MATHS

BOOKS - KUMAR PRAKASHAN

AREAS RELATED TO CIRCLES

Textual Examples

1. The cost of fencing a circular field at the rate of Rs. 24 per metre is Rs. 5280. The field is to be ploughed at the rate of Rs 0.50 per m^2.

Find the cost of ploughing the field (Take $\pi = \frac{22}{7}$)

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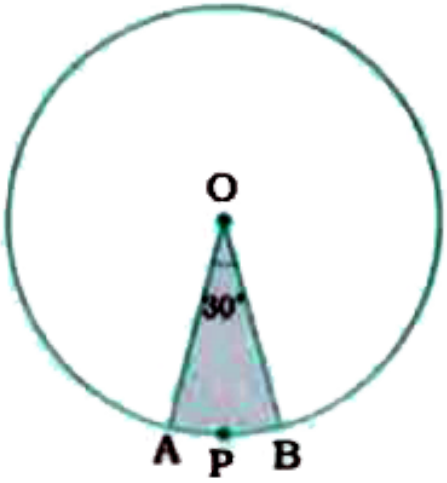
2. Find the area of the sector of a circle with radius 4 cm and of angle 30°. Also, find the area of the corresponding major sector [Use

$\pi = 3.14]$.



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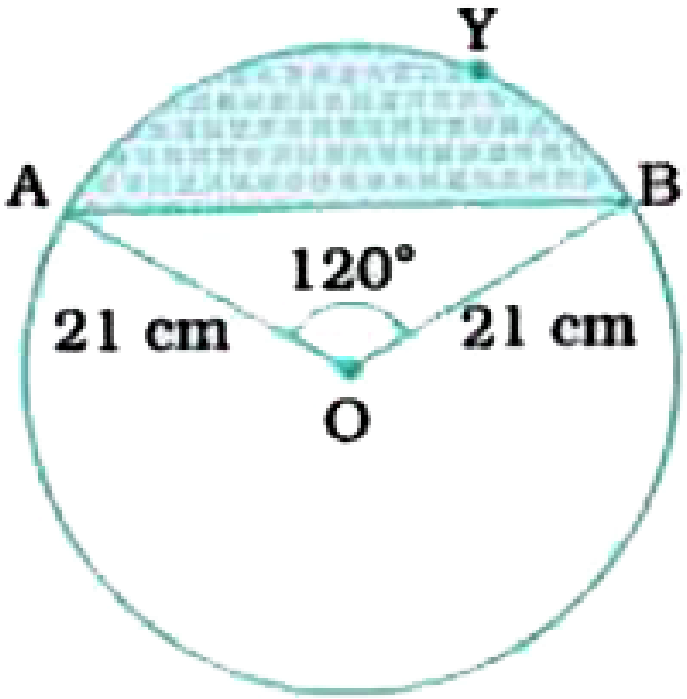
3. Find the area of the segment AYB shown in the given figure, if radius of the circle is 21 cm

and $\angle AOB = 120^\circ$. (Use $\pi = \frac{22}{7}$)



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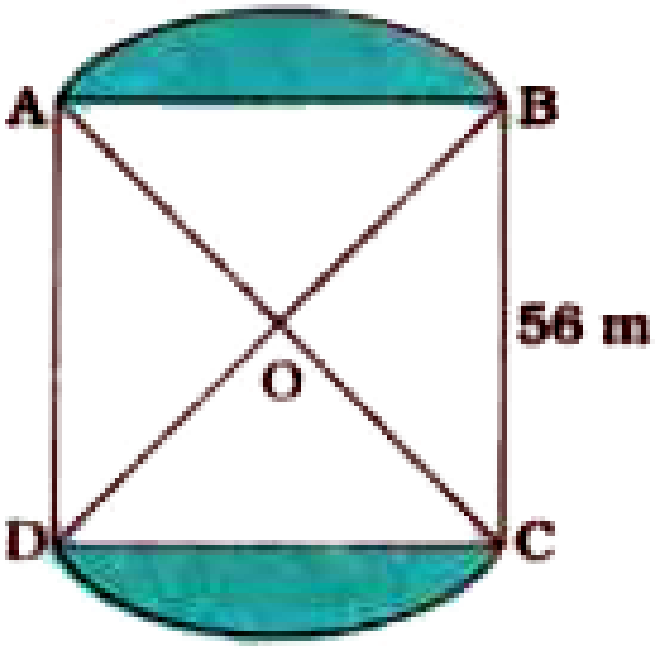
4. In the given figure, two circular flower-beds have been shown on two sides of a square lawn ABCD of side 56m. If the centre of each circular flower-bed is the point of intersectio O of the diagonals of the square lawn, find the sum of the area of the lawn and the flower-

beds.



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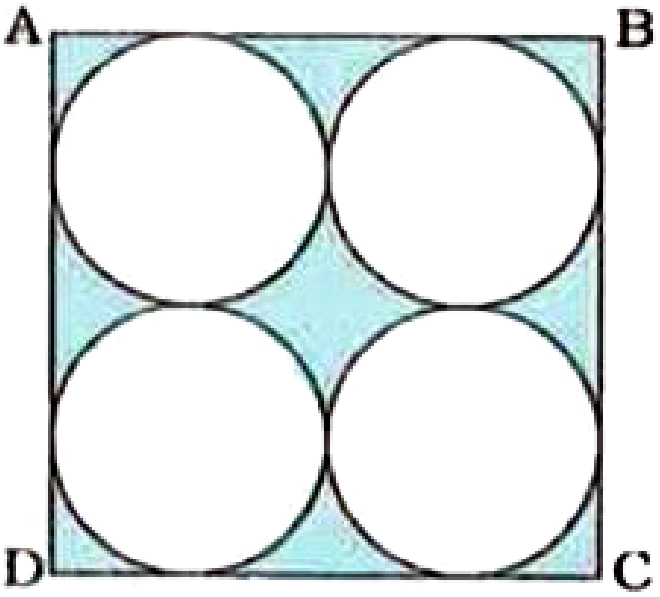
5. Find the area of the shaded region in the given figure, where ABCD is a square of side 14

cm.



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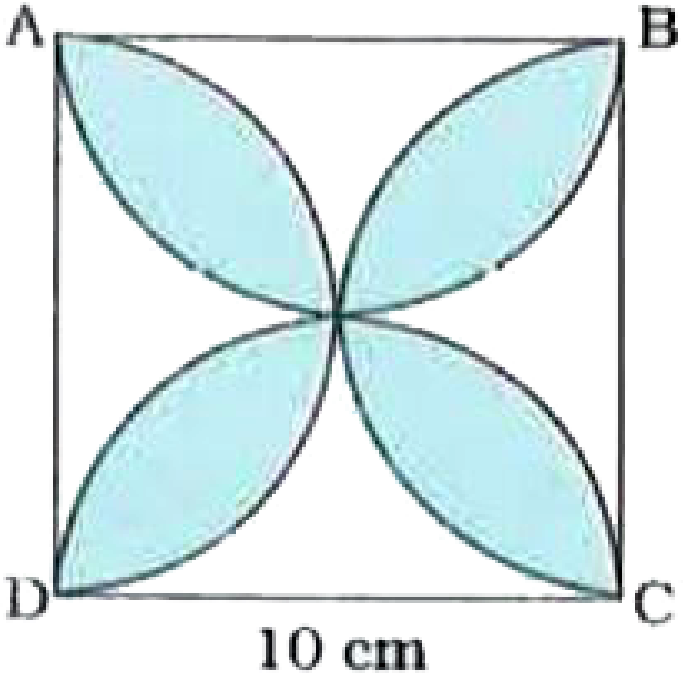
6. Find the area of the shaded design in the given figure, where ABCD is a square of side 10

cm and semicircles are drawn with each side of the square as diameter. (Use $\pi = 3.14$)



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Other Important Examples

1. Find the diameter of the circle whose area is equal to the sum of the areas of two circles of diameters 20cm and 48 cm.

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2. The diameters of the front and the rear wheels of a tractor are 80cm and 2m respectively. Find the number of revolutions that the rear wheel makes in covering a

distance in which the front wheel makes 1400 revolutions.

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3. The difference between the radii of the bigger circle and the smaller circle is 7cm and the difference between their area is $1078cm^2$. Find the radii of both the circles.

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4. Find the differnce of the areas of a minor sector of angle 120° and its corresponding major sector of a circle of radius 21 cm.

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5. 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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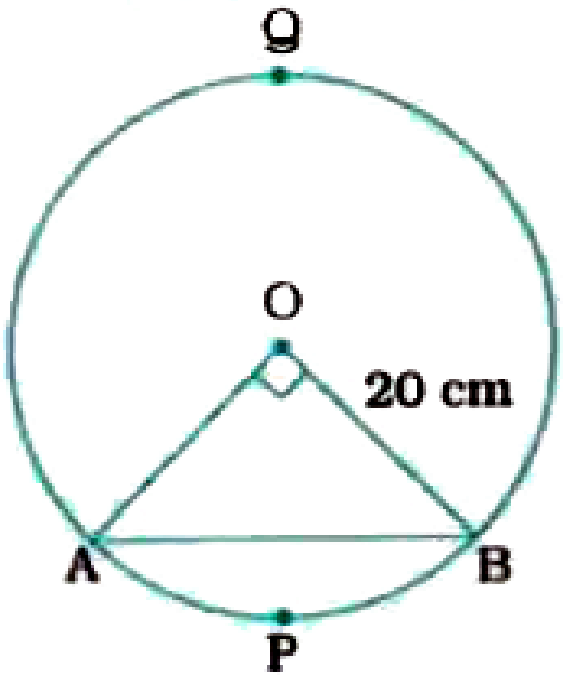
6. A chord of a circle of radius 20 cm subtends an angle of 90° at the centre. Find the area of th corresponding major segment of the circle. (Use $\pi = 3.14$)



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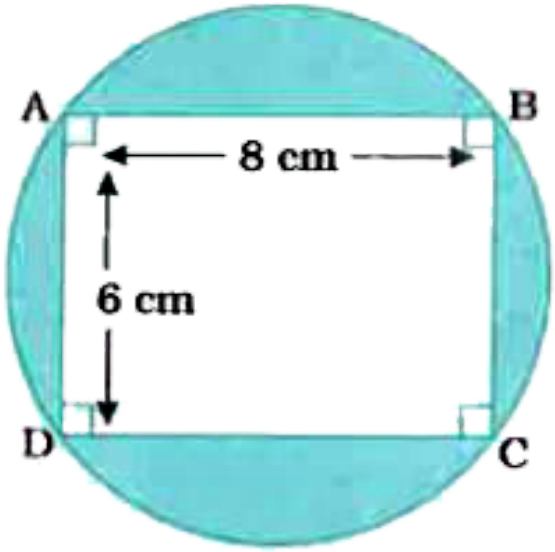
7. In the given figure, find the area of the shaded region. (Use $\pi = 3.14$)



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8. An archery target has three regions formed by three concentric circles as shown in the given figure. If the diameters of the circle are in ratio $1:2:3$, then find the ratio of the areas of three regions.

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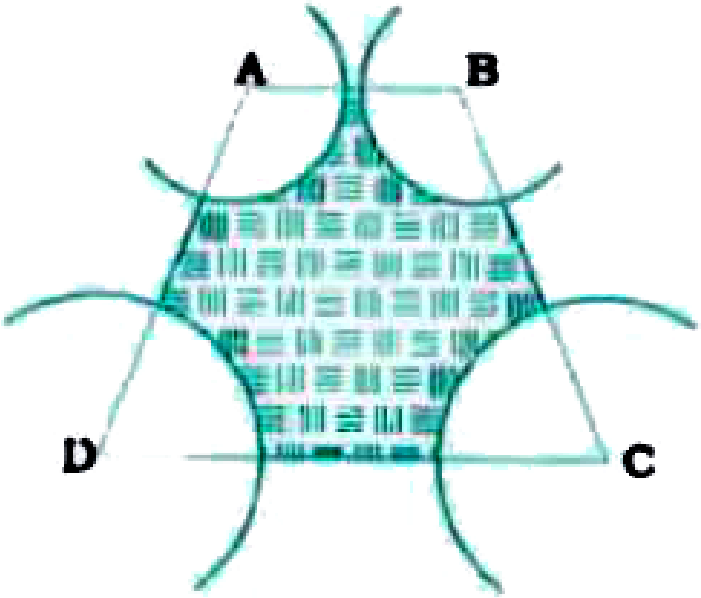
9. In the given figure, ABCD is a trapezium with $AB \mid\mid DC$, AB = 18 cm, DC = 32 cm and distance between AB and DC = 12 cm. If arcs of equal radii 7 cm with centres A, B, C and D have been drawn, then find the area of the

shaded region of the figure.



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Exercise 12 1

1. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has circumference equal to the sum of the circumference of the two circles.

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2. The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having area equal to the sum of the areas of the two circles.

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3. The given figure depicts an archery target marked with its five scoring regions from the centre outwards as Gold, Red, Blue, Black and White. The diameter of the region representing Gold score is 21 cm and each of the other bands is 10.5 cm wide. Find the area of each of the five scoring regions.

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4. The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66km per hour ?

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5. Tick the correct answer in the following and justify your choice :

If the perimeter and the area of a circle are

numerically equal, then the radius of the circle is

A. 2 units

B. π units

C. 4 units

D. 7 units

Answer: A::B

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Exercise 12 2

1. Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60°.

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2. Find the area of a quadrant of a circle whose circumference is 22 cm.

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

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4. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding : (1) minor segment (2) major sector ([Use $\pi = 3.14$)

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5. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find : (1) the length of the arc (2) area of the sector formed by the arc. (3) area of the segment formed by the corresponding chord

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6. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the area of the corresponding minor and major segments

of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

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7. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

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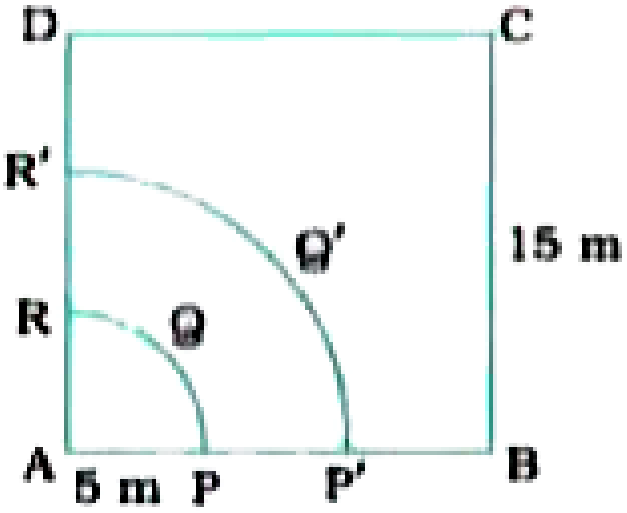
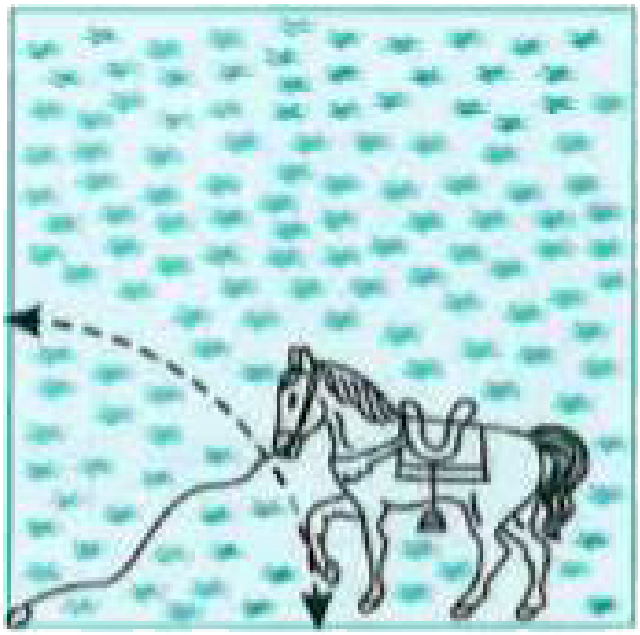
8. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5m long rope. Find :

(1) the area of that part of the field in which the horse can graze.

(2) the increase in the grazing area if the rope were 10m long instead of 5m. (use $\pi = 3.14$)





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9. A brooch is made with silver wire in the form of a circle with diameter 35mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the given figure. Find :

(1) the total length of the silver wire required.

(2) the area of each sector of the brooch.

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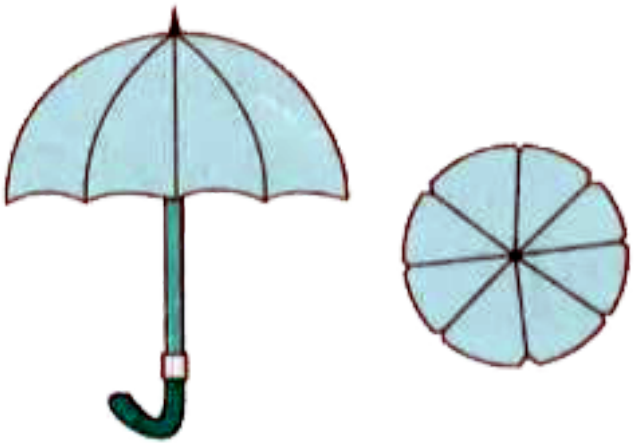
10. An umbrella has 8 ribs which are equally spaced (see the given figure). Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella.



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

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12. To warn ships for underwater rocks, a lighthouse spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use $\pi = 3.14$)

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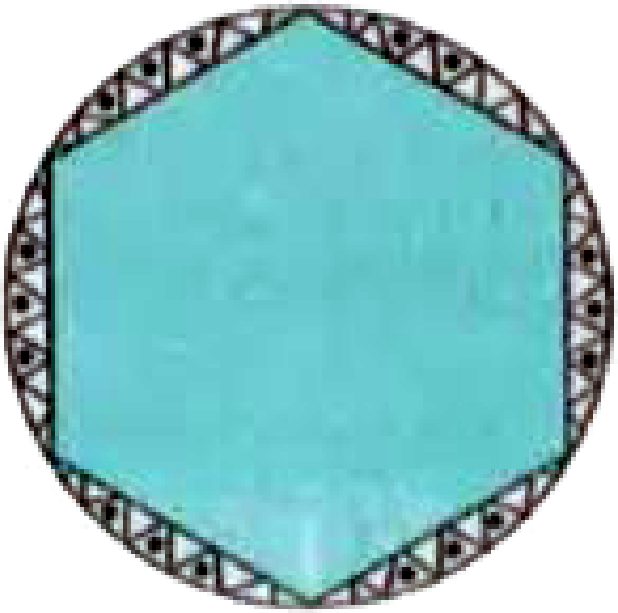
13. A round table cover has six equal designs as shown in the given figure. If the radis of the cover is 28cm, find the cost of making the designs at the rate of Rs. 0.35 per cm^2. (Use

$\sqrt{3} = 1.7$)



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14. Tick the correct answer in the following :

Area of a sector of angle p (in degrees) of a

circle with radius R is

A. $\frac{p}{180} \times 2\pi R$

B. $\frac{p}{180} \times \pi R^2$

C. $\frac{p}{360} \times 2\pi R$

D. $\frac{p}{720} \times 2\pi R^2$

Answer: B::D

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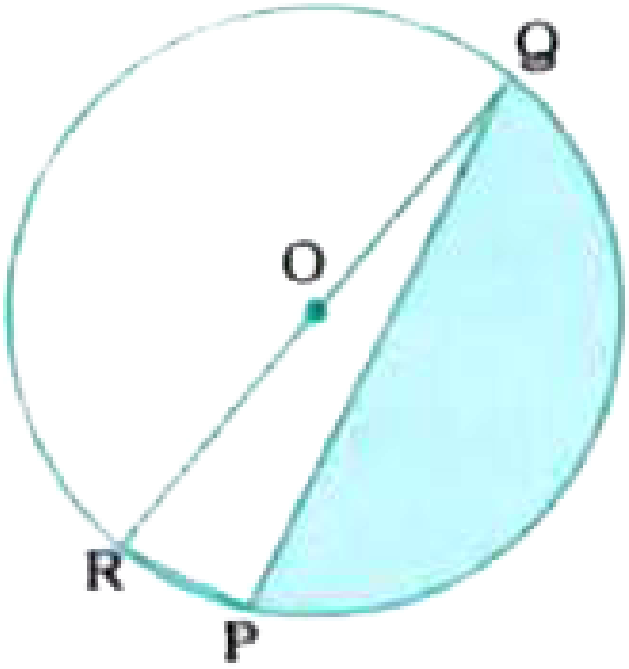
Exercise 12 3

1. Find the area of the shaded region in the given figure, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.



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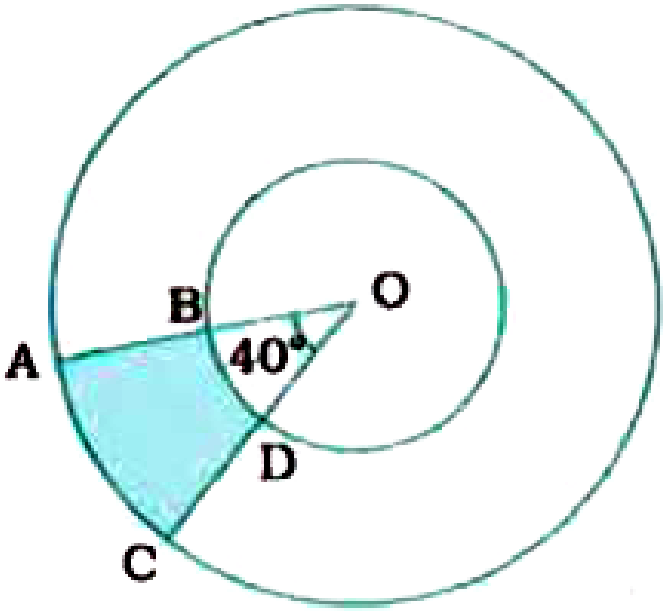
2. Find the area of the shaded region in the given figure, if radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and $\angle AOC = 40^\circ$.



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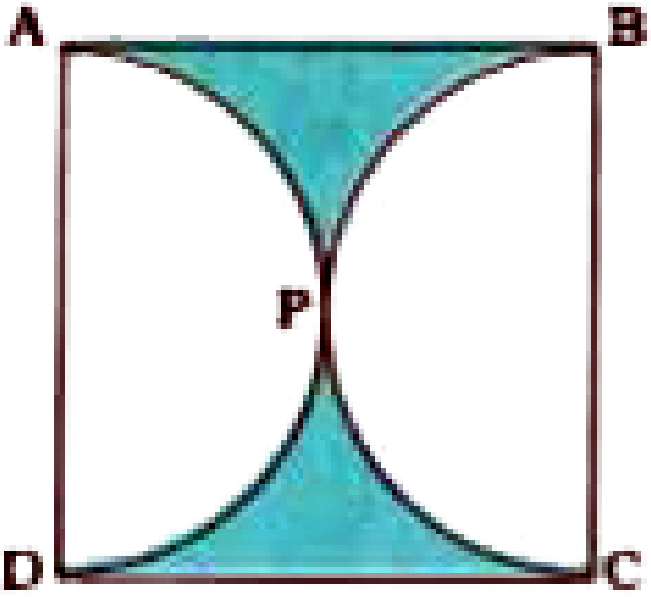
3. Find the area of the shaded region in the given figure, if ABCD is a square of side 14 cm and APD and BPC are semicircles.



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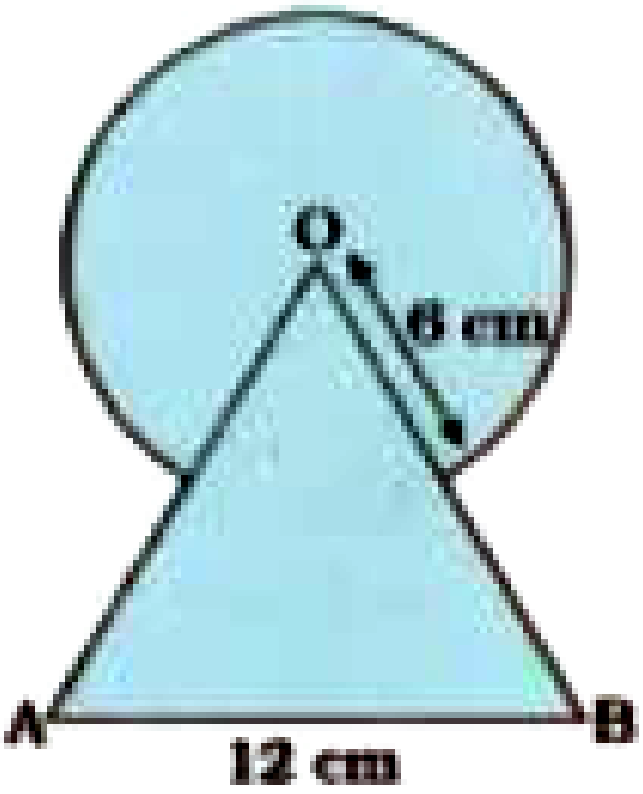
4. Find the area of the shaded region in the given figure, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.



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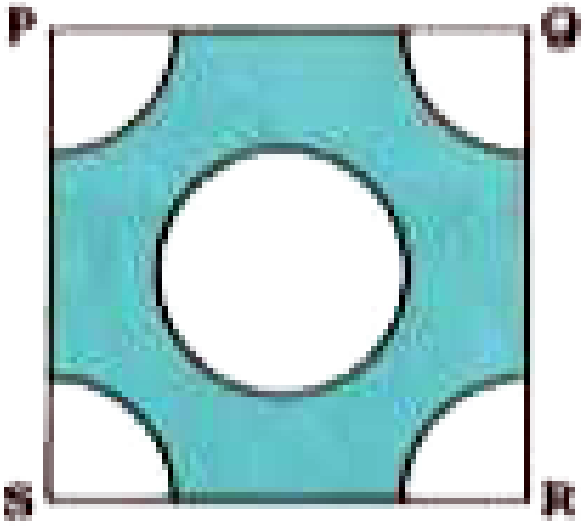
5. From each corner of a square of 4 cm quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in fig. Find the area of the remaining portion

of the square.



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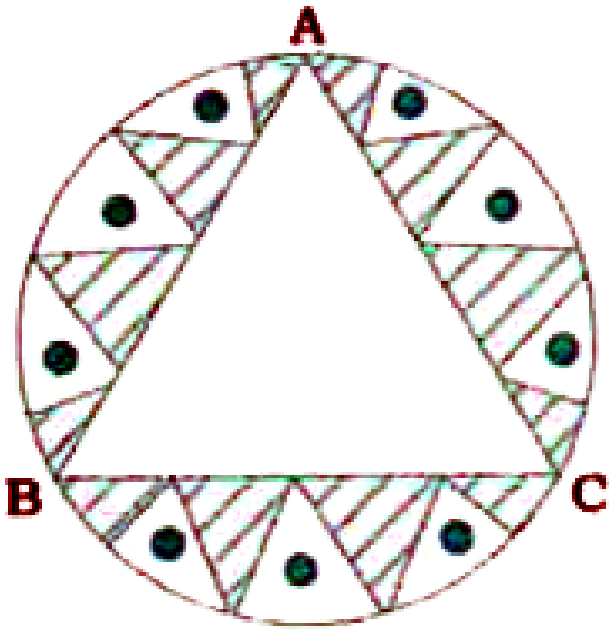
6. In a circular table cover of radius 32 cm, a design is formed leaving an equilateral triangle ABC in the middle as shown in the

given figure. Find the area of the design.



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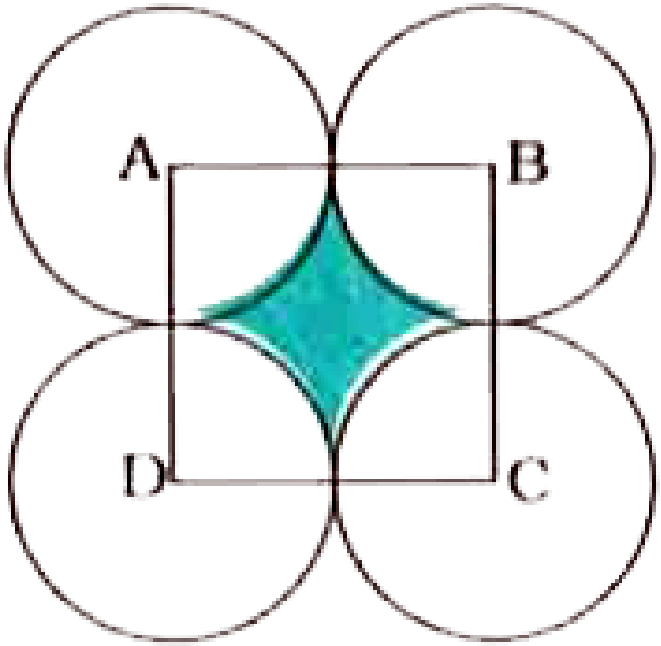
7. In the given figure, ABCD is a square of side 14 cm. Withcentres A, B, C and D four circles

are drawn such that each circle touch externally two of the remaining three circles. Find the area of the shaded region.



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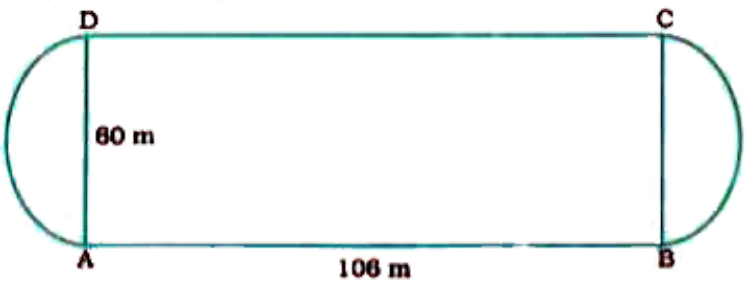
8. The given figure depicts a racing track whose left and right ends are semicircular. The distance between the two inner parallel line segments is 60m and they are each 106 m long. If the track is 10 m wide. Find :

(1) the distance around the track along its inner edge.

(2) the area of the track.



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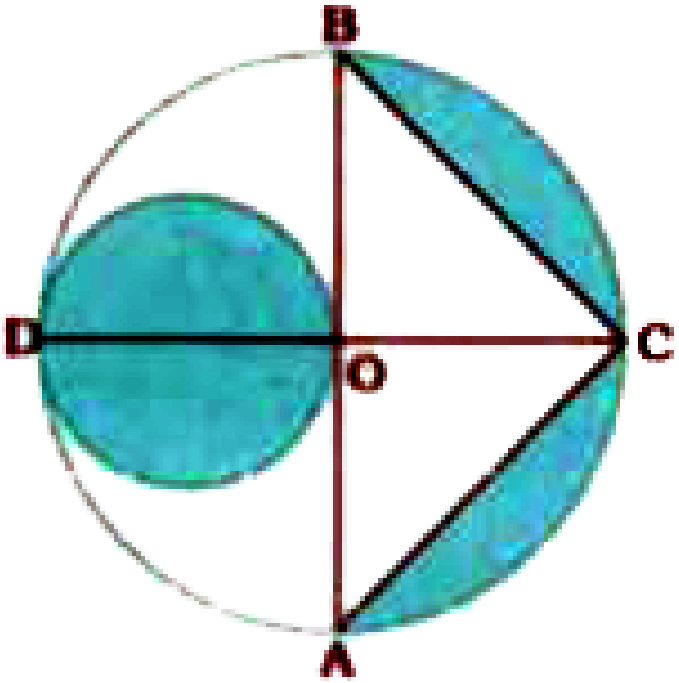
9. In the given figure, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find

the area of the shaded region.



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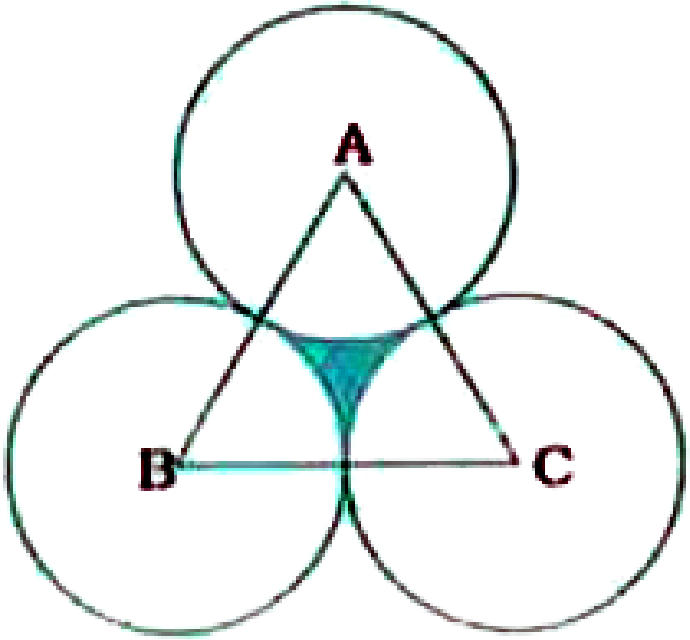
10. The area of an equilateral triangle ABC is $17320.5cm^2$. With each vertex of the triangle

as centre, a circle is drawn with radius to half the length of the side of the triangle (see the given figure). Find the area of the shaded region. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73205$)



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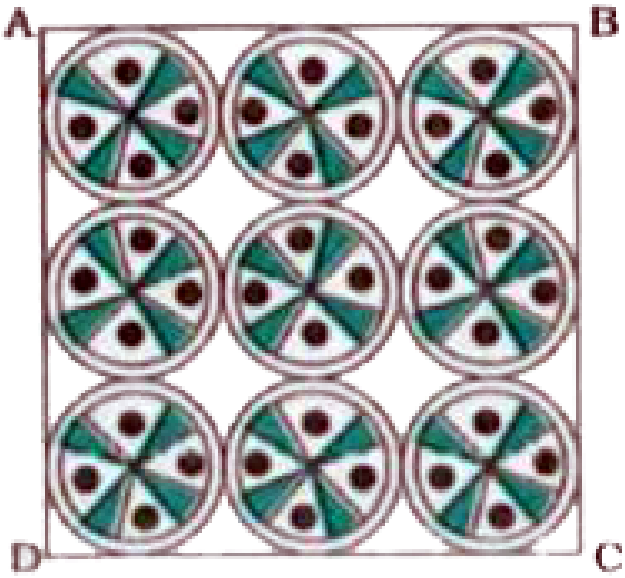
11. On a square handkerchief, nine circular designs each of radius 7 cm are made (see the given figure). Find the area of the remaining portion of the handkerchief.



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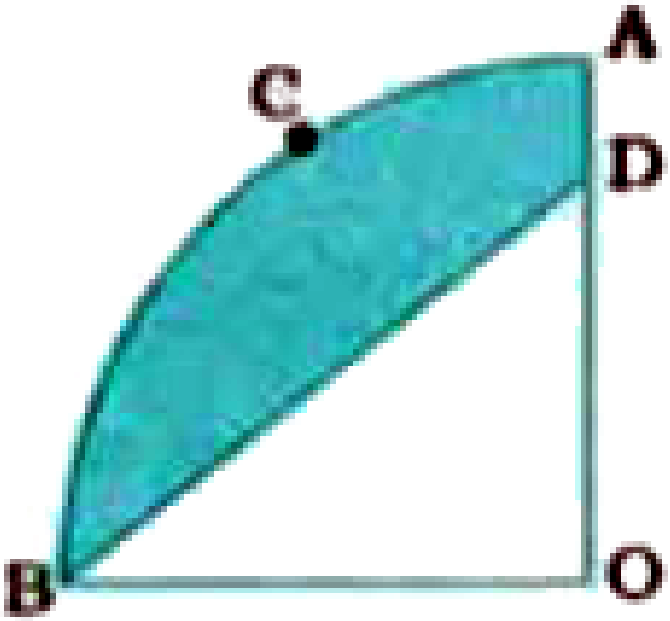
12. In the given figure, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2cm, find the area of the (1) quadrant OACB, (2) shaded region.



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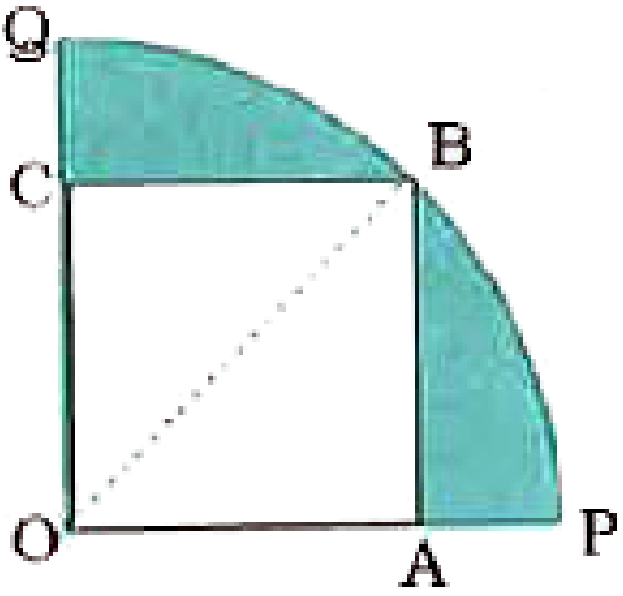
13. In the given figure, a square OABC is inscribed in a quadrant OPBQ. If $OA = 20cm$, find the area of the shaded region. (Use $\pi = 3.14$)



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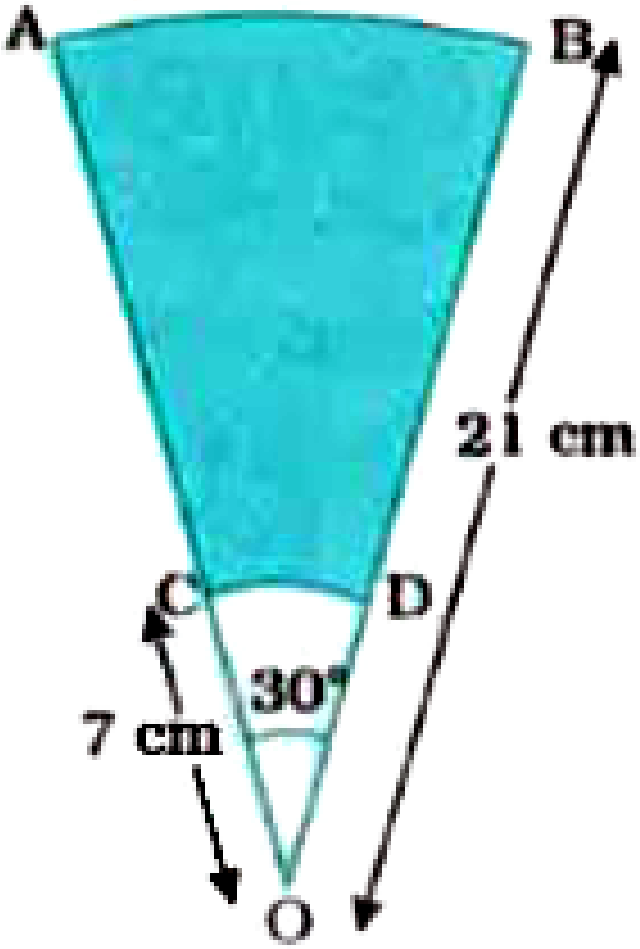
14. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O (see the given figure). If $\angle AOB = 30^\circ$, find the area of the shaded

region.



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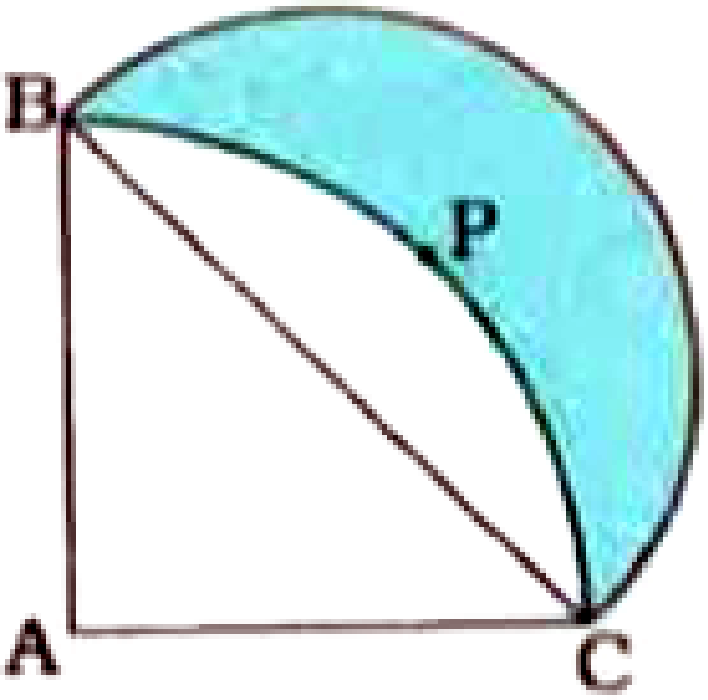
15. In the given figure, ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter. Find the area of the shaded region.



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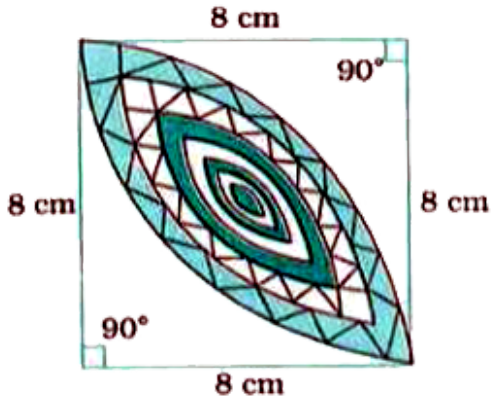
16. Calculate the area of the designed region in the given figure common between the two quadrants of circles of radius 8 cm each.



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Test Your Skills

1. The circumference of a circle exceeds its diameter by 30 cm. Find the circumference of the circle.

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2. The area of a circular playground is $22,176 m^2$. Find the cost of facing this ground at the rate of Rs.50 per meter.

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3. The area enclosed between two concentric circles is $770cm^2$. If the radii of the circles differ by 7 cm, find both the radii.

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4. The wheels of a motorcycle are of radius 35 cm. How many revolutions per minute must the wheel make so as to keep a speed of 66 km/h ?

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5. A path of width 3.5m runs around the curved boundary of a semicircular grassy plot whose perimeter is 72m. Find the area of the path.

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6. Find the area of the minor segment of a circle of radius 14 cm. When the angle of the corresponding sector is 60°.

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7. Find the area of a sector of a circle of radius 28 cm and central angle 45°.

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8. A cow is tied with a rope of length 14 m at the corner of a rectangular field of dimensions $20m \times 16m$. Find the area of the field in which the cow can graze.

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9. A chord of a circle of radius 14 cm makes a right angle at the centre. Find the areas of the minor and major segments of the circle.

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10. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding : (1) minor segment (2) major sector ([Use $\pi = 3.14$)

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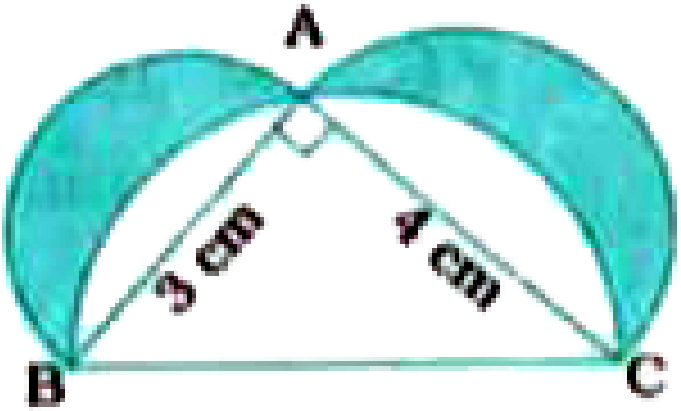
11. In the given figure, ABC is a right triangle, right angled at A. AB = 3 cm and AC = 4 cm. Semicircles are drawn on AB, AC and BC as diameters. Find the area of the shaded region.



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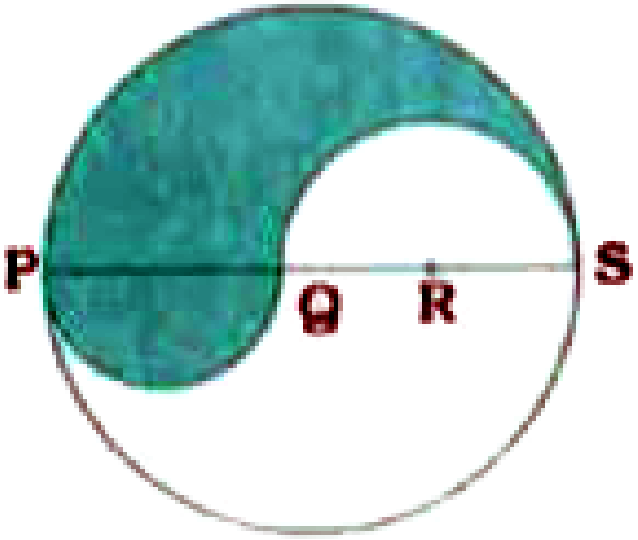
12. In the given figure, PQRS is a diameter of circle with radius 6cm, such that the lengths PQ, QR and RS are equal. Semicircles are drawn on PQ and QS as diameters. Find the area of the shaded region.



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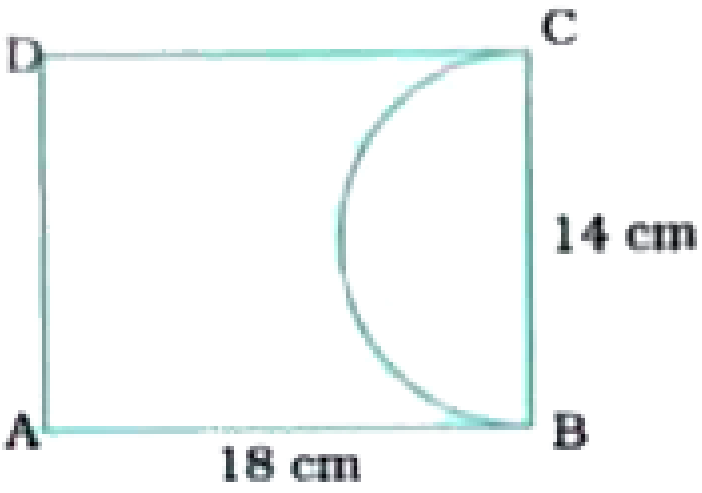
13. A paper is in the form of a rectangle ABCD in which AB = 18 cm and BC = 14 cm. A semicircle with BC as diameter is cut off. Find the area of remaining paper.



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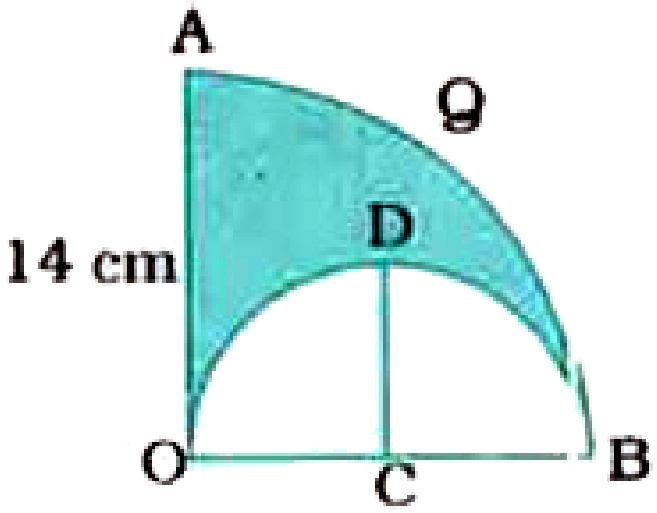
14. OAQB is a quadrant of a circle with centre O and radius 14 cm. A semicircle is drawn on diameter OB. Find the area of the shaded region.



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15. What is the area of an equilateral triangle inscribed in a circle of radius 4cm?

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Practice Thoroughly

1. A playground has the shape of a rectangle, with two semicircles on its smaller sides as diameters, added to its outside. If the sides of the rectangle are 36 m and 24.5 m, find the area of the playground.

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2. A rectangular park is 100 m by 50m. It is surrounded by semicircle flowerbeds all round. Find the cost of levelling the semicircular flower-beds at 70 paise per square metre.

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3. If the diameter of a semicircular protractor is 14 cm, then find its perimeter.

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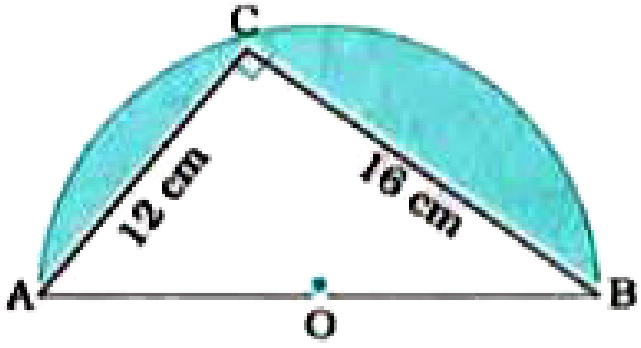
4. In the given figure AB is a semicircle with centre O. Find the perimeter and the area of the shaded region correct upto one decimal place. Here, AC = 12 cm and BC = 16 cm. (Use $\pi = 3.14$)



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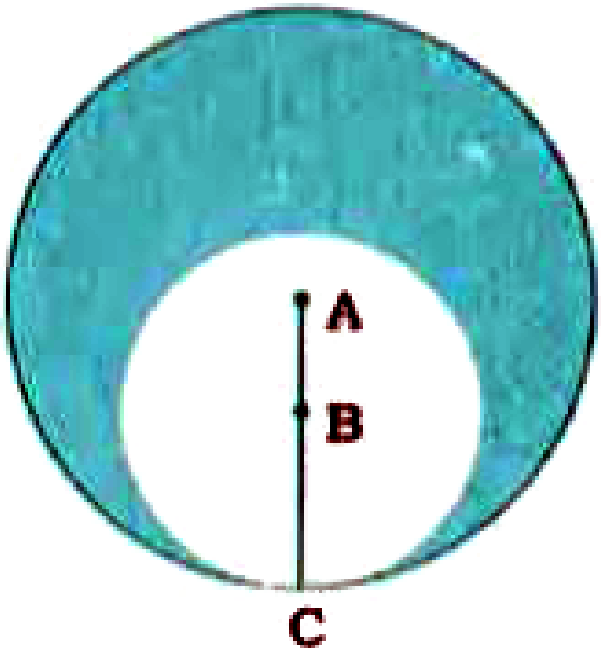
5. In the given figure, two circles with centres A and B touch each other internally at point C. If AC = 8 cm and AB = 3cm, find the area of the shaded region.



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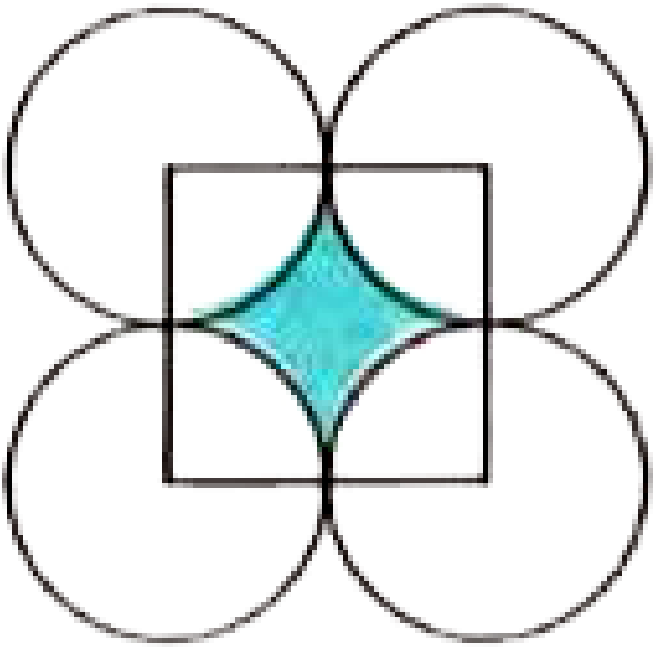
6. The diameter of a coin is 1 cm. If four such coins are palced on a table as shown in the figure such that the rim of each touches that of the other two, find the area of the shaded region. (Use $\pi = 3.1416$)



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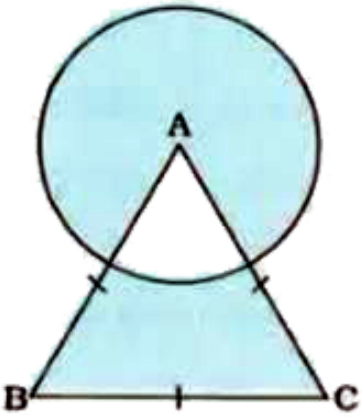
7. In the given figure, ABC is an equilateral triangle with side 14 cm and a circle of radius 7 cm is drawn with vertex A as centre. Find the area of the shaded region. (Use $\sqrt{3} = 1.73$)



[Hint : Required area = Area of triangle + Area of circle $-2 \times$ Area of sector]

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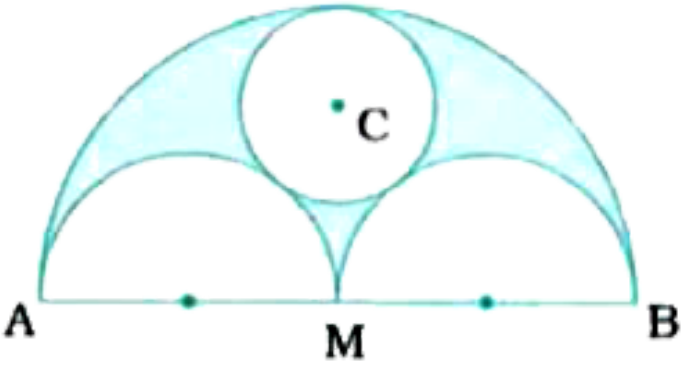
8. In the given figure, AB = 36 cm and M is the midpoint of AB. Semicircles are drawn on AB, AM and MB as diameters. A circle with centre C touches all the three circles. Find the area of shaded region.



[Hint : Take O as the centre of semicircle on

diameter AM. Take the radius of the circle with centre C as r. Then , OC = (9 + r)cm, OM = 9 cm and CM = (18-r) cm. Now, use Pythagoras theorem and find r = 6 cm.]

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Objective Questions

1. Fill in the blanks so as to make each of the following statements true :

The difference between the circumference and

radius of a circle is 37 cm. Then the circumference of the circle is.....

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2. Fill in the blanks so as to make each of the following statements true :

The area of the largest triangle that can be inscribed in a semicircle of radius r cm is ..... cm^2.

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3. Fill in the blanks so as to make each of the following statements true :

If the perimeter of a sector of a circle of radius 6.5 cm is 29 cm, then its area is..... cm^2.

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4. Fill in the blanks so as to make each of the following statements true :

If the radius of a circle diminished by 10%, its area diminishes by ..... %.

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5. Fill in the blanks so as to make each of the following statements true :

The area of a quandrant of a circle with radius 28 cm is ..... cm^2.

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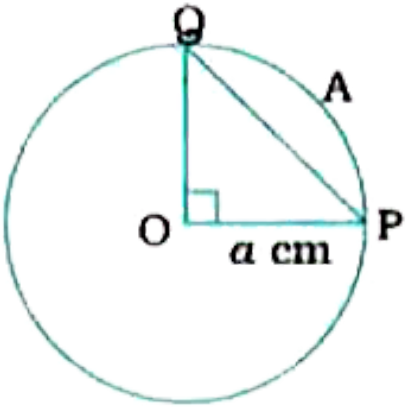
6. Answer each question by selecting the proper alternative from those given below each question so as to make each statement

true :

In the given figure, the area of segment PAQ is

..... cm^2.



A. $\frac{a^2}{4}(\pi + 2)$

B. $\frac{a^2}{4}(\pi - 2)$

C. $\frac{a^2}{4}(\pi - 1)$

D. $\frac{a^2}{4}(\pi + 1)$

Answer: A::B::D

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7. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

If the area of a sector of a circle bounded by an arc of length $5\pi cm$ is equal to $20\pi cm^2$, then its radius is ..... cm.

A. 12

B. 16

C. 8

D. 10

Answer:

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8. Answer each question by selecting the proper alternative from those given below each question so as to make each statement

true :

If the perimeter of a circle is equal to that of a square, then the ratio of their areas is ..... .

A. $22:7$

B. $14:11$

C. $7:22$

D. $11:14$

Answer: A::D

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9. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. Then, the radius of the new park would be ..... m.

A. 10

B. 15

C. 20

D. 24

Answer: A

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10. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

The area of a circle that can be inscribed in a square of side 6 cm is ..... cm^2.

A. 36π

B. 18π

C. 12π

D. 9π

Answer:

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11. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

The diameter of a circle whose area is equal to the sum of areas of two circles of radii 24 cm and 7 cm is ..... cm.

A. 31

B. 25

C. 62

D. 50

Answer:

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12. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

The area of a square that can be inscribed in a circle of radius 8 cm is ..... cm^2.

A. 256

B. 128

C. $64\sqrt{2}$

D. 64

Answer: A::B

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13. Answer each question by selecting the proper alternative from those given below each question so as to make each statement

true :

The distance covered by a wheel of diameter 35 cm in one revolution is ..... m.

A. 2.2

B. 1.1

C. 9.625

D. 96.25

Answer: A

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14. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

If the sum of circumferences of two circles with radii r_1 and r_2 is equal to the circumference of a circle of radius r, then ..... holds good.

A. $r = r_1 + r_2$

B. $r < r_1 + r_2$

C. $r > r_1 + r_2$

D. none of these

Answer: A::B

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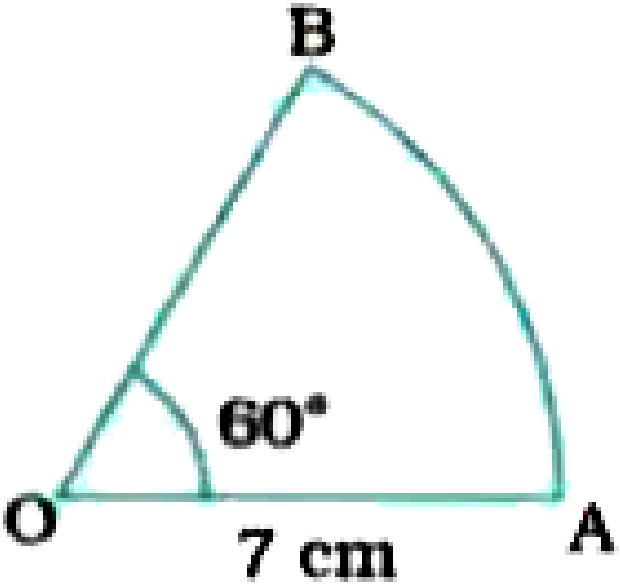
15. Answer each question by selecting the proper alternative from those given below each question so as to make each statement true :

The perimeter of the sector OAB as shown in

the figure is ..... cm.



A. $\frac{64}{3}$

B. 26

C. $\frac{64}{5}$

D. $\frac{22}{3}$

Answer: C::D

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16. Answer the following by a number or a word or a sentence :

If the area of a square is same as the area of a circle,find the ratio of the perimeter of the square and that of the circle.

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17. Answer the following by a number or a word or a sentence :

If the area of a circle with radius r is same as the sum of areas of two circles with radii r_1 and r_2. Find the relation between r, r_1 and r_2.

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18. Answer the following by a number or a word or a sentence :

If the circumference and the area of a circle

are numerically equal, find the diameter of the circle.

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19. Answer the following by a number or a word or a sentence :

A circular park has a path of uniform width around it. The difference between the outer and inner circumference of the circular path is 132m. Find the width of the circular path.

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20. Answer the following by a number or a word or a sentence :

The area of a circle is $220cm^2$. Find the area of a square inscribed in the circle.

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21. State whether each of the following statements is true or false :

The perimeter of a square circumscribing a circle of radius a cm is $8a$ cm.

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22. State whether each of the following statements is true or false :

The distance travelled by a circular wheel of a diameter d cm in one revolution is $2\pi dcm$.

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23. State whether each of the following statements is true or false :

The area of a segment of a circle is less than the area of its corresponding sector.

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24. State whether each of the following statements is true or false :

The numerical value of the area of a circle is always greater than the numerical value of its circumference.

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25. State whether each of the following statements is true or false :

If the areas of two sectors of two different circles are equal, the lengths of their corresponding arcs are equal.

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