

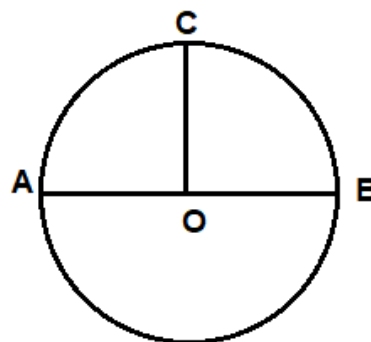
Area Related to Circles

Parts of circle:

Observe the given circle carefully and remember the names of its different parts

- (a) AB is called diameter

A diameter is a line segment from one point on the circumference to another point on the circumference which passes through the centre of the circle



- (b) OC is called radius

Radius is a line segment from the centre to any point of the boundary of the circle. Radius is half of the diameter.

- (c) Circumference of circle

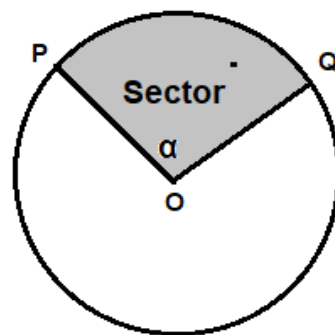
The length of the boundary of the circle is called circumference of circle. It is calculated by using the formula $2\pi r$ or πd , where ' r ' is the radius and ' d ' the diameter of circle.

- (d) Area of a circle:

Area of a circle is the measurement of the surface bounded by the circumference. It is calculated by using the formula πr^2 . To know more about area formula for the circle, consult your textbook where it is clearly discussed.

Sector of a circle:

Sector is a portion of a circle between two radii and the circumference. The shaded portion in the given circle is a sector with angle α at centre. The remaining portion of the circle (Unshaded portion) is also a sector.



Area of the sector of a circle:

Since sector is part of a circle, therefore we can calculate the area of sector by using the formula $\frac{\theta}{360} \pi r^2$ where, θ is angle made by the sector at the centre of the circle.

Why area of sector is $\frac{\theta}{360} \pi r^2$? Let us know about it

We know that:

$$\text{Area of circle} = \pi r^2$$

Let us divide the circle into 360 sectorial parts, the area of each of the sectorial part will be $\frac{\pi r^2}{360}$

The area of two sectorial parts is $2\left(\frac{\pi r^2}{360}\right)$

Similarly, the area of ' n ' sectorial parts of the circle is $n\left(\frac{\pi r^2}{360}\right)$

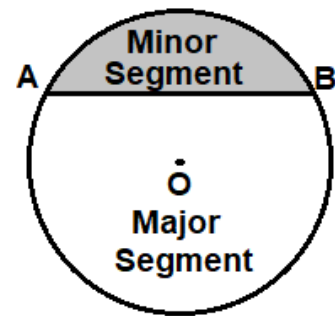
What is ' n '? It is actually $n - \text{degree}$ angle out of 360°

We replace the n by θ

This means the area of the sector will be calculated by $\frac{\theta}{360} \pi r^2$

Segment of a circle:

A segment of a circle is a portion in circle bounded by chord and the circumference of the circle. In the given figure, shaded portion is called Minor (small) segment while as unshaded portion is called major (bigger) segment.

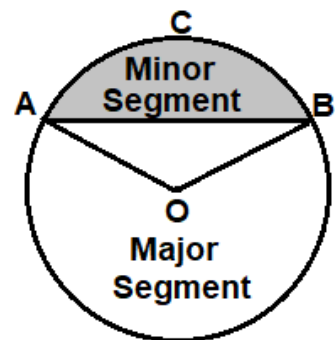


Area of segment:

There is not a specific formula to calculate the area of a segment. But we can calculate the area of segment using concept of sector.

To calculate the area of minor segment in the circle, we need to calculate the area of sector ACBO and area of $\triangle AOB$. Further, the area of the minor segment will be calculated as;

Area of minor segment = *Area of sector ACBO* – *Area of $\triangle AOB$*



Questions for Practice

Objective Type Questions

Q.No.1. The area of $\frac{1}{4}th$ part of a circle of radius 1m is

a) $\frac{\pi}{360} m^2$

b) $\frac{\pi}{1440} m^2$

c) $\frac{\pi}{4} m^2$

d) $\pi r^2 m^2$

Q.No.2. If the area of a circle of radius $154cm^2$, the radius of the circle is:

a) $7cm$

b) $49cm$

c) $7 cm^2$

d) 22

Q.No.3. A sector of a circle subtends at an angle of 90° at the centre. If the radius of the circle is 7cm, the area of the circle is:

a) $38.5cm^2$

b) $14cm$

c) $154 cm^2$

d) 22

Q.No.4. If a chord divides a circle into two segments of equal area, then the chord is:

a) Radius of circle

b) Diameter of circle

c) Less than diameter of circle

d) Greater than diameter of circle

Q.No.5. If the area of a circle of radius "r" is $154cm^2$. Then the diameter of the circle is;

a) $7cm$

b) $14cm$

d) $21cm$

d) $22cm$

Q.No.6. If the radius of circle (A) is twice the radius of circle (B), The ratio of their areas is;

- a) 1:2
- b) 2:3
- c) 2:4
- d) 4:1

Q.No.7. The radii of two circles are r and r^2 . The ratio of their areas is;

- a) 1:2
- b) $1:r^2$
- c) $1:r^3$
- d) $1:r^3$

Q.No.8. If the area of circle (A) is half of the area of circle (B), then the ratio of their radii is respectively:

- a) 1:2
- b) 2:3
- c) 3:1
- d) $1:\sqrt{2}$

Q.No.9. If the area of a square is equal to the area of a circle with radius $\frac{5}{\sqrt{\pi}}$, then the side of the square is:

- a) π
- b) 5
- c) $\frac{1}{5}$
- d) $\frac{\pi}{2}$

Q.No.10. Two circles of equal area will have:

- a) Equal radii
- b) Equal Circumferences
- c) Equal diameters
- d) All of these

Q.No.11. Two circles with radius $\frac{1}{\pi}$ and $\frac{2}{\pi}$ will differ in area by:

- a) 1 sq unit
- b) $\frac{3}{\pi}$ sq unit
- c) π units
- d) 3π units

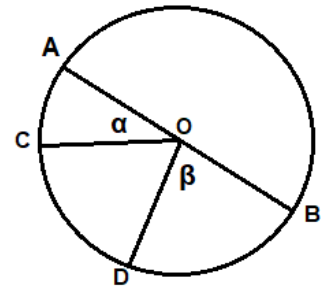
Very Short Answer type questions

- Q.No.1. Find the area of a circle with radius 10.5cm.
- Q.No.2. Find the area of a circle with radius x^2 units
- Q.No.3. Find the area of a circle with radius $\frac{1}{\pi}$ units.
- Q.No.4. Find the area of a circle with radius $\frac{1}{\pi^2}$ units.
- Q.No.5. Find the area of a circle with radius $\sqrt{\pi}$ units.
- Q.No.6. Find the area of a sector of a circle of radius 7cm having angle at centre equal to 90° .
- Q.No.7. Find the area of a sector of the circle of radius 10.5cm with angle at the centre 180° .
- Q.No.8. Find the area of semicircle of radius 21cm.
- Q.No.9. Find the area of $\frac{1}{3}rd$ of a circle with radius 3.5cm
- Q.No.10. Find the area of a sector of a circle with diameter 14cm and the angle at centre is 120° .
- Q.No.11. Two sectors in a circle are equal in area. Prove that their angles at the centre of the circle are equal.
- Q.No.12. Area of a sector of a circle is $\frac{1}{4}th$ of the area of the circle. Prove that the angle of the sector at the centre of the circle is 90° .
- Q.No.13. Two circles C_1 and C_2 have the radii in the ratio 1:2, Find the ratio of their areas.
- Q.No.14. Find the difference between the areas of two concentric circles of radii 5cm and 2cm.
- Q.No.15. Show that the difference between the areas of two concentric circles with radii r and $3r$ is 1:9

Short Answer type questions

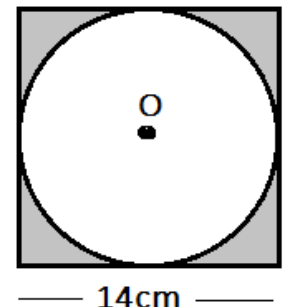
Q.No.1. A sector of a circle subtends at an angle of 90° at the centre. If the area of the sector is $\frac{77}{2} \text{ cm}^2$, find the diameter of the circle.

Q.No.2. AB is a diameter of the circle. OC and OB are two radii of the circle. Sectors AOC and DOB have the angles at centre as α and β respectively. If the area of the sector AOC is half of the area of sector DOB , show that $2\alpha = \beta$



Q.No.3. If the circumference of a circle in meters is equal to its area in square meters, find the radius of the circle.

Q.No.4. Find the area of the shaded portion in the given square.



Q.No.5. A circle of radius 7 cm has two equal sectors with sector angle 45° in it. Find the area of the remaining part of the circle.

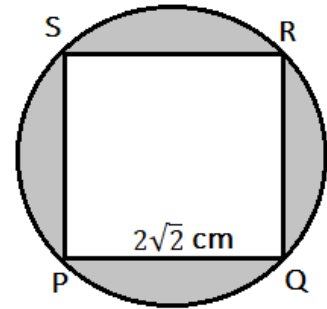
Q.No.6. If the area of a circle with radius ' r ' is 49π , find the radius of the circle.

- Q.No.7. A circular mirror of diameter 21cm is one-side polished. If it costed ₹346.5 to polish the mirror, what is the rate of polishing per square centimetre?
- Q.No.8. The ratio of the radii of three circles C_1, C_2, C_3 is 1:2:3. Find the ratio of their areas.
- Q.No.9. If the sum of the areas of two concentric circles is 245π square units and the radius of one is twice the radius of another. Find their radii.
- Q.No.10. If the area of two circles are in the ratio 1:2. Show that their radii are in the ratio $1:\sqrt{2}$
- Q.No.11. Circumference of a circle is 44cm. Find the area of the circle.
- Q.No.12. If the ratio of the circumferences of two circles is 1:2. What is the ratio of their areas:
- Q.No.13. The ratio of the areas of two circles is 2:3. What is the ratio of their circumferences?
- Q.No.14. The ratio of the areas of two circles is 1:9. What is the ratio of their radii?
- Q.No.15. A circle is divided into 22 equal parts. If the area of each part is 7cm^2 , what is the radius of the circle?

Long Answer Type Questions

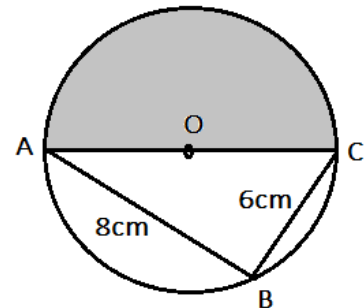
- Q.No.1. A square shaped park of each side $10m$ has four circular flower beds in it. If the radius of each of the flower bed is $0.7m$, find the area of the remaining park.

- Q.No.2. $PQRS$ is a square with side $2\sqrt{2}cm$. (See given figure) Find the area of shaded portion.



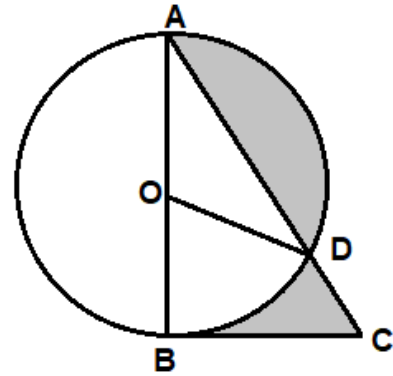
- Q.No.3. If the area of square is equal to the area of a circle of radius $10.5cm$, find the perimeter of the square.

- Q.No.4. In the given figure, $AB = 8cm$, $BC = 6cm$. If AC is the diameter of the circle, find the area of the shaded portion.

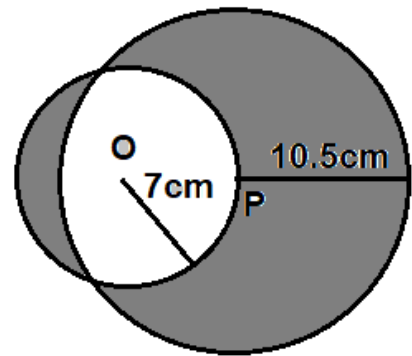


- Q.No.5. Two circles of radius ' r ' and ' $2r$ ' have two sectors of equal area. Find the relation between the angles of the sectors.

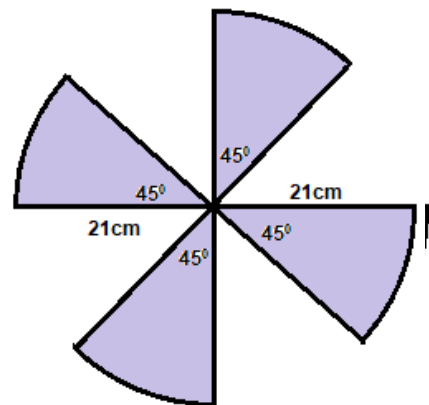
- Q.No.6. In the given figure, $\triangle ABC$ is right angled at $\angle B$. If the diameter AB of circle is 14cm and $BC = 12\text{cm}$, also $\triangle AOD$ is equilateral, find the area of the shaded portion.



- Q.No.7. Given below are two circles with centre O and P having radius 7cm and 10.5cm respectively. (See given figure) If the centre of bigger circle lies on the boundary of smaller circle and the area of unshaded portion is 121cm^2 , find the area of shaded portion.



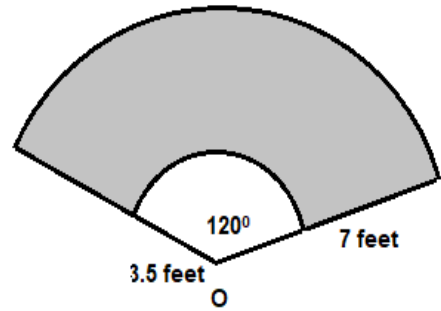
- Q.No.8. A fan has four wings. (See given figure) Each wing is a sector of radius 21cm with angle at centre 45° . Find the cost to paint the wings both sides @ $\text{₹}1000/\text{m}^2$.



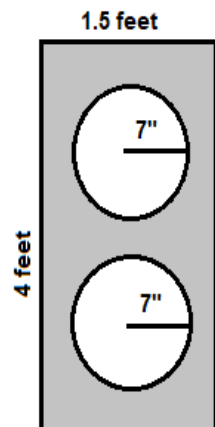
- Q.No.9. If the area of a sector of a circle is $\frac{1}{3}rd$ of the area of the circle. What is the angle of sector?

Q.No.10. There are two circles, circle (A) of radius 21cm and circle (B) of radius 14cm . Circle (A) has a sector whose area is equal to the area of a sector in circle (B). Find the ratio between the angles of the sectors when X and Y are the angles of circle (A) and (B) respectively.

Q.No.11. A signboard of a circle is a sectorial portion of a circle of radius 7 feet without a small sectorial portion of radius 3.5 feet . (Coloured portion in the given figure) If the angle at the centre is 120° , find the cost to design the signboard if the artist charges $\text{₹}300/\text{square feet}$.



Q.No.12. A window-pan of size $1.5\text{ feet} \times 4\text{ feet}$ has two circular mirrors in it. (See the given figure) If the radius of each mirror is 7 inches, find the area of wood. Also find the amount to paint it @ $\text{₹}30$ per square feet.



Q.No.13. Find the radii of two concentric circles having difference in their areas 16π and the difference of their radii is 2.

Answers

Objective

Q1, c	Q2, a	Q3, a	Q4, b	Q5, b	Q6, d
Q7, b	Q8, d	Q9, b	Q10, d	Q11, b	Q12, a
Q13, b	Q14, Greater than	Q15, false	Q16, False		
Q17, Complete	Q18, Equal	Q19, Circle	Q20, $\frac{\theta}{360} \pi r^2$		
Q21, 180					

Very Short Answer Type

Q1, 346.5cm^2	Q2, πx^4 sq. units	Q3, $\frac{1}{\pi}$ sq. units	
Q4, $\frac{1}{\pi^3}$ sq. units	Q5, 1 sq. unit	Q6, 38.5cm^2	Q7, 173.25cm^2
Q8, 1386cm^2	Q9, 12.84cm^2	Q10, 205.34cm^2	Q13, 1:4
Q14, $21\pi \text{ cm}^2$			

Short Answer type Questions'

Q1, 14cm	Q3, 2 units	Q4, 42cm^2	Q5, 115.5cm^2
Q6, 7cm	Q7, Rs1/	Q8, 1:4:9	Q9, 7cm, 14cm
Q11, 7cm	Q12, 1:4	Q13, 2:3	Q14, 1:3
Q15, 7cm			

Long Answer Type Questions

Q1, 93.84cm^2	Q2, $\frac{32}{7}\text{cm}^2$	Q3, 74.46cm^2 (Apprx)	
Q4, 39.29cm^2	Q5, $\theta_1 = 4\theta_2$	Q6, 15.9cm	Q7, 258.5cm^2
Q8, Rs138.6/	Q9, 120° ,	Q10, $4X = 9Y$	Q11, Rs11550/
Q12, 3.86 sft, Rs 115.83	Q13, 5cm, 3cm		