



MATHS

BOOKS - ZEN MATHS (KANNADA ENGLISH)

AREA RELATED TO CIRCLES

Illustrative Examples

1. Find the perimeter of a circle of radius 7cm.



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2. The circumference of a circle is 39.6cm. Find its area.



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3. The circumference of a field is 440m. Find

(a) its radius

(b) its area

(c) cost of levelling the ground at the rate of

$Rs.20perm^2$



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4. A sector is cut from a circle of radius $\frac{21}{2}$ cm. If the angle of the sector is 150° , find its area.



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5. The minute hand of a clock is 15cm long. What is the area swept by it in 20 minutes?



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6. The radius of a circle is 21cm. Calculate the area and perimeter of a sector with an angle of 120° at the centre.



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7. Three congruent of circles of radius 7cm touch each other externally. Find the area enclosed between them.



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8. The radius of a circle is 28cm and the area of the sector filled with rainwater is 205.4cm^2 . Calculate the central angle.

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9. Find the area of the sector of a circle with radius 4cm and angle 30° . Find the area of the corresponding major sector.

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10. A Pendulum swings through an angle of 60° and describes an arc 11cm in length. Find the length of the pendulum.

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11. A chord of a circle of radius 30cm makes an angle 120° at the centre of the circle. Find the area of the minor and major segment.



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12. A rectangle whose sides are 3cm and 4cm is inscribed in a circle. Find the area of the shaded part.



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13. The diameter of a circle is 10cm. A chord of length $\sqrt{50}cm$ is drawn in the circle. Find the area of the major segment.

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14. A chord of a circle subtends an angle of 60° at its centre. If the length of the chord is 100cm, find the area of the major segment.

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15. A rectangle whose sides are 3cm and 4cm is inscribed in a circle. Find the area of the shaded part.



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16. Find the area of the segment of a circle of radius 12cm whose corresponding sector has a central angle of 60°

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17. Find the difference between the areas of the major and minor segments of a circle formed by a chord of length 7cm subtending an angle of 90° at the centre.



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18. A road 7m wide surrounds a circular park whose circumference is 352 m.

Find the surface area of the road. Find the cost of paving the road at $Rs.20perm^2$



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19. The area enclosed between the circumference of two concentric circles is $2464m^2$. Their radii are in the ratio 5:3. Calculate

(i) the area of the outer circle

(ii) Circumference of the inner circle

(iii) the area of the third circle drawn so that the area enclosed between this circle and the given larger circle is twice the area enclosed between the given circles.



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20. The diameter of a car wheel is 56cm. Calculate

(a) the number of times the wheel rotates in travelling a distance of 1.056 km.

(b) the speed of the car in kmph if its wheel covers 750 revolutions per minute.



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21. The area of a circle with radius 13cm is equal to the sum of the areas of circles with radii 3cm, 4cm and R. Find R. Find the area of the circle with radius 'R'.



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22. On a circular table cover of radius 42cm, a design is made by a girl leaving an equilateral triangle ABC in the middle as shown in the figure. It was decided that the payment to the girl be proportional to the covered area of the design. Find the covered area of the design.



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23. In the adjoining figure $\triangle ABC$ is right angled at A. Find the area of the shaded region if $AB=6\text{cm}$,

$\overline{BC} = 10\text{cm}$, and I is the incenter of the $\triangle ABC$.



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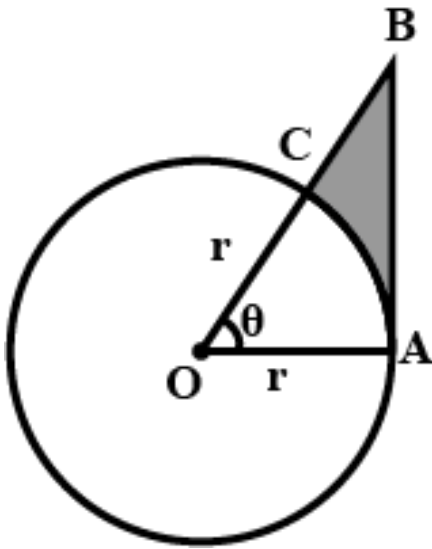
24. Figure shows a sector of a circle with centre O and angle ' θ '. Prove that:

(a) Perimeter of shaded region is

$$r \left(\tan \theta + \sec \theta + \frac{\pi \theta}{180^\circ} - 1 \right) \text{units}$$

(b) area of the shaded region is

$$\frac{r^2}{2} \left(\tan \theta - \frac{\pi \theta}{180^\circ} \right) \text{sq. units}$$



A.

B.

C.

D.

Answer: $= \frac{r^2}{2} \left[\tan \theta - \frac{\pi \theta}{180^\circ} \right] \text{sq. units}$



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25. Find the area of a ring whose outer and inner radii are 12 cm and 10cm respectively.



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26. A paper is in the form of a rectangle with dimensions 20cm and 14cm. A semicircular portion 14cm in diameter is cut off. Find the area of the remaining part.



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27. In an equilateral triangle of perimeter 72cm, a circle is inscribed touching its sides. Find the area of the remaining portion of the triangle.

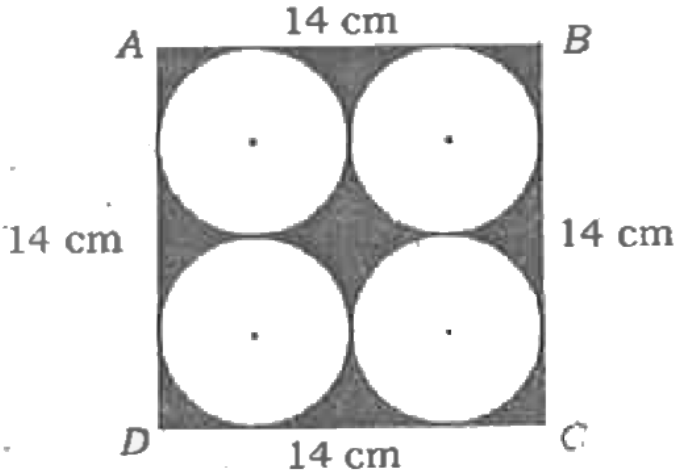


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28. ABCD is a square of side 14cm. Four congruent circles are drawn in the square as shown in figure. Calculate the area of the shaded region.

[Circles touch each other externally and also sides

of the square]



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29. Find the area of the shaded region.

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30. In the given figure ABCD is trapezium with $AB \parallel CD$ and $\angle ABC = 90^\circ$. Four sectors with centres A,B,C,D are cut off, each of radius 3.5cm. IF $BC=CD=14\text{cm}$ and $AB=21\text{cm}$, find the area of the remaining trapezium.



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Textual Exercises Exercise 5 1

1. The radii of two circles are 19 cm and 9 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. Fig.12.3 depicts an archery target marked with its five scoring regions from the center outwards as

gold, red ,blue, black and white. The diameter of the region representing gold is 21 cm and each of the other bands is 10.5cm wide. Find the area of each of the five scoring regions.



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4. The wheels of a car are of diameter 80cm each. How many complete revolutions does each wheel make in ten minutes when the car is traveling at the 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 area of a circle are numerically equal, the radius of the circle is

A. 2 units

B. π units

C. units

D. 7 units

Answer: A



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Textual Exercises Exercise 5 2

1. Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60° . use $\pi = \frac{22}{7}$



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2. Find the area of 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 10cm subtends a right angle at the centre. Find the area of the corresponding.

(a) minor segment (b) major segment



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5. In a circle of radius 21cm , an arc subtends an angle 60° at the centre. Find

(i) the length of the arc

(ii) area of the sector formed by the arc

(iii) area of the segment formed by the corresponding chord.



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



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



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

(i) the area of that part of the field, in which the horse can graze

(ii) the increase in the grazing area if the rope were

10m long



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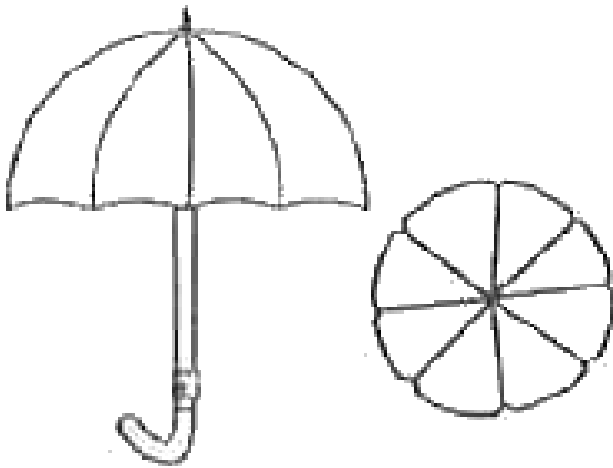
9. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making diameters which divide the circle into ten equal sectors as shown in figure. Find:

- (i) the total length of the silver wire required
- (ii) the area of each sector of the brooch



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10. An umbrella has 8 ribs which are equally spaced. 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. An car has two wipers 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 designs of equal area as shown in the figure. If the radius of the cover is 28cm, find the cost of making the designs at the rate Rs.0.35per cm^2



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14. Area of a sector of angle p (in degrees) of a circle with radius R is

A. $\frac{P}{180^\circ} \times 2\pi r$

B. $\frac{P}{180^\circ} \times \pi r^2$

C. $\frac{P}{360^\circ} \times 2\pi R$

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

Answer: D



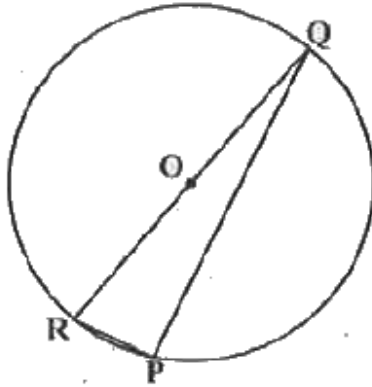
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Textual Exercises Exercise 5 3

1. Unless stated otherwise, use $\pi = \frac{22}{7}$.

Find the area of the shaded region in Fig. 5.19, if PQ =

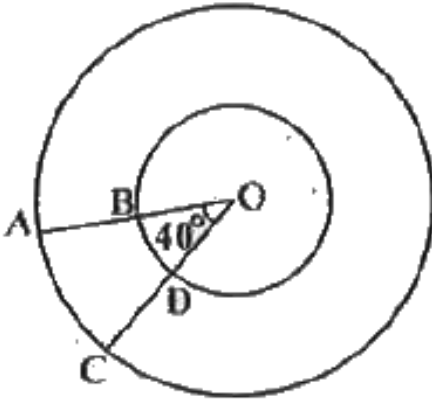
24 cm, $PR = 7$ cm and O is the centre of the circle.



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2. Find the area of the shaded region in Fig., if radii of the two concentric circles with centre O are 7 cm

and 14 cm respectively and $\angle AOC = 40^\circ$.

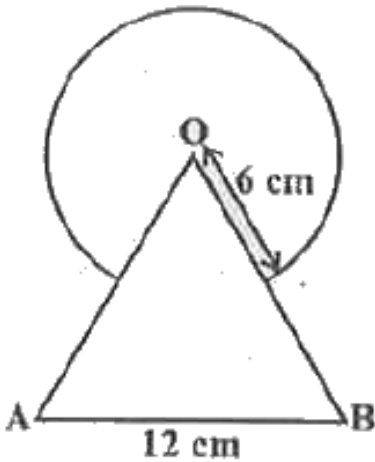


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3. Find the area of the shaded region in Fig, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

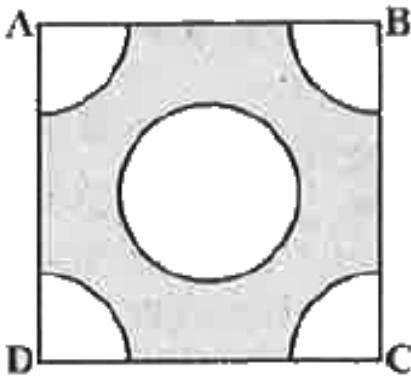
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4. Find the area of the shaded region in Fig. 5.22, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.



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5. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in Fig. 5.23. Find the area of the remaining portion of the square.



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



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7. In the figure, ABCD is a square of side 14cm. With centres A,B,C and D four circles are drawn such that each circle externally touches two of the remaining three circles. Find the area of the shaded region.



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8. The 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 106m long. If the track is 10m wide, find:

(i) distance around the track along its inner edge

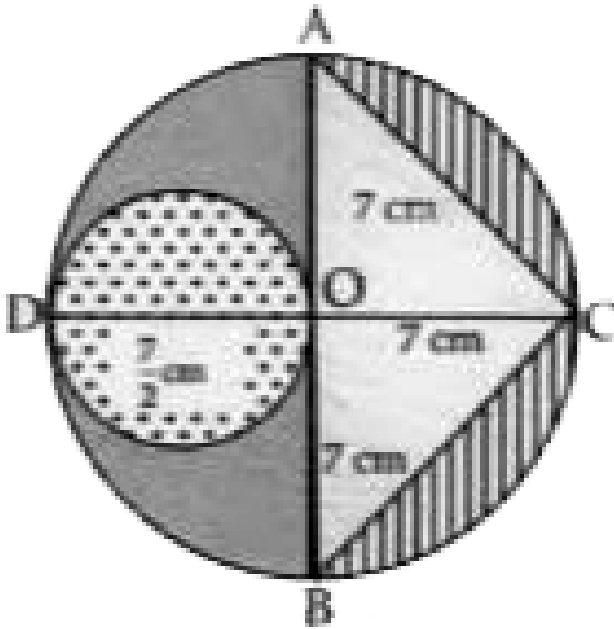
(ii) the area of th track



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9. AB and CD are two diameters of a circle 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 equal to half the length of the side of the triangle. Find the area of the shaded region .



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



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12. In Fig, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm, find the area of the quadrant OACB

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13. In the figure, square OABC is inscribed in a quadrant OPBQ. IF OA=20cm, find the area of the shaded region .



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14. AB and CD are respectively two arcs of two concentric circles of radii 21cm and 7cm with centre O. IF $\angle AOB = 30^\circ$ Find the area of the shaded region.



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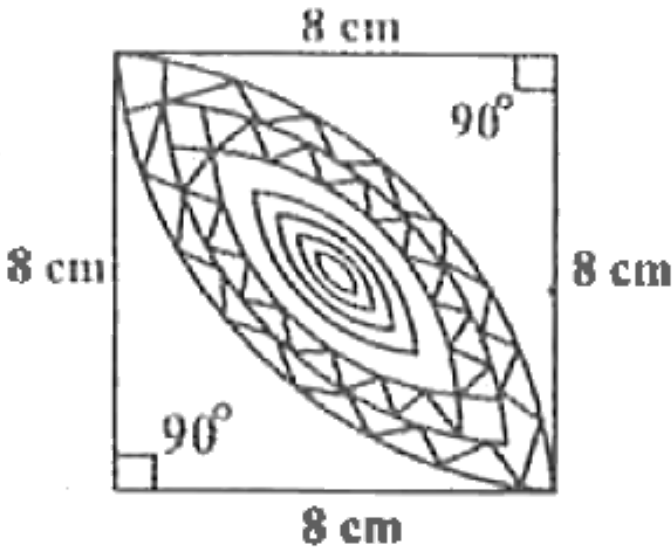
15. In the fig. ABC is a quadrant of a circle of radius 14cm and a semicircle is drawn with BC as a diameter. Find the area of the shaded region.

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16. Calculate the area of the designed region in Fig.

5.34 common between the two quadrants of circle

of radius 8 cm each.



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Additional Questions Multiple Choice Questions

1. The perimeter of a semicircular protactor is 36cm, its diameter is

A. 10cm

B. 12cm

C. 14cm

D. 15cm

Answer: C



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2. The perimeter of a quadrant of a circle with radius a is

A. $\frac{\pi a}{2}$ units

B. $2\pi a$ units

C. $\frac{a}{2}[\pi + 4]$ units

D. $2\pi a + \frac{a}{2}$ units

Answer: C



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3. The outer and inner diameters of a circular ring are 34cm and 32 cm respectively. The area of the ring is

A. $60\pi cm^2$

B. $33\pi cm^2$

C. $66\pi cm^2$

D. $29\pi cm^2$

Answer: B



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4. The circumference of a circle increases from 4π to 8π . The area becomes

- A. doubled
- B. tripled
- C. four times
- D. five times

Answer: C



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5. The circumference and area of a circle are numerically equal. Its diameter is

A. 4 units

B. 2 units

C. 2π units

D. $\frac{\pi}{4}$ units

Answer: A



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6. The area of a circle that can be inscribed in a square of side 10cm is

A. $10\pi cm^2$

B. $5\pi cm^2$

C. $25\pi cm^2$

D. $100\pi cm^2$

Answer: C



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7. The angle the minute hand covers in moving from 9.00am to 9.35 am is

A. 90°

B. 60°

C. 210°

D. 120°

Answer: C



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8. A wire is in the shape of a circle of radius 21cm. It is bent to form a square. The side of the square is

A. 33cm

B. 66cm

C. 11cm

D. 22cm

Answer: A



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9. A square circumscribes a circle of radius 6cm the length of the diagonal of square is

A. $12cm$

B. $2\sqrt{2}cm$

C. $5\sqrt{2}cm$

D. $3\sqrt{2}cm$

Answer: A



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10. The diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 40 cm and 9cm is

A. 62cm

B. 41 cm

C. 49 cm

D. 82 cm

Answer: D



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11. Find the area of the ring shaped region enclosed between two concentric circles of radii 4cm and 3cm.

A. 33cm^2

B. 44cm^2

C. 11cm^2

D. 22cm^2

Answer: D



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12. A bicycle wheel makes 5000 revolutions in moving 11 km. Find the diameter of the wheel.

A. 165 cm

B. 220cm

C. 110cm

D. 55 cm

Answer: B



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13. IF the area of a sector is $\frac{7}{20}$ of the area of the circle, the sector angle is

A. 90°

B. 100°

C. 126°

D. 110°

Answer: C



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14. A wheel has a radius of 42cm. To cover a distance of 792m, the number of revolutions it makes is

A. 350

B. 400

C. 300

D. 270

Answer: C



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15. The length of the minute hand of a clock is $\sqrt{21} \text{ cm}$. The angle moved by the minute hand from 8 a.m to 8.10 a.m. is

A. 60°

B. 30°

C. 90°

D. 45°

Answer: A



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16. The area swept out by a horse tied in a rectangular field with a rope 8cm long is



A. $64\pi cm^2$

B. $32\pi cm^2$

C. $16\pi cm^2$

D. $48\pi cm^2$

Answer: C



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17. A chord of a circle of radius 28cm makes an angle 90° at the centre. The area of the major segment is

A. 2240cm^2

B. 1456cm^2

C. 1848cm^2

D. 392cm^2

Answer: A



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18. The perimeter of sector of a circle of radius 7cm and central angle 45° is

A. 19.5cm

B. 25cm

C. 14cm

D. 24cm

Answer: A



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19. Area of the largest triangle that can be inscribed in a semicircle of radius a is

A. $\frac{1}{2}a^2 \text{ sq. units}$]

B. $2a^2 \text{ sq. units}$

C. $a^2 \text{ sq. units}$

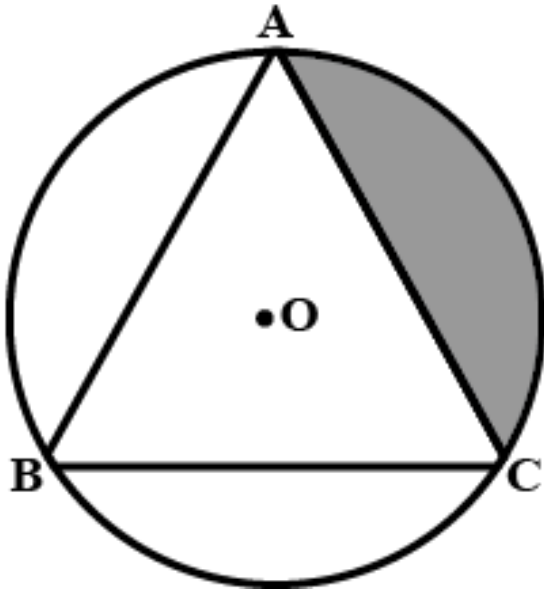
D. $\frac{3}{2}a^2 \text{ sq. units}$

Answer: C



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20. ABC is an equilateral triangle. The area of the



shaded region is

A. $\left(\frac{\pi}{3} + \frac{\sqrt{3}}{4}\right)a^2$

B. $\left(\frac{\pi}{3} - \frac{\sqrt{3}}{2}\right)a^2$

C. $\left(\frac{\pi}{3} - \frac{\sqrt{3}}{4}\right)a^2$

D. $\left(\frac{\pi}{3} + \sqrt{3}\right)a^2$

Answer: C



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21. The radius of a circle is decreased by 10%. Its area is changed by

A. 0.12

B. 0.1

C. 0.19

D. 0.81

Answer: C



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22. If the area of circle is 49π sq. units then it's perimeter is

A. 7π units

B. 9π units

C. 14π units

D. 49π units

Answer: C



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1. Find the area of the circle of radius 4.2cm.



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2. Find the circumference of the circle whose area is 38.5cm^2



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3. What is the area of the sector with central angle 120° ?



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4. The diameter of a semicircular protactor is 14cm.
Find its perimeter .



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5. The circumference of two circles is in the ratio 2:5
, Find the ratio of their areas.



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6. Find the area of a sector of a circle whose diameter is 28cm and central angle is 120°

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7. The sum of the circumference and area of a circle is 15π units. Find its radius.

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8. The area of a sector of a circle $\frac{1}{20}$ the area of the circle Find the sector angle.



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9. What is the area of a circle with diameter d ?



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10. A wheel has a diameter of 84cm. How many revolutions must it make to cover a distance of 1848m?



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Additional Questions Short Answer Type Question

1. The wheel of a motorcycle is of 35cm. How many revolutions per minute must the wheel make so as to keep a speed of 66km/hr

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2. The side of a square is 8cm. Find the areas of circumscribed and inscribed circles.

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3. The area of a circular playground is $22176m^2$. Find the cost of fencing this ground at the rate of Rs 50 per metre.

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4. A circular pond is 17.5 m in diameter It is surrounded by a path 2m wide. Find the cost of constructing the path Rs 25 per m^2

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5. Two circles touch each other externally. Sum of their areas is $90\pi\text{cm}^2$ and the distance between their centres is 12cm. Find their radii.



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6. Two circles touch each other internally. Sum of their areas is $25\pi\text{sq. cm}$ If the distance between their centres is 1cm, find their radii.



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7. The driving wheel of a locomotive engine is 2.1m in radius and it makes 75 revolutions per minute. Find the speed of the train in kmph.

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8. Prove that the ratio of the area of a circle and the equilateral triangle whose side is equal to the diameter of the circle is $\pi : \sqrt{3}$

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9. The difference between the radii of a smaller circle and a larger circle is 7cm and the difference between the areas of the two circles is 1078sq. cm. Find the radius of the smaller circle.

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

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11. Find the difference in the area of a sector of angle 120° and its corresponding major sector in a circle of radius 21cm.



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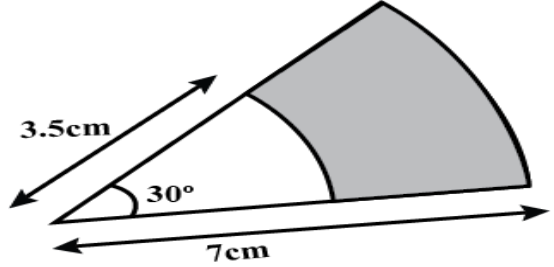
12. The area of a sector is one twentieth of the area of the circle. Find the sector angle.



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13. Two concentric circles of radii 3.5 cm and 7cm form a sector as shown in the figure. Find the area

of the shaded region.



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14. In a circle of radius 21 cm , an arc subtends an angle of 60° at the centre. Find the length of the arc

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15. The area of an equilateral triangle is $49\sqrt{3}cm^2$.

Taking each angular point as centre, circles are drawn with radius equal to half the length of the side of the triangle . Find the area of the triangle not included in the circles.



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16. In figure APB and CQD are semicircles of diameter 7cm each while ARC and BCD are semicircles of diameter 14cm each. Find the perimeter of the

shaded region.



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17. Four circles each of radius 5cm, touch each other as shown in the figure. Find the area included between them.



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[Additional Questions Short Answer Question li](#)

1. A chord 10cm long is drawn in a circle whose radius is $5\sqrt{2}cm$. Find the area of both the segments.



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2. The radius of the circle with radius 5cm is shown in the figure. Two radii OP and OQ are drawn such that $\angle POQ = 90^\circ$. Find the area of major segment and minor segment.



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3. A chord of a circle of radius 14cm subtends an angle 120° at the centre. Find the area of the corresponding minor segment of the circle.



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4. Find the area of the major segment AQB in the figure of a circle of radius 35 cm and $\angle AOB = 90^\circ$



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5. A plot is in the form of a rectangle PQRS having semicircle on QR as shown in the figure.

IF $PQ=60\text{cm}$, $QR=28\text{cm}$, find the area of the plot.



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6. PQRS is a diameter of a circle of radius 6cm. \overline{PQ} , \overline{QR} , \overline{RS} are equal. Semicircles are drawn on PQ and QS as diameters as shown in figure. Find the area of the shaded region.



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7. PQRS is a rectangle. Two sectors with centre R and S are shown in the figure, Find the area of the shaded region. Given $PQ=21\text{cm}$, $QR=14\text{cm}$



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8. Arcs drawn with centres A,B,C and D intersect in pairs at midpoints P,Q,R and S of th sides PQ,QR,RS and SP respectively of a square ABCD of side 14cm.



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9. Three semicircles each of diameter 3cm, a circle of diameter 4.5cm and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region



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10. The short and long hands of a clock are 4cm and 6cm long respectively. Find the sum of distances travelled by their tips in 48 hours.



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11. In the figure there are three sectors of a circle of radius 7cm making angles of 60° , 80° and 40° at the centre are shaded. Find the area of the shaded region.



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12. IF the figure, ABCD is a parallelogram. A semicircle with centre O and the diameter AB has been drawn and it passes through D. IF $AB=12\text{cm}$ and

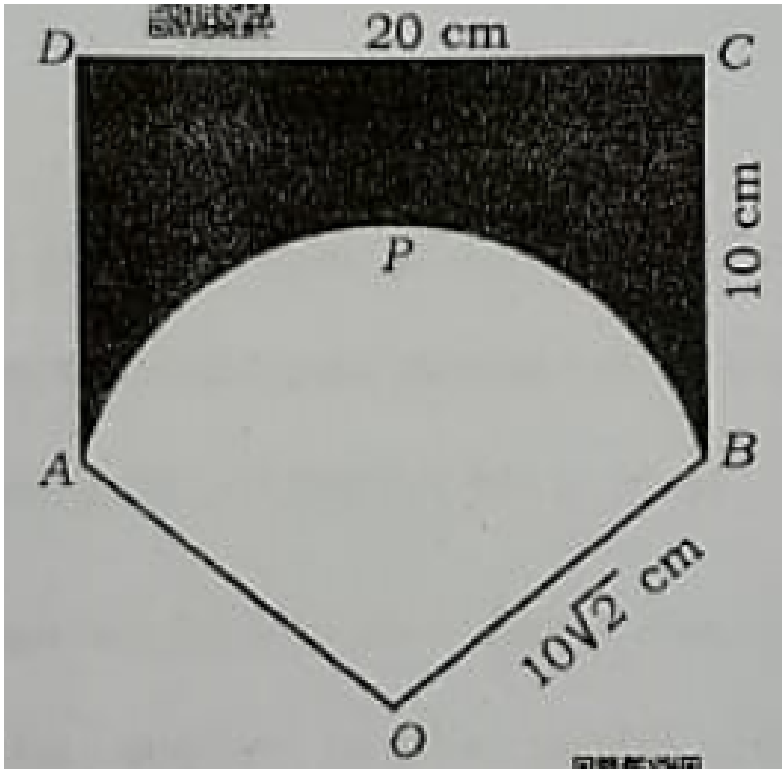
$OD \perp AB$ then find the area of the shaded region.



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13. ABCD is a rectangle of length 20cm and breadth 10cm. OAPB is a sector of a circle of radius $10\sqrt{2}$ cm. calculate the area of the shaded region. [Take $\pi =$

3.14]`



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14. A hand fan is made up of cloth fixed in between the metallic wires. It is in the shade of a sector of a

circle of radius 21cm and of angle 120° as shown in the figure. Calculate the area of the cloth used and also find the total length of the metallic wire required to make such a fan.



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Additional Questions Long Answer Type Question

1. A field is in the form of a quadrilateral. TO each corner of the field, one horse is tied with the help of a rope (each 14cm). The sides of the quadrilateral

are 50,55,60 and 70cm. Find the total area which can be grazed by all the four horses.



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2. Find the difference between the area of a regular hexagon whose sides is 72cm and the area of the circle inscribed in it.



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3. Prove that the area of a segment of a circle with radius r and sector angle θ is $\frac{r^2}{2} \left[\frac{\pi\theta}{180^\circ} - \sin\theta \right]$



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4. A chord of a circle of radius 10cm subtends a right angle at the centre. Find

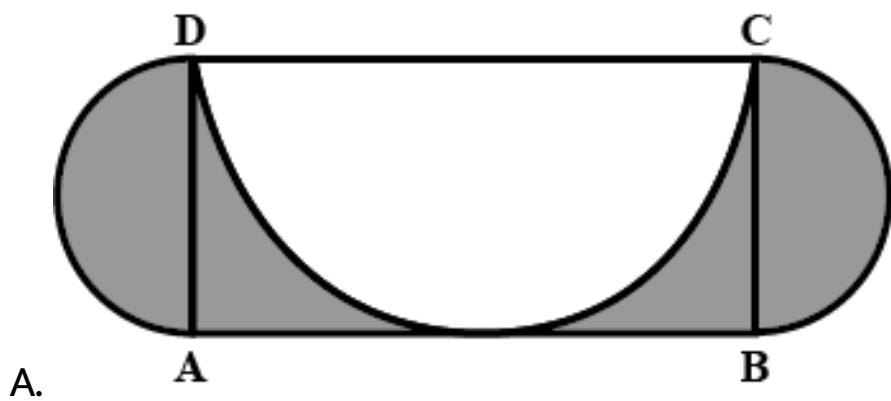
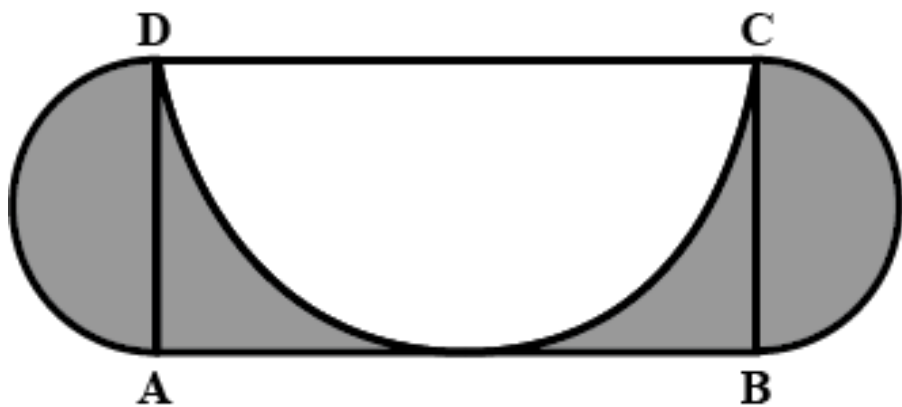
- (a) area of minor sector (b) area of minor segment (c)
(d) area of major sector (e) area of major segment



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5. ABCD is a rectangle, Semicircles, are drawn on AD and BC as diameters and the radius of the circles drawn between is same. If $AD=7\text{cm}$, find the area of

the shaded region.



A.

B.

C.

D.

Answer: 21cm^2



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6. An athletic track 14m wide consists of two straight sections 120m long joining two semicircular ends whose inner radii are 35m. Calculate the area of the shaded region.



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7. In the given figure O is the centre of the circle .
 $AC=24\text{cm}$ and $AB=7\text{cm}$ and $\angle BOD = 90^\circ$. Find the
area of the shaded region.



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8. In the given figure ABCD is a trapezium with
 $AB \parallel CD$ and $\angle BCD = 60^\circ$. IF BFEC is a sector
of a circle with centre C. $AB=BC=7\text{cm}$ and $DE=4\text{cm}$,
find the area of the shaded region.





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9. Find the difference of areas of two segments of a circle formed by a chord of length 5cm subtending an angle 90° at the centre.



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10. In the $\triangle ABC$ right angled at B, $AB=12\text{cm}$, $BC=16\text{cm}$ and $AC=20\text{cm}$. With vertices A, B and C as centres, arcs are drawn with radius 5cm Find the area of the shaded region.



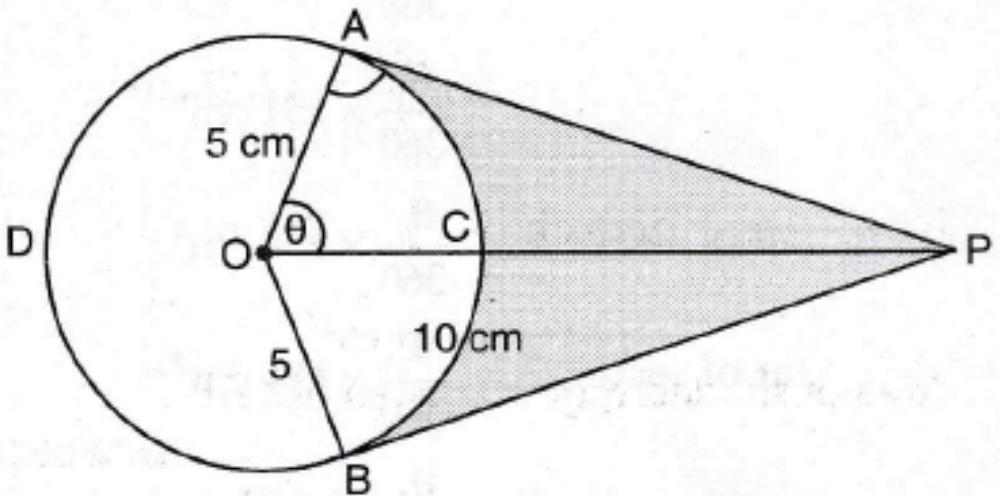
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11. In figure, two circular flower beds have been shown on two sides of a square lawn ABCD of side 56cm. IF the centre of each circular flower bed is the point of the intersection of the diagonals of the square lawn, find the sum of the areas of the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



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12. An elastic belt is placed around the rim of a pulley of radius 5cm. From one point C on the belt, the elastic belt is pulled directly away from the centre O of the pulley until it is at point P, 10cm from the point O. Find the length of the belt that is still in contact with the pulley, also find the area of the shaded region.



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Additional Questions Higher Order Thinking Skills

1. Find the area of the shaded region portion in the given figure if E is the midpoint of AB, AGE and BEF are quadrants, and DOC is a semicircle.



A. 154cm^2

B. 416cm^2

C. 284cm^2

D. 546cm^2

Answer: D



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2. The areas of two concentric circles are 962.5cm^2 and 1386cm^2 respectively. What is the width of the ring?



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3. In the given figure O is the centre of the circle .
 $AC=24\text{cm}$ and $AB=7\text{cm}$ and $\angle BOD = 90^\circ$. Find the

area of the shaded region.



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4. Two identical circles intersect so that their centres and the points at which they intersect form a square of side 1cm. The area of the portion that is common to both circles is



A. $\frac{\pi}{4}$

B. $\frac{\pi}{2} - 1$

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

D. $\sqrt{2} - 1$

Answer: B

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5. A square of side a is inscribed in a circle as shown in the figure. What is the area of the shaded region?



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6. The radius of a circle is so increased that its circumference is increased by 5%. How does the area of the circle increase?



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7. Consider a circle with unit radius. There are seven adjacent sectors $S_1, S_2, S_3, S_4, S_5, S_6$ and S_7 in a circle such that their total area is $\frac{1}{8}$ of the area of the circle.

Further, the area of the j th sector is twice the area $(j-1)$ th sector for $j=2\dots 7$. What is the angle subtended by the arc S_1 at the centre of the circle.



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