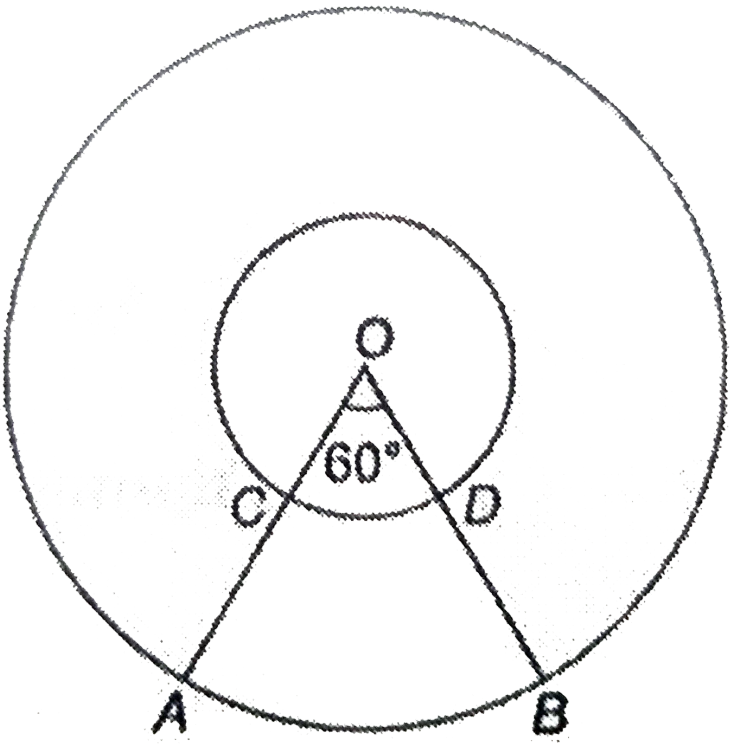
12. In the adjoining figure, two concentric circle with centre O have radii 21 cm and 42 cm. If $\angle AOB = 60^\circ$, find the area of the shaded

region. (Use $\pi = \frac{22}{7}$)



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13. In the adjoining figure, O is the centre of the circle with AC = 24 cm, AB = 7 cm and $\angle BOD = 90^\circ$. Find the area of the shaded region.

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14. In the adjoining figure, find the area of the shaded region (Use $\pi = 3.14$)

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15. A park is of the shape of a circle of diameter 7 m. It is surrounded by a path of width 0.7 m. Find the expenditure of cementing the path, if its cost is Rs 110 per sq. m.

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16. Find the area of the region between the two concentric circles, if the length of a chord of the outer circle just touching the inner circle at a particular point on it is 10 cm (Take, $\pi = \frac{22}{7}$)

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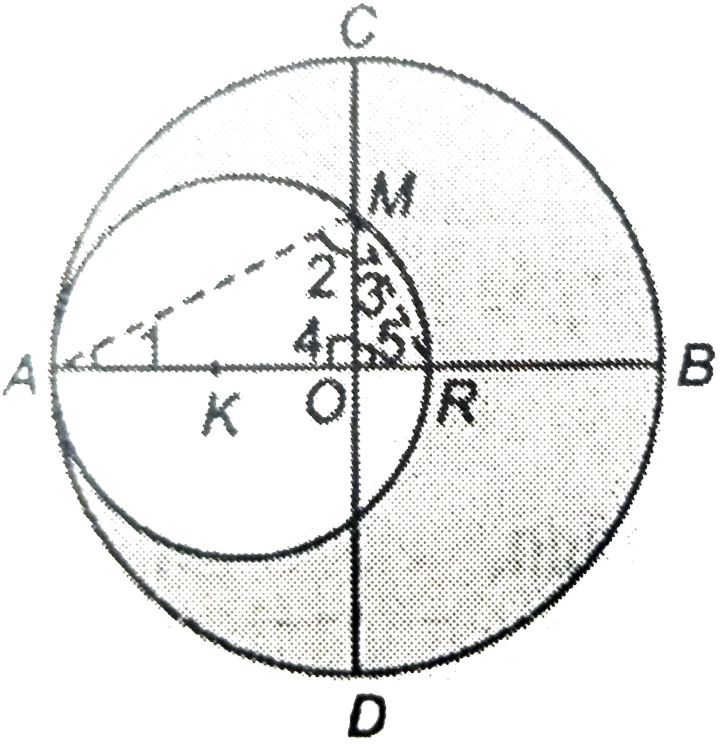
17. In the adjoining figure, CM = 5 cm, RB = 9 cm, $CD \perp AB$, O is the centre of larger circle and K is the centre of smaller circle. Find the area of shaded region



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18. A square of the largest area is cut out of a circle. What % of the area of the circle is lost as trimmings ?

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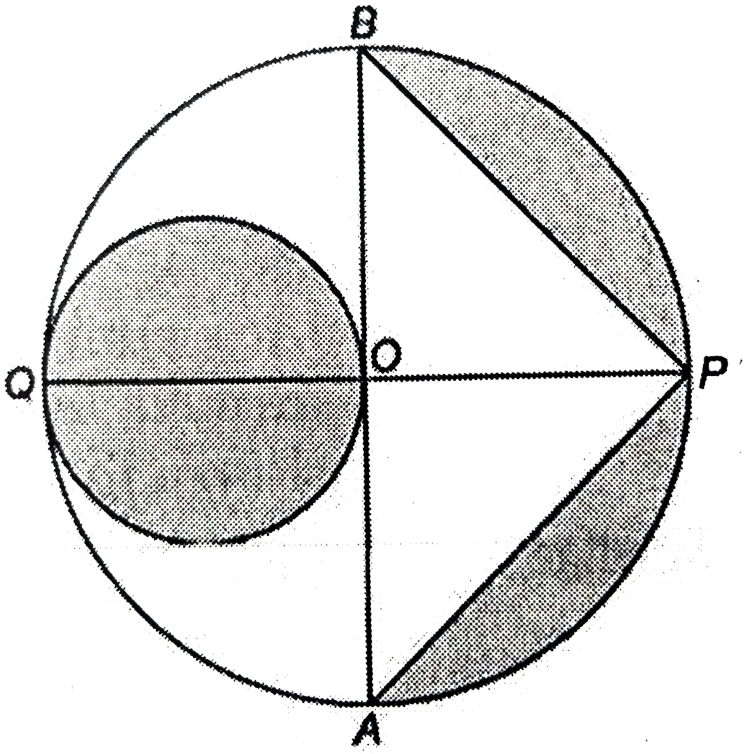
19. In the given figure, AB and PQ are perpendicular diameters of the circle whose centre is O and radius OA = 7 cm. Find the area of

the shade region.



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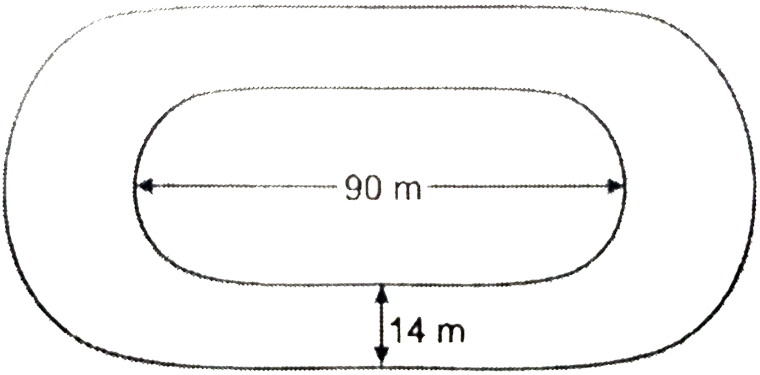
20. The inner perimeter of a running track (shown in figure) is 400 m. The length of each of the straight portion is 90 m and the ends are semicircular. If the track is everywhere 14 m wide, find the area of the track. Also, find the length of the outer running track.



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21. In a circular table cover of radius 32 cm, a design (shade) is formed leaving an equilateral traingle ABC in the middle as shown in the adjacent figure.Find the area of the shaded region.

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Problems From Ncert Exemplar

1. The perimeter of a semi circular protractor is 32.4 cm. Calculate :

(i) the radius of protractor in cm, (ii) the area of protractor in cm^2

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2. The minute hand of a clock is $\sqrt{21}$ cm long. Find the area described by the minute hand on the face of the clock between 6 a.m. and 6.05 a.m.

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3. In the adjoining figure radius is 14 cm ,calculate:

(i) the length of minor arc ACB

(ii) area of shaded sector

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4. A chord AB of a circle of radius 10cm makes a right angle at the centre of the circle. Find the area of the major and minor segments $(Take\pi = 3.14)$

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5. The area of an equilateral triangle ABC is $17320.5\ cm^2$. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle (see Fig. 12.28). Find the area of the shaded region. ($Use\ \pi = 3.14\ \text{and}\ \sqrt{3}$= 1.73205)

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6. In the given figure, the side of square is 28 cm and radius of each circle is half of the length of

the sides of the square where O and O are centres of the circles. Find the area of shaded region

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7. Combination of quadrilateral and circle : In Figure; ABCD is a trapezium with AB||DC ; AB = 18cm; DC = 32cm and the distance between AB and DC is 14 cm. Circles of Equal radii 7 cm with centres A;B;C and D have been drawn. Then; find the area of the shaded region of the figure.

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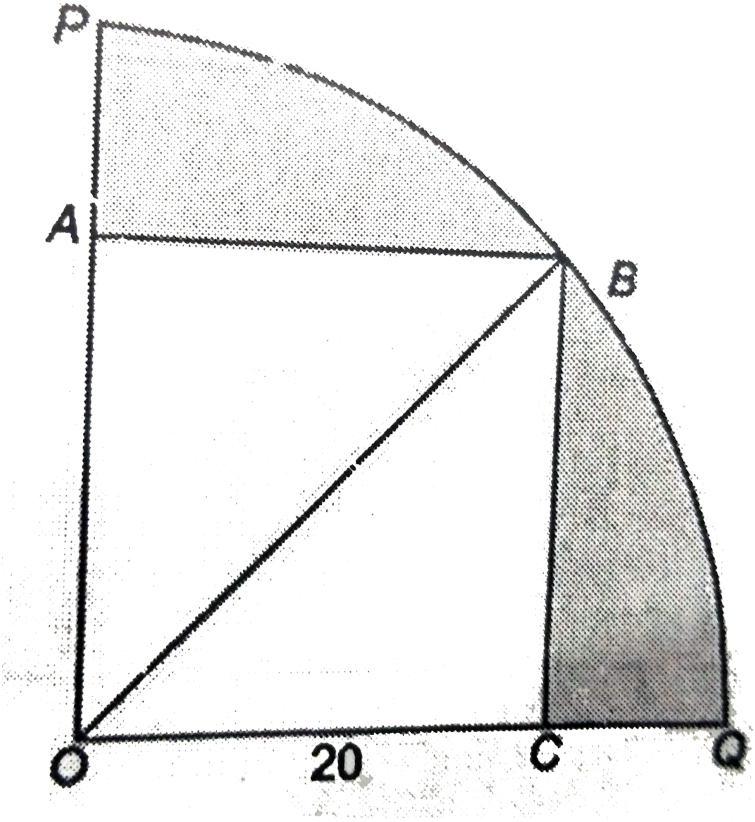
8. In the given figure square OABC is inscribed in a sector OPBQ. If OC = 20 cm, find the area of the shaded region (Use $\pi = 3.14$)



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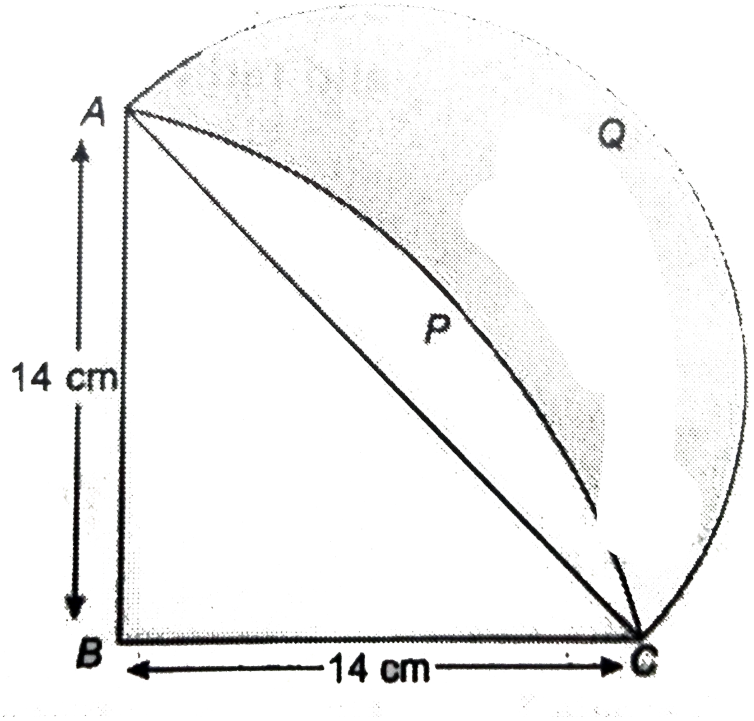
9. ABCP is a quadrant of a circle of radius 14 cm. with AC as diameter, a semicircle is drawn. Find the area of the shaded portion



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10. In Figure, two circular flower beds have been shown on two sides of a square lawn ABCD of side 56m. If the centre of each circular flower bed is the point of intersection of the diagonals of the square lawn, find the sum of the areas of the lawns and the flower beds.

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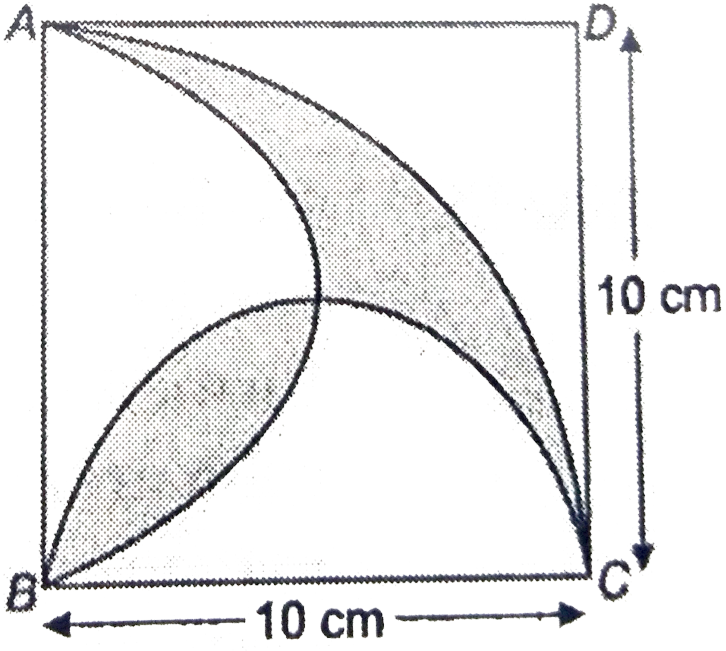
11. In the adjoining figure, ABCD is a square of side 10 cm and two semicircles with side of the

square as diameter. A quarter circle is also seen in figure with side of square as radius. Find the area of the square region excluding the shaded part . (Take $\pi = 3.14$)



A. $75.5cm^2$

B. $71.5cm^2$

C. $81.5cm^2$

D. None

Answer: B

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12. If the hypotenuse of an isosceles right triangle is $7\sqrt{2}$cm, find the area of the circle inscribed in it

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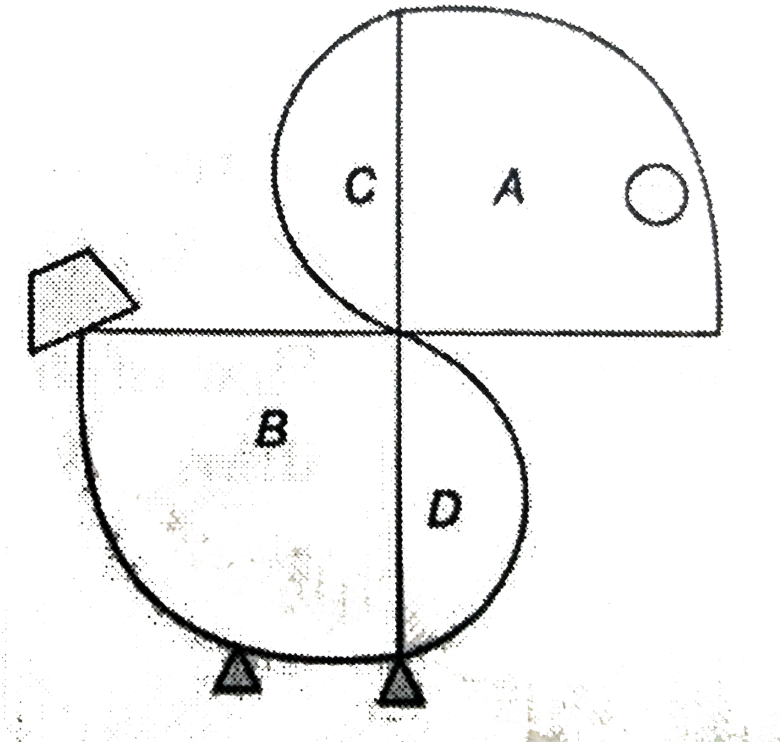
13. In the adjoining line diagram, a birds is shwon having its one eye, two legs and one tail in shaded portions. Head and lower part are formed with two quarter circles A and B with diameters 10 cm each and two semicircles C and D with diameters 4 cm each. An eye has a radius 0.5 cm. Each leg is in the shape of equilateral Δ with sides 1 cm each and a tail is a trapezium with parallel sides 1 cm and 3 cm and the distance between these sides is 1.5 cm. Find the area covered by this bird. (Take

$\pi = 3.14, \sqrt{3} = 1.732$)



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14. The length of the minute hand of a clock is 14cm. Find the area swept by the minute hand in 5 minutes.

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15. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding :

(i) minor segment

(ii) major sector.

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16. A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm sweeping through an angle of $115o$. Find the total area cleaned at each sweep of the blades.

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17. To warn ships for underwater rocks, a lighthouse spreads a red coloured light over a sector of angle $80o$to a distance of 16.5 km. Find

the area of the sea over which the ships are warned.

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18. On a square handkerchief, nine circular designs each of radius 7 cm are made (see Fig. 12.29). Find the area of the remaining portion of the handkerchief.

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19. Circumference of two circles are equal. Is it necessary that their areas be equal ? Why ?

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20. In figure arcs have been drawn with radii 14 cm each and with centres P, Q and R. Find the area of the shaded region .

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21. In figure, arcs have been drawn of radius 21 cm each with vertices A,B,C and D of quadrilateral $ABCD$ as centres . Find the area of the shaded region.

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22. A piece of wire 20 cm long is bent into the form of an arc of a circle, subtending an angle of 60° at its centre. Find the radius of the circle.

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23. The diameters of the front and rear wheels of a tractor are 80 cm and 2 m respectively. Find the number of revolutions that rear wheel will make to cover the distance which the front wheel covers in 1400 revolutions.

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24. Sides of a triangular field are 15 m, 16m and 17m. With the three corners of the field a cow, a buffalo and a horse are tied separately with

ropes of length 7m each to graze in the field. Find the area of the field which cannot be grazed by the three animals.

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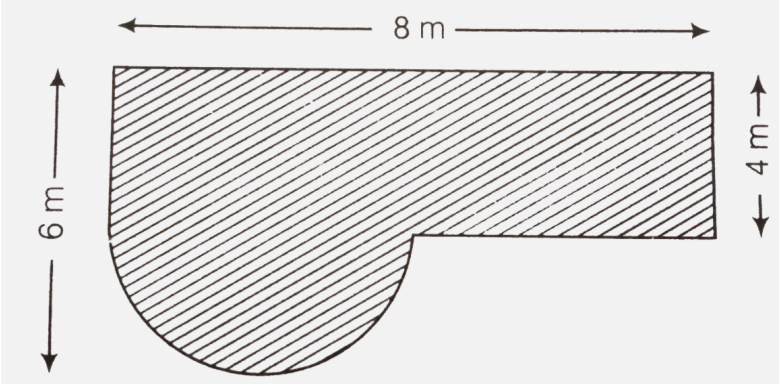
25. Find the area of the shaded field shown in figure.



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Exercise 12 A

1. Find the area of a cricle whose circumference is 440m

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2. Find the radius of a circular sheet whose area is $5544m^2$

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3. The diameter of a circular plot is 49m. Find the cost of fencing it at 30 paise per metre

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4. Two circles touch internally. The sum of their areas is $116\pi cm^2$ and distance between their centres is 6 cm. Find the radii of the circles

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5. The circumference of a circular garder is 572 m. Outside the garden a road of width 3.5 m runs around it. Calculate the cost of repairing the road at the rate of Rs 3.75 per square metre

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6. A field is in the form of a circle. A fence is to be erected around the field. The cost of fencing would be Rs. 2640 at the rate of Rs. 12 per metre. Then, the field is to be thoroughly ploughed at

the cost of Re. $0.50\ per\ m^2$. What is the amount required to plough the field? $[Take\ \pi = 22/7]$.

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7. The sum of the radii of two different circles is 18.5 cm and the difference of their circumference is 22 cm. Find their radii

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8. A race track is in the form of a ring whose outer and inner circumference are 506 m and 440 m respectively. Find the width of the track and also the area.

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9. The area enclosed by the circumference of two concentric circles is $423.5cm^2$. If the circumference of outer circle is 132 cm. Calculate the radius of the inner circle

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10. Find the circumference of the circle whose area is 16 times the area of the circle with diameter 1.4 m

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11. Calculate the circumference of a circle whose area is equal to the sum of the area of the circles with diameter 24 cm, 32 cm and 96 cm

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12. The diameters of two given circles are in the ratio $3:4$ and the sum of the areas of the circles is equal to the area of a circle whose diameter measures 30m. Find the diameter of the given circles.

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13. The number denoted by the area of a cicle is five times the number denoted by its circummference. Find the radius of the circle

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14. A park is in the form of a circle with radius 35m. At the centre of the park, there is a lawn in the form of a square. If the area of the park, excluding the lawn is $2500m^2$ find the cost of levelling the lawn at the rate of Rs 50 per m^2

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15. If a square is inscribed in a circle, find the ratio of the areas of the circle and the square.

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16. Area of a circle is $61m^2$. Find the area of the greatest square constructed in this circle.

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17. The area of a circle inscribed in an equilateral triangle is $154\,cm^2$. Find the perimeter of the triangle. $[Use\ \pi = 22/7 and\ \sqrt{3} = 1.73]$

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18. Prove that the area of a circular path of uniform width h surrounding a circular region of radius r is $\pi h(2r + h)$.

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19. The radius of a wheel is 77 cm, find the number of revolutions it will make in travelling a distance of 2.904 km

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20. If the wheel of a bus with 50 cm radius makes 280 revolutions per minute, find the speed of the bus in km/h

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21. A man runs with a speed of 15.84 km/hr. He completes 12 rouds of a circular ground in one hour. Find the area of the ground

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22. A bucket is raised from a well by means of a rope which is wound round a wheel of diameter 77cm (figure). Given that the bucket ascends in 1 minute 28 seconds with a uniform speed of 1.1 m/s. Calculate the number of complete revolutions the wheel makes in raising the bucket.

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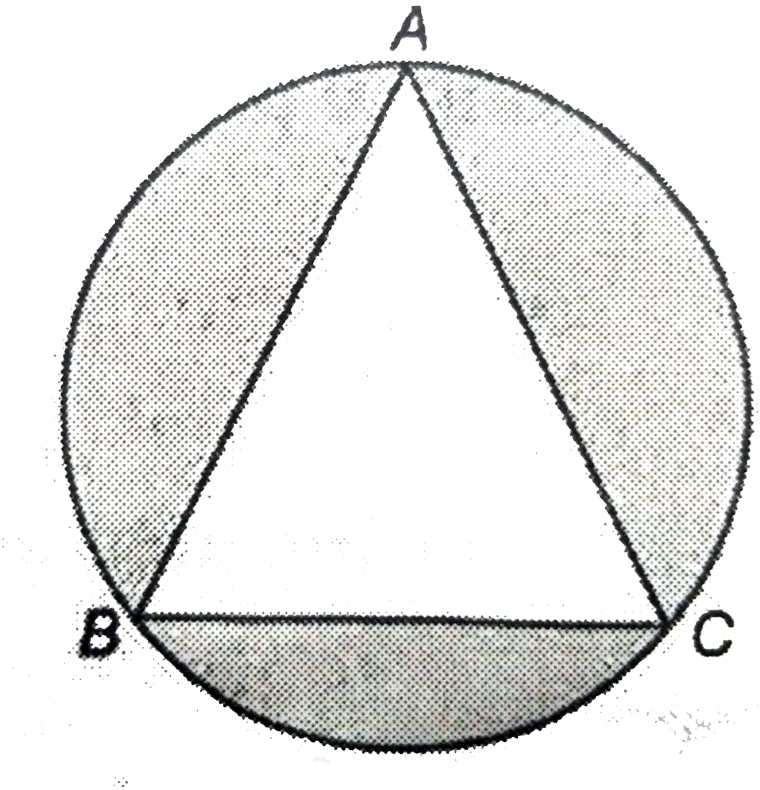
23. ABC is an equilateral triangle inscribed in a circle of radius 4 cm. Find the area of the shaded

portion.



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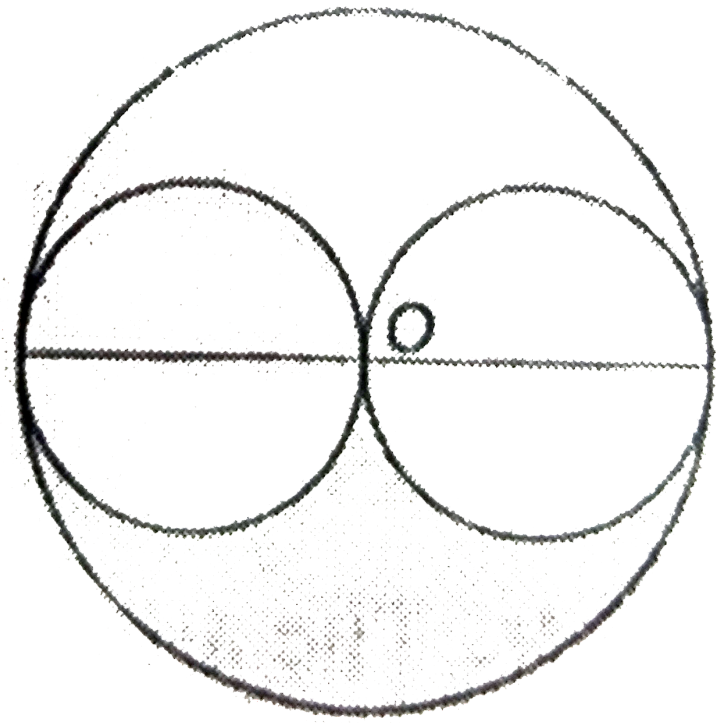
24. In the given figure two small circles touch each other externally at the centre of a big circle and these small circles are touched internally by a big circle of radius 4cm. Find the area of the shaded region



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Exercise 12 B

1. A sector is cut off from a circle of radius 21 cm. The angle of the sector is 150°. Find the length of its arc and the area.

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2. A horse is placed for grazing inside a rectangular field 70 m by 52 m and is tethered to

one corner by a rope 21 m long. On how much area can it graze?

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3. A paper is in the form of a rectangle ABCD where AB = 21 cm and BC = 14 cm. A semicircular portion with BC as diameter is cut off. Find the area of the remaining paper

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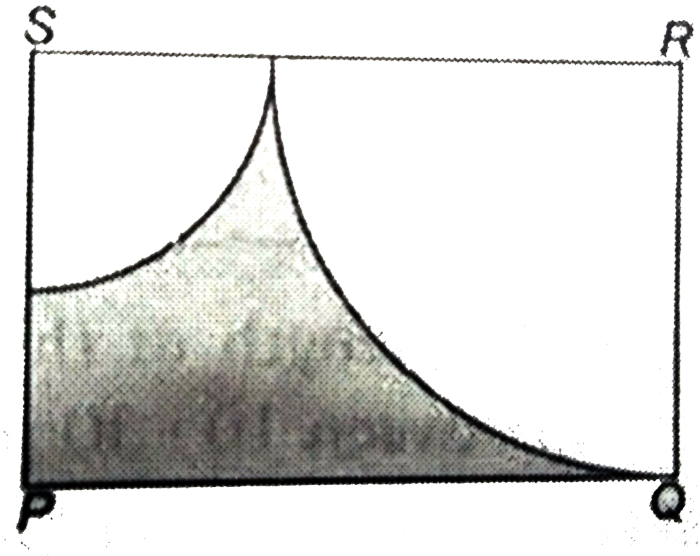
4. Quadrilaterl PQRS is a rectangle. Two sectors with centres R and S are drawn as shwon in the figure. Find the area of shaded region. Given that PQ = 21 cm and QR = 14 cm



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5. A pendulum swing through an angle of 30^0 and describes an arc 8.8 cm in length. Find the length of the pendulum.

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6. The perimeter of a certain sector of a circle of radius 5.7 m is 27.2 m. find the area of the sector

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7. The radius of a circle is 14 cm and the area of the sector is $102.7cm^2$. Find the central angle of the sector.

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8. A chord PQ of a circle of radius 10 cm makes an angle of 60° at the centre of the circle. Find the area of the major and the minor segment

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9. The length of a wire which is tied as a boundary of a semi ciruclar park is 72 cm. Find the radius and the area of the semi circular park

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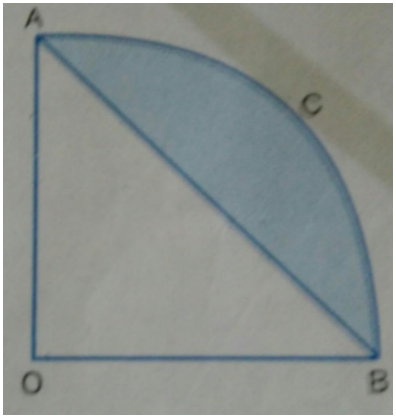
10. AOBC is a quadrant of a circle of radius 10 cm. Calculate the area of the shaded portion. (Use

$\pi = 3.14$)



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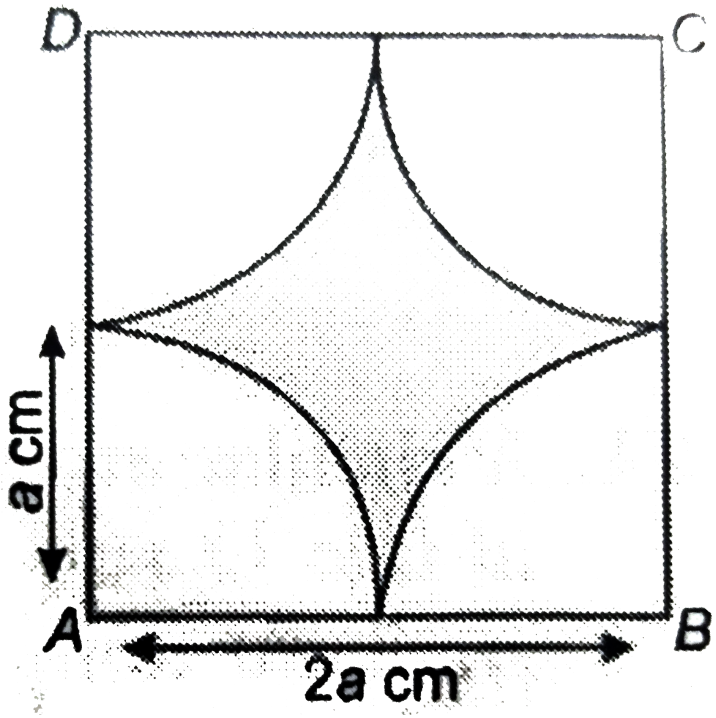
11. In the square ABCD with side $2acm$, four quarter circles are drawn with the vertices as centres and radius acm. Find the area of the

shaded portion.



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12. In ΔABC with fixed length of AB, the internal bisector of angle C meets the sides AB at D and

the circumcircle at R. The maximum value of $CD \times DE$ is

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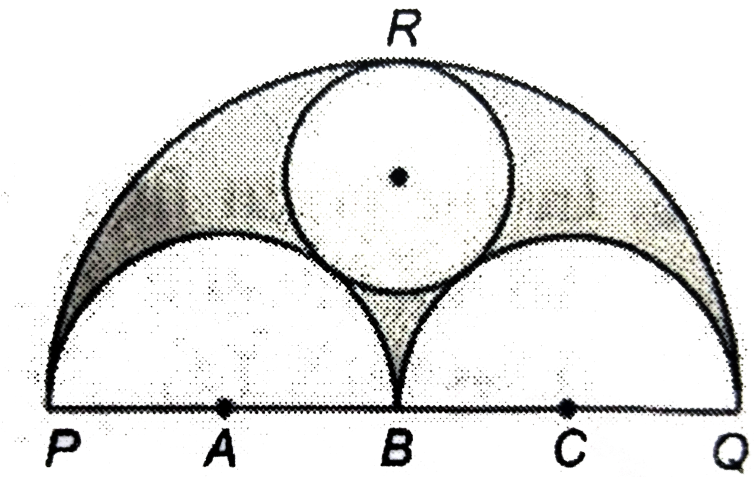
13. In the figure semicircles are drawn with PQ, PB and BQ as diameter. $PB = BQ = 21cm$. A circle with centre O is drawn to touch all the three semicircles. Find its radius and also find the

shaded region.



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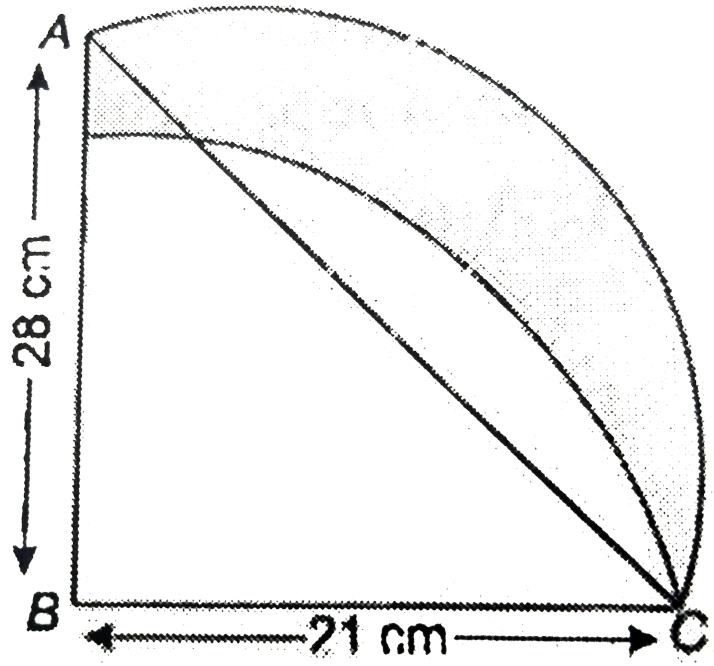
14. In the figure, in $\Delta ABC, \angle B = 90^\circ, AB = 28cm$ and $BC = 21cm$. With AC as diameter a semicircle is drawn and with BC as radius a quarter circle is drawn. Find

the area of the shaded region correct to two decimal places.



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15. The length of the minute hand of a clock is 10.5 cm. Find the area swept by the minute hand between $10:30$ p.m. and $10:40$p.m.

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16. A chord 10cm long is drawn in a circle whose radius is $\sqrt{52}$ cm. Find the area of both the segments.

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17. In a right -angle triangle, the length of the sides containing the right angles are a and b. With the mid-point of each sides as centres three semicircles are drawn outiside the triangle. Find the area of Δ and the semicircles together

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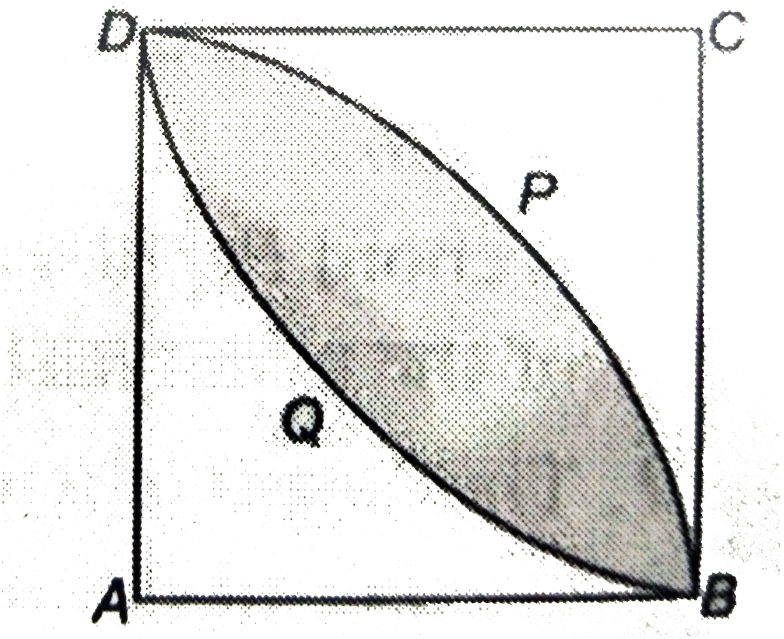
18. In the given figure, ABCD is a square of side 7 cm. DPBA and DQBC are quardrants of circles each of the radius 7 cm. Find the area of the

shaded region.



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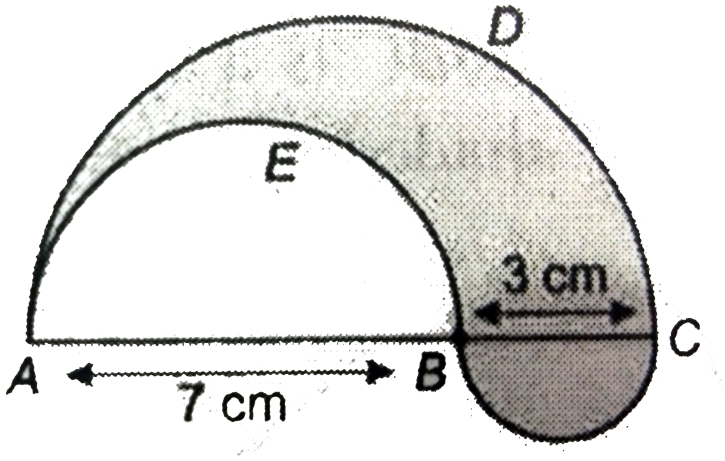
19. In the given figure, three semicircles are drawn of diameter 10 cm, 7 cm and 3 cm, respectively Find the perimeter of shaded

regions (Use $\pi = 3.14$)



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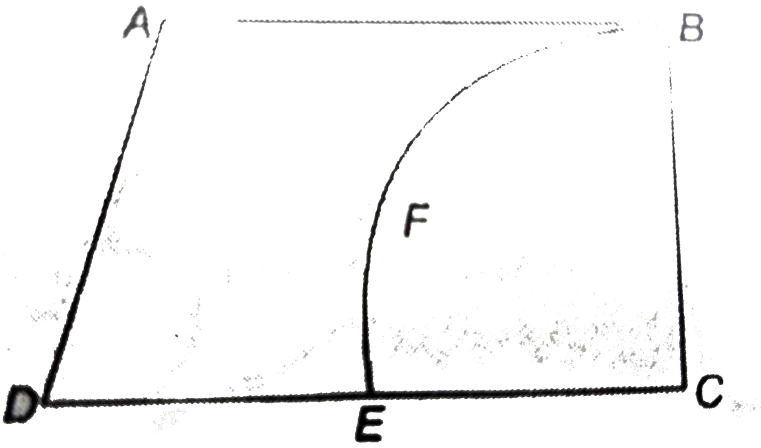
20. From a thin metallic sheet in the shape of a trapezium ABCD in which $AB \| CD$ and $\angle BCD = 90^\circ$, a quarter circle BFEC is removed. Given

$AB = BC = 3.5cm$ and $DE = 2cm$. Calculate the area of shaded region.



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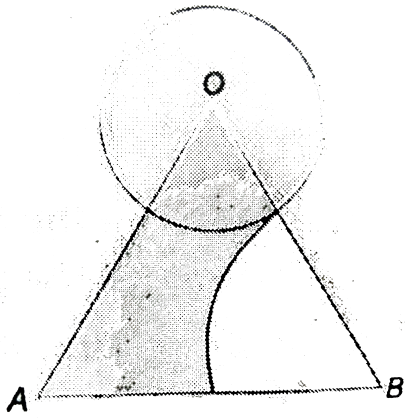
21. A circulare arc has been with vertex of an equilateral triangle of side 12 cm. The radius of arc is 6 cm. A sector of circle of radius 6 cm is cut

from the triangle OAB. Find the area of the shaded region



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22. In the adjoining figure, O is the centre of the circle with AC = 24 cm, AB = 7 cm and $\angle BOD = 90^\circ$. Find the area of the shaded region.

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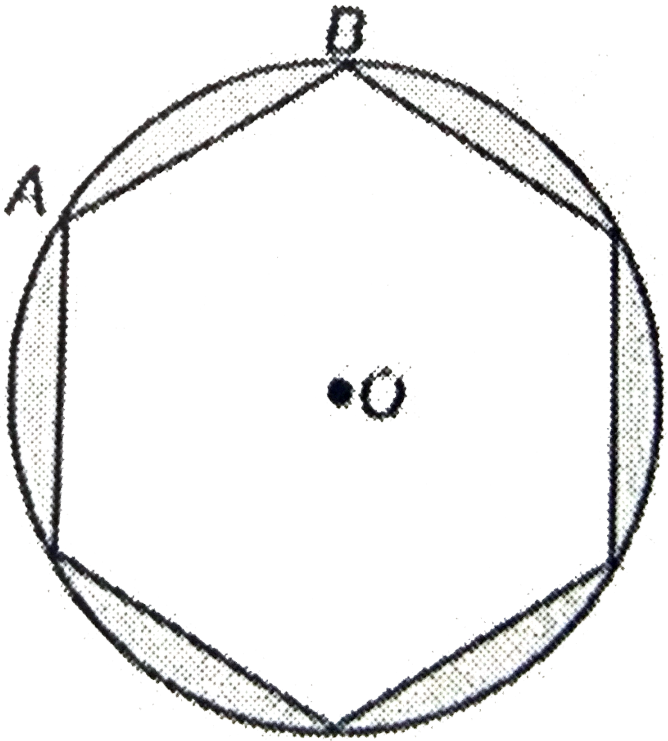
23. A round table cover has six equal designs as shown in the given figure. If the radius of the cover is 35 cm then find the total area of the

design. (Use $\sqrt{3} = 1.732$ and $\pi = 3.14$)



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24. In the following figure, ABC is a right angled triangle at A. Find the area of the shaded region

If AB = 6 cm, BC = 10 cm and L is the center of incircle of ΔABC

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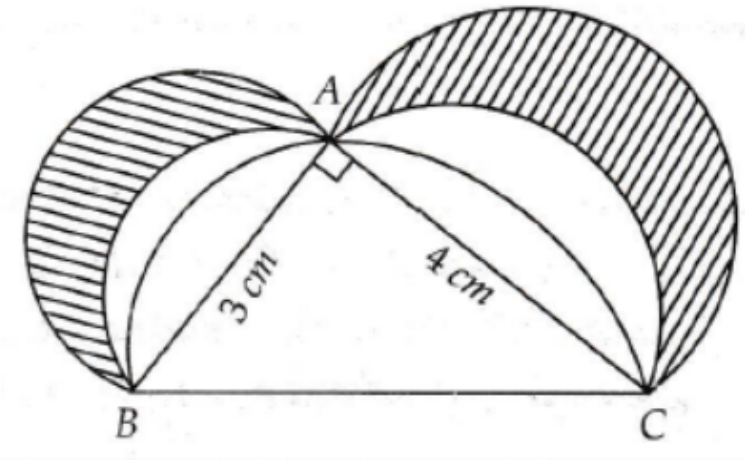
25. In the given figure ΔABC is right angled at A. Semicircles are drawn on AB, BC and AC as diameters. It is given that AB=3 cm and AC=4cm

then find the area of the shaded region



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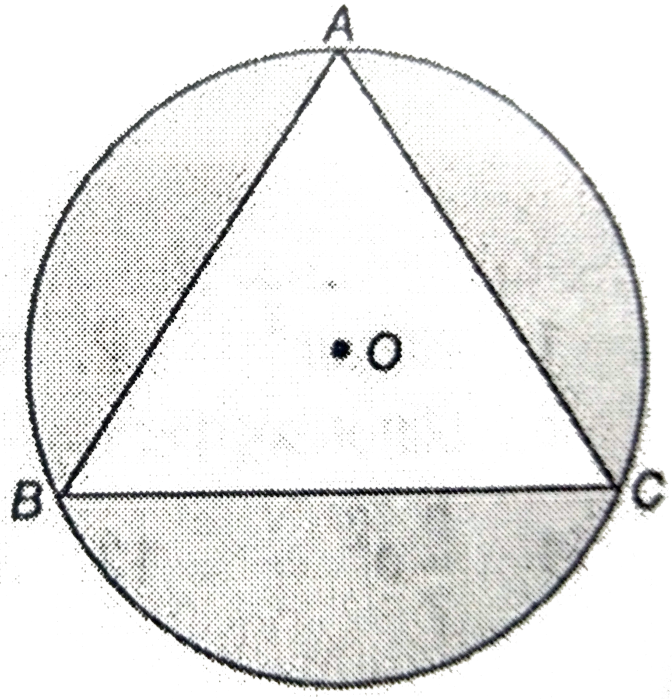
26. A girl formed of design in a circle of radius 42 cm leaving an equilateral triangle ABC in the middle as shown in the figure. Find the corvered area of the design. (Use

$\sqrt{3} = 1.73$ and $\pi = \frac{22}{7}$)



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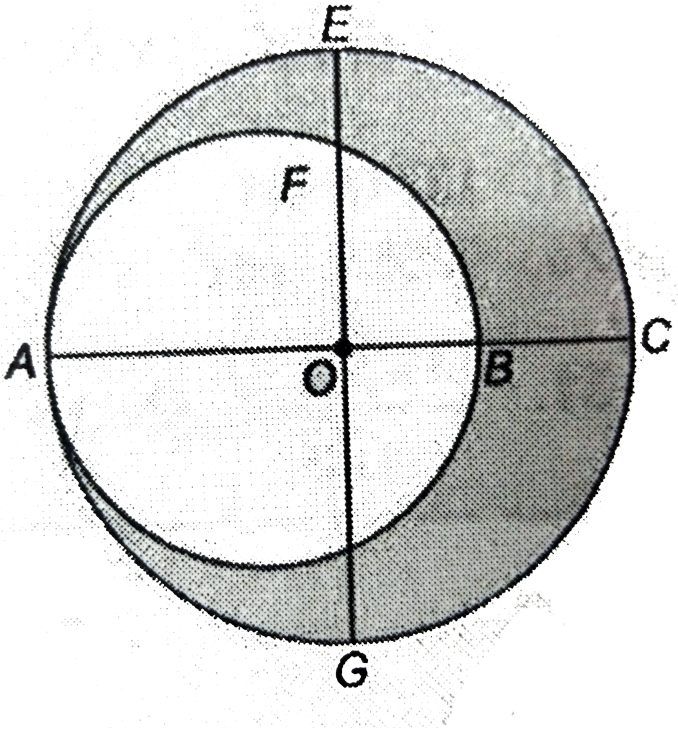
27. In the given figure, O is the centre of the bigger circle and AC is its diameter. Another

circle with AB as diameter is drawn. If AC = 54 cm and BC = 10 cm. Find the area of the shaded region



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28. The area of a circle inscribed in an equilateral triangle is $154\,cm^2$. Find the perimeter of the triangle. $[Use\ \pi = 22/7 and \sqrt{3} = 1.73]$

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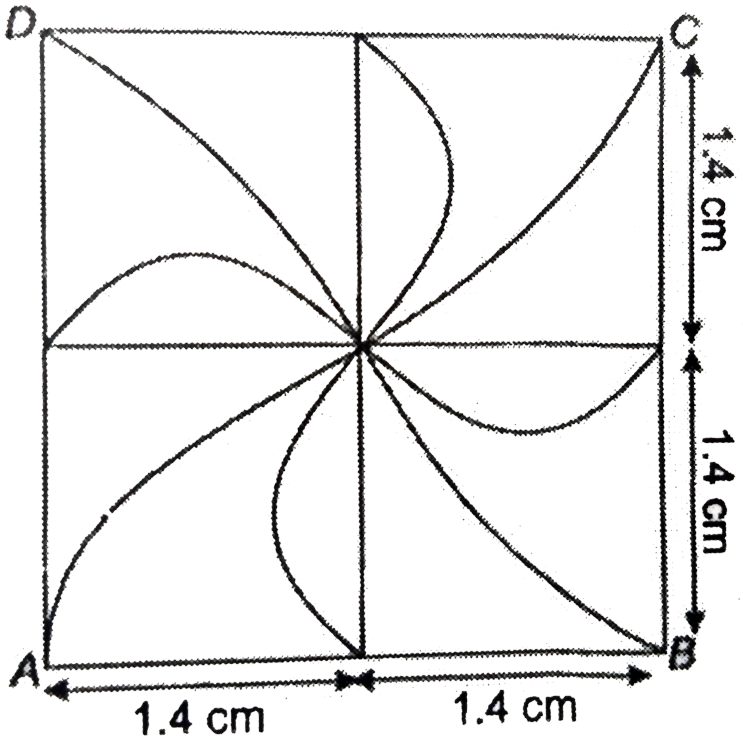
29. A girl was wearing a set of earings made of the line segments, semicircular arcs and arcs of quadrant of cricles as shown in the figure. Calculate total length of the metal wire required

to make a set of ear rings



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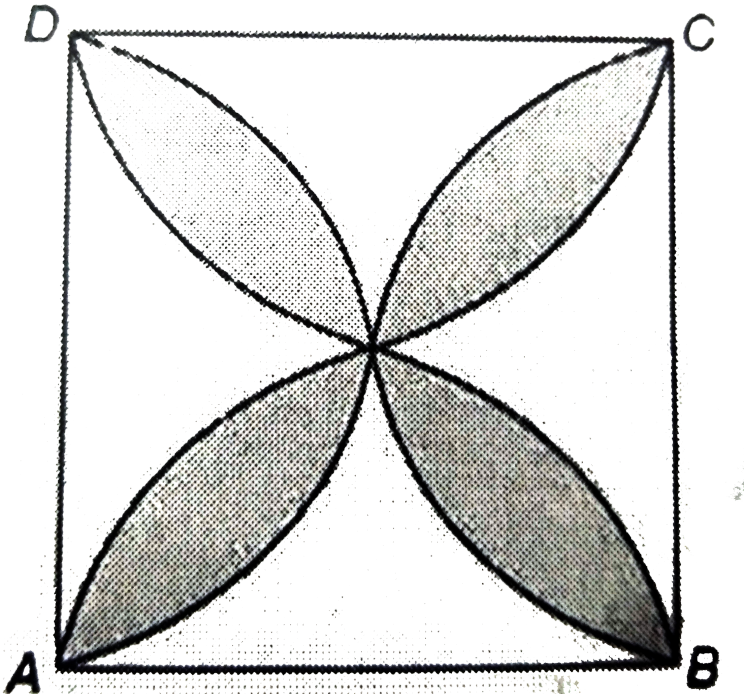
30. The given figure shows a square ABCD of side 20 cm. Semicircle are drawn with each side of the

square as diameter. Find the area of the shaded portion. (Use $\pi = 3.14$)



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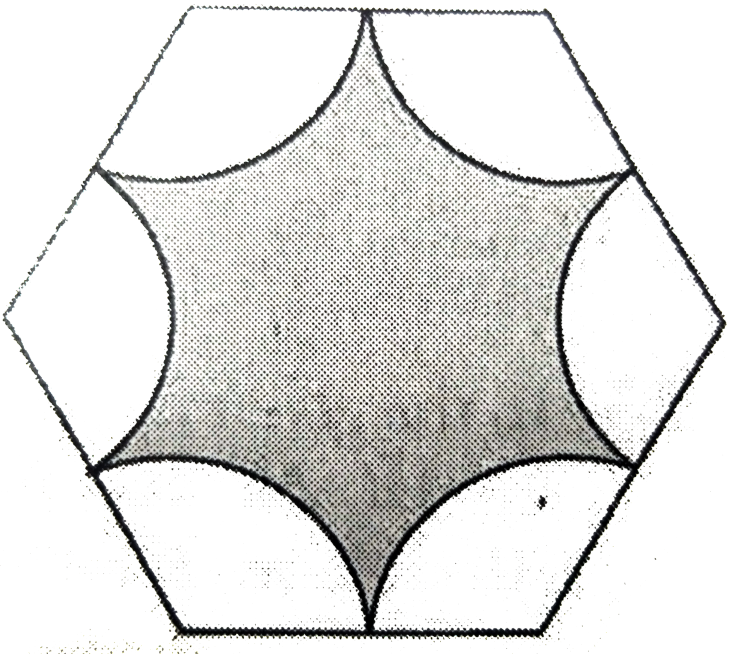
31. From a piece of paper in the shape of a regular hexagon, sectors of circles with the centre at the vertices are removed as shown in the figure. Find the fraction of the vertices are removed as shown in the figure. Find the fraction of the piece of paper left. Also find the perimeter of the piece of paper left in terms of a side of the

hexagon



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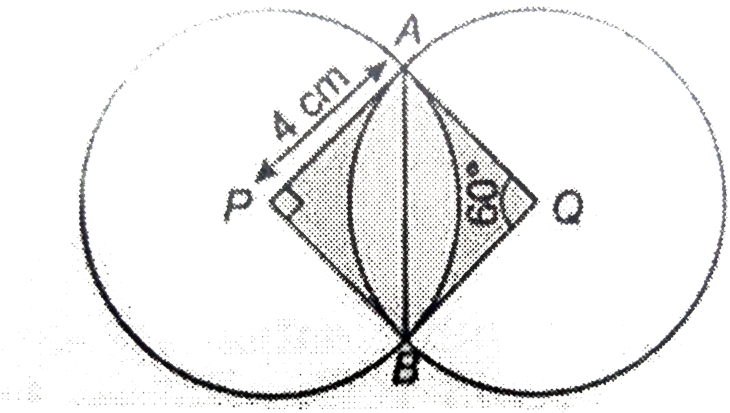
32. In the adjoining figure, two circles cut at A and B. P and Q are the centres of the circles. If $\angle APB = 90^\circ$ and $\angle AQB = 60^\circ$, then find

the area of the shaded portion if AP = 4 cm. (Use

$= \sqrt{3} = 1.73)$



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Revision Exercise Very Short Answer Question

1. The radius of a circle is 7 cm. Find its area

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2. The perimeter of a circular plate is 132 cm. Find its area

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3. The area of a semicircle is $308cm^2$. Find its perimeter

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4. The perimeter of a sheet of paper in the shape of a quadrant of a circle is 75 cm. Find its area

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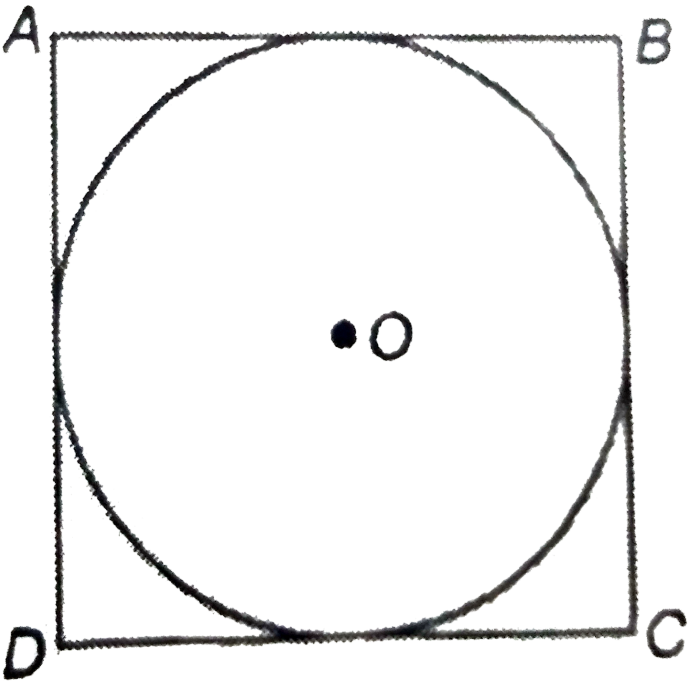
5. in the adjoining figure ABCD is a square of side 14 cm. Find the radius of the circle



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6. The area of a circle is $301.84cm^2$. Calculate radius of circle

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7. The radius of a circle is 3.6 cm. Find the length of the arc of the sector with central angle 36°

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8. A sector is cut from a circle of radius 21 cm. The angle of the sector is 150°. Find its area

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9. The perimeter of a certain sector of a circle of radius 5.6 m is 27.2 m. Find the area of the sector

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10. The inner and outer radius of a circular track are 56 m and 63m respectively. Find the area of the track

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11. The diameter of a wheel is 84 cm. How many revolution will it make to cover 792 m ?

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12. The difference between the circumference and radius of a circle is 37 cm. Find the area of the circle

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Revision Exercise Short Answer Question

1. Two circles touch each other externally. The sum of their areas is $58\pi cm^2$ and the distance between their centres is 10 cm. Find the radii of the two circles.

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2. The perimeter of a sheet of tin in the shape a quadrant of a circle is 12.5 cm. Find its area

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3. A sheet is 11 cm long and 2 cm wide. Circular piece of diameter 0.5 cm are cut from it. Calculate the number of discs that can be prepared.

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4. A road 3.5 m wide surrounds a circular plot whose circumference is 44 m. Find the cost of paving the road at Rs 50 per m^2

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5. The sum of diameter of two circles is 14 cm and the difference of their circumferences is 8 cm. Find the circumference of two circles

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6. A reactangle with one side 4 cm is inscribed in a circle of radius 2.5 cm. Find the area of the rectangle

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7. A circle field has perimeter 660m. Plot in the shape of a square having its vertices on the circumference is marked in the field. Calculate the area of the square field

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8. A chord 10cm long is drawn in a circle whose radius is $\sqrt{52}$ cm. Find the area of both the segments.

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9. OABC is a rhombus whose three vertices A,B and C lie on a cricle with centre O. If the radius of the circle is 10 cm. Find the ara of the rhombus

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10. If an arc forms 72° at the centre of the circle. Find the ratio of its length to circumference of circle.

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11. Find the ratio of the areas of the incircle and circumcircle of a square.

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12. The arcs of two circles whose radii are in the ratio of $4:3$ subtend an angle of 48° each at their centres. Compare the areas of the two sectors

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Revision Exercise Long Answer Question

1. An equilateral triangle is inscribed in a circle. If a side of the triangle is 12 cm. If a side of the triangle is 12 cm. Find the area of the circle.

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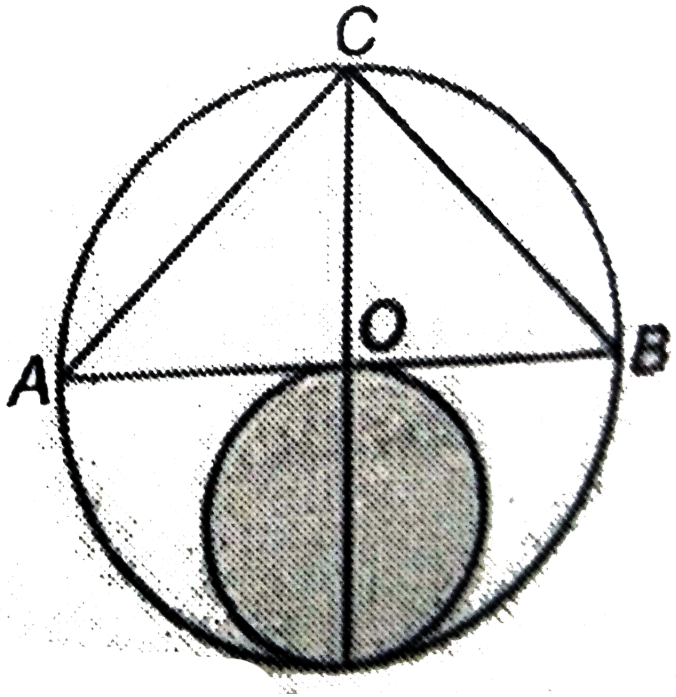
2. In the given figure, O is the centre of the circle with radius 14 cm. Find the area of the shared

portion



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3. The inside perimeter of a running track with semi circular ends and straight parallel sides is

888 metres. The length of the each of the straight portion of sides is 180 metre. If the track has an uniform width 2.10 metres throughout, find its area, also find its external perimeter.

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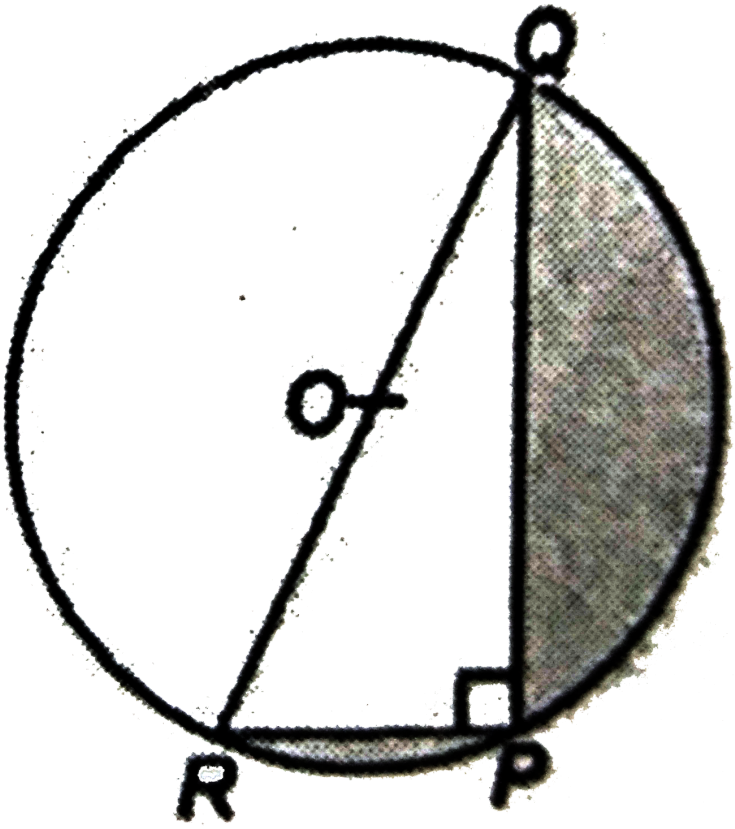
4. In the given figure, PQ = 24 cm PR = 7 cm and O is the centre of the circle. Find the area of the

shaded region. (Use $\pi = 3.14$)



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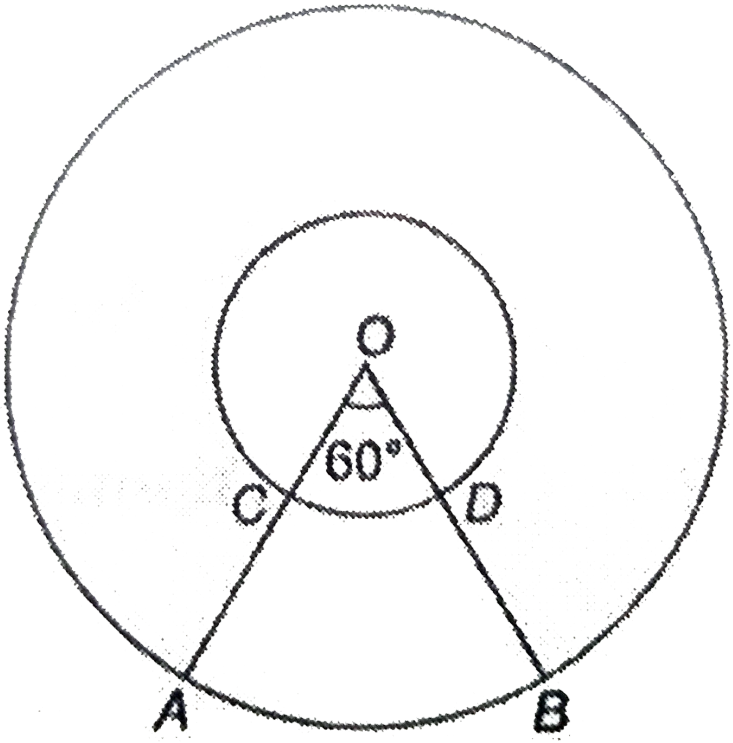
5. In the adjoining figure, two concentric circle with centre O have radii 21 cm and 42 cm. If $\angle AOB = 60^\circ$, find the area of the shaded region. (Use $\pi = \frac{22}{7}$)



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