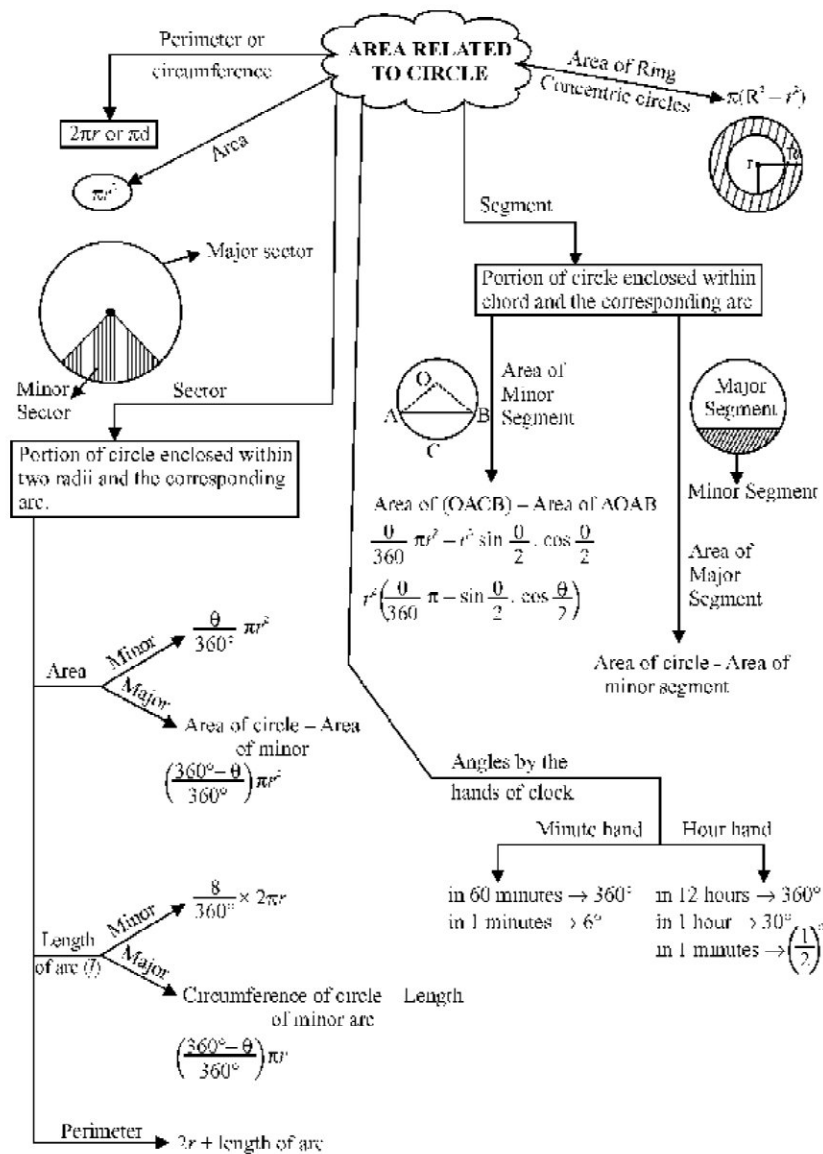# 11 | Areas Related to Circles

TOPICS

Perimeter and Area of a circle.

Area of sector and segment of a circle.

KEY POINTS

Circle: A circle is the locus of a point which moves in a plane in such a way that its distance from a fixed point always remains the same. The fixed point is called the centre and the constant distance is known as the radius of the circle.

If r is radius of a circle, then

(i)   Area of semi circle $= \dfrac{\pi r^2}{2}$

(ii)   Area of quadrant of a circle $= \dfrac{\pi r^2}{4}$

(iii) If two circles touch internally, then the distance between their centres is equal to the difference of their radii.

(iv) If two circles touch externally, then distance between their centres is equal to the sum of their radii.

(v) Distance covered by rotating wheel in one revolution is equal to the circumference of the wheel.

(vi) The number of revolutions completed by a rotating wheel in

$$\text{one minute} = \frac{\text{Distance moved in one minute}}{\text{Circumference of the wheel}}$$

(vii) The sum of the arcs of major and minor sectors of a circle is equal to the circumference of the circle.

(viii) The sum of the areas of major and minor sectors of a circle is equal to the area of the circle.

VERY SHORT ANSWER QUESTIONS

1.   If the diameter of a semi circular protactor is 14 cm, then find its perimeter.

2.   If circumference and the area of a circle are numerically equal, find the diameter of the circle.

3.   Find the area of the circle 'inscribed' in a square of side a cm.

4.   Find the area of a sector of a circle whose radius is r and length of the arc is l.

5.   The radius of a wheel is 0.25 m. Find the number of revolutions it will make to travel a distance of 11 kms.

6. If the area of a circle is 616 cm², then what is its circumference?

7. What is the area of the circle that can be inscribed in a square of side 6 cm?

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

9. A wire can be bent in the form of a circle of radius 35 cm. If it is bent in the form of a square, then what will be its area?

10. What is the angle subtended at the centre of a circle of radius 6 cm by an arc of length 3π cm?

11. If the circumference of two circles are in the ratio 2:3, what is the ratio of their areas?

12. If the difference between the circumference and radius of a circle is 37 cm, then find the circumference of the circle. (Use $\pi = \dfrac{22}{7}$)

13. If diameter of a circle is increased by 40%, find by how much percentage its area increases?

14. The minute hand of a clock is 6 cm long. Find the area swept by it between 11:20 am and 11:55 am.

15. The perimeter of a sector of a circle of radius 14 cm is 68 cm. Find the area of the sector. (CBSE 2020)

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

(Use $\pi = \dfrac{22}{7}$) (CBSE 2020)

17. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in one minute. (Use $\pi = \dfrac{22}{7}$)

MULTIPLE CHOICE QUESTIONS

18. 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

19. The Area of circle that can be inscribed in a square of side 6 cm is:

   (a) $36\,\pi$ cm²   (b) $18\,\pi$ cm²

   (c) $12\,\pi$ cm²   (d) $9\,\pi$ cm²

20. If the circumference of a circle increases from 4π to 8π, then Area is:

   (a) Halved   (b) Doubled

   (c) Tripled   (d) Quadrupled

21. If the perimeter of a semi- circular protractor is 36 cm , then its diameter is:

   (a) 10 cm   (b) 14 cm

   (c) 12 cm   (d) 16 cm

22. The length of a minute hand of clock is 14 cm. What is the area swept by the mimute hand in 15 minutes?

   (a) 154 cm²   (b) 87 cm²

   (c) $154\,\pi$ cm²   (d) $87\,\pi$ cm²

23. The wheel of a cycle is of radius 35 cm. How many revolutions are required to travels a distance of 11 m ?

   (a) 2   (b) 5

   (c) 10   (d) 15

24. Four horses are tied each with 7 m long rope at four corner of a square field of sides 20 m. What is the area of field which can be grazed by the horses?

   (a) $49\,\pi$ m²   (b) $98\,\pi$ m²

   (c) $74\,\pi$ m²   (d) $154\,\pi$ m²

SHORT ANSWER TYPE QUESTIONS (1)

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

$$\left(\text{Use } \pi = \frac{22}{7}\right)$$

26. What is the angle subtended at the centre of a circle of radius 10 cm by an arc of length 5π cm?

27. If a square is inscribed in a circle, what is the ratio of the area of the circle and the square?

28. Find the area of a circle whose circumference is 44 cm. **(CBSE 2020)**

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

30. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal?

31. In figure, O is the centre of a circle. The area of sector OAPB is $\frac{5}{18}$ of the area of the circle. Find x.
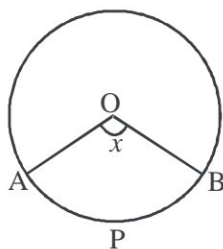

32. Find the perimeter of the given figure, where AED is a semicircle and ABCD is a rectangle. **(CBSE 2015)**
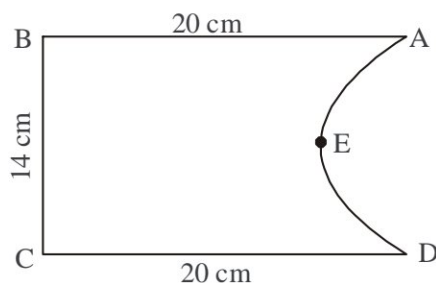
33. In figure, OAPBO is a sector of a circle of radius 10.5 cm. Find the perimeter of the sector.
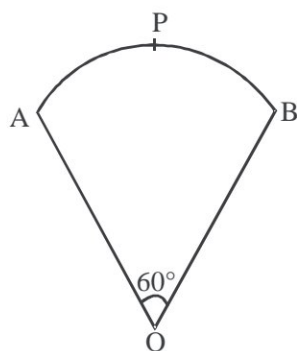
34. A Japenese fan can be made by sliding open its 7 small sections, each of which is in the form of sector of a circle having central angle of 15°. If the radius of this fan is 24 cm, find the length of the lace that is required to cover its entire boundary. (Use $\pi = 22/7$)
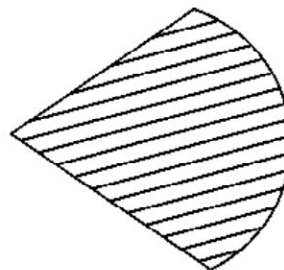
**(CBSE 2014)**

35. The perimeter of a sector of circle of radius 6.3 cm is 25.8 cm. Find the area of the sector.

36. Find the area of a circle in which a square of area 64 cm^2 is inscribed.

**37.** Find the area of a circle which is inscribed in a square of area 64 cm^2.

SHORT ANSWER TYPE II QUESTIONS

38. Area of a sector of a circle of radius 36 cm is 54π cm^2. Find the length of the corresponding arc of the sector.

39. The length of the minute hand of a clock is 5 cm. Find the area swept by the minute hand during the time period 6:05 am to 6:40 am.

40. Find the area of the segment bounded by a chord AB and the arc ACB of the circle with centre O having radius 7 cm and sector angle equal to 90°, as shown in the figure.

Mathematics-X
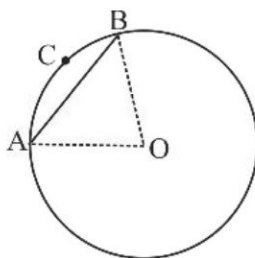
41. In fig, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and $\angle AOB = 120°$. Find the length of OAPBO.
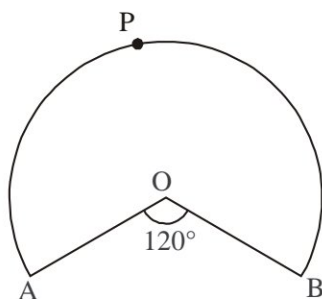
42. Circular footpath of width 2 m is constructed at the rate of ₹ 20 per square meter, around a circular park of radius 1500 m. Find the total cost of construction of the foot path. (Take $\pi = 3.14$)

43. A boy is cycling such that the wheels of the cycle are making 140 revolutions per minute. If the diameter of the wheel is 60 cm. Calculate the speed of cycle.

44. In a circle with centre O and radius 4 cm, and of angle 30°. Find the area of minor sector and major sector AOB. (Use $\pi = 3.14$)

45. Find the area of the largest triangle that can be inscribed in a semi circle of radius r unit. (NCERT Exemplar)

46. In a square park of side 8 m two goats are tied at opposite vertices with a rope of length 1.4 m and a cow is tied in the centre with a rope of length 2.1m. Calculate the area of park which cannot be grazed by them.

47. A sector of 100° cut off from a circle contains area 70.65 cm². Find the radius of the circle. (Use $\pi = 3.14$)

48. The hour and minute hand of a 12 hour clock are 3.5 cm and 7 cm long respectively. Find the sum of distance travelled by their tips in a day. $\left(\text{use } \pi = \dfrac{22}{7} \right)$

49. A square water tank has its each side equal to 40 m. There are four semi circular grassy plots all around it. Find the cost of turfing the plot at Rs 1.25 per sq. m. (Use $\pi = 3.14$)

50. Length of a chord of a circle of a radius of 4 cm is 4 cm. Find the area of the sector and segment formed by the chord.

51. Find the area of the minor segment of a circle of radius 21 cm, when the angle of the corresponding sector is 120°.

52. A piece of wire 11 cm long is bent into the form of an arc of a circle subtending an angle of 45° at its centre. Find the radius of the circle.

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

54. A pendulum swings through an angle of 45° and describes an arc of 22 cm in length. Find the length of the pendulum. $\left(\text{use } \pi = \dfrac{22}{7} \right)$

LONG ANSWER TYPE QUESTIONS

55. Two circles touch externally. The sum of their areas is 130π sq. cm and the distance between their centres is 14 cm. Find the radii of the circles.

56. Find the number of revolutions made by a circular wheel of area 6.16 m² in rolling a distance of 572 m.

57. Three horses are tied at the vertices of a triangular park of sides 35 m, 84 m and 91 m with the help of a rope of length 14 m each. Calculate the ratio of the area which can be grazed to the area which can't be grazed.

58. Two circle touch each other internally. The sum of their area is 116π cm^2 and distance between their centres is 6 cm. Find the radii of the circles.

(CBSE = 2017)

ANSWERS AND HINTS

1. $\pi r + d = \dfrac{22}{7} \times 7 + 14 = 36$ cm

2. $2\pi r = \pi r^2 \Rightarrow$ diameter $= 4$ units

3. Side of the square is equal to diameter of the circle,

$$\pi r^2 = \pi \times \dfrac{a^2}{4} \text{ (side } = a, \text{ radius } = \dfrac{a}{2} \text{)}$$

4. $l = \dfrac{\theta}{360°} \times 2\pi r$, Area $= \dfrac{\theta}{360°} \times \pi r^2 = \dfrac{l \times \pi r^2}{2\pi r} = \dfrac{lr}{2}$ sq. units