CHAPTER

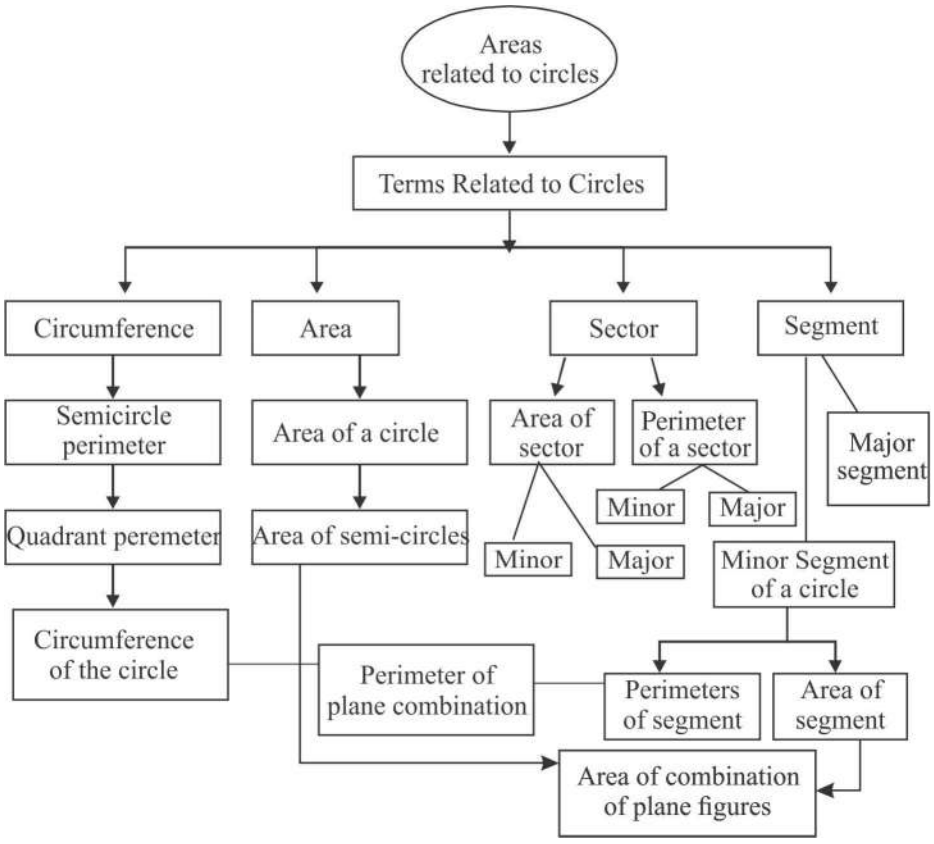
12 Areas Related to Circles

TOPICS

Perimeter and Area of a circle.

Area of sector and segment of a circle.

MIND MAPING



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

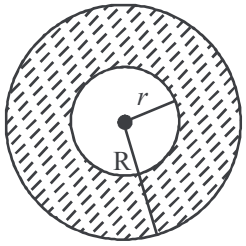
(i) Circumference = $2\pi r$ or πd where d = 2r is the diameter of the circle

(ii) Area = πr^2 or $\frac{\pi d^2}{4}$

(iii) Area of semi circle = $\frac{\pi r^2}{2}$

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

Area enclosed by two concentric circles: If R and r are radii of two concentric circles, then area enclosed by the two circles = $\pi R^2 - \pi r^2$



$= \pi (R^2 - r^2)$

$= \pi (R + r) (R - r)$

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

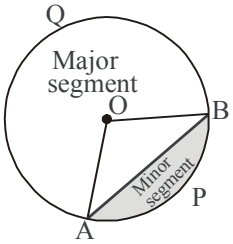
(ii) If two circles touch externally, then distance between their centres is equal to the sum of their radii.

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

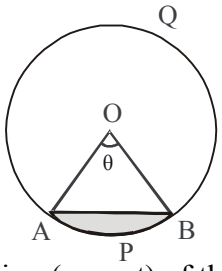
(iv) The number of revolutions completed by a rotating wheel in

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

Segment of a Circle: The portion (or part) of a circular region enclosed between a chord and the corresponding arc is called a segment of the circle. In adjacent fig. APB is minor segment and AQB is major segment.

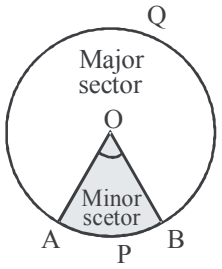


Area of segment APB = Area of the sector OAPB – Area of ΔOAB



Sector of a circle: The portion (or part) of the circular region enclosed by the two radii and the corresponding arc is called a sector of the circle.

In adjacent figure OAPB is minor sector and OAQB is the major sector.



Area of the sector of angle $\theta = \frac{\theta}{360°} \times \pi r^2$

$= \frac{1}{2} \times$ length of arc $\times$ radius $= \frac{1}{2} lr$

Length of an arc of a sector of angle $\theta = \frac{\theta}{360°} \times 2\pi r$

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

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

(iii) Angle described by minute hand in 60 minutes = 360°

Angle described by minute hand in one minute $= \frac{360°}{60} = 6°$

Thus minute hand rotates through an angle of 6° in one minute

(iv) Angle described by hour hand in 12 hours = 360°

Angle described by hour hand in one hour = $\frac{360°}{12} = 30°$

Angle described by hour hand in one minute = $\frac{30°}{60} = \left(\frac{1}{2}\right)^\circ$

Thus, hour hand rotates through an angle of $\left(\frac{1}{2}\right)^\circ$ in one minute.

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 inscribe 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. Write the formula for the area of a sector of angle θ (in degrees) of a circle of radius *r*.

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

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

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

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

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

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

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

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

19. Area of a sector having length of corresponding arc '*l*' and radius '*r*' is _____.

20. Circumference of a circle of radius s is _____ .

21. Area of a circle of radius is _____ ,

22. Length of an arc of a sector of a circle with radius *r* and angle θ is _____ .

23. Area of a sector with radius r and angle with degrees measure θ is _____ .

24. Area of segment of a circle = Area of the corresponding sector _____ .

SHORT ANSWER TYPE QUESTIONS (1)

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

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

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

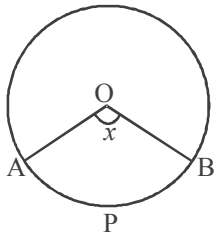
27. If a square is inscribed in a circle, what is the ratio of the area of the circle and the square?

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

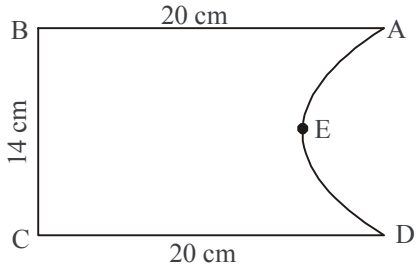
29. If the perimeter of a circle is equal to that of square, then find the ratio of their areas.

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

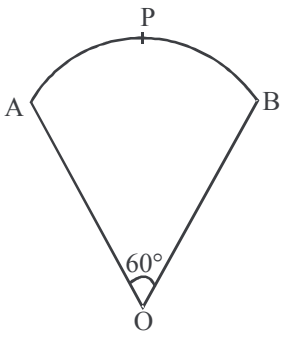
31. In fig., O is the centre of a circle. The area of sector OAPB is $\frac{5}{18}$ of the area of the circle. Find x.



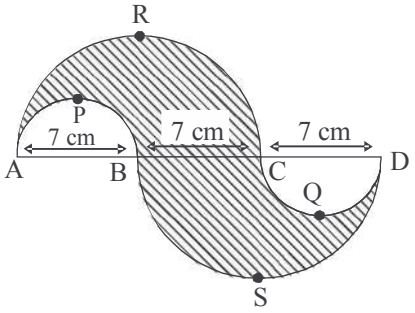
32. Find the perimeter of the given fig, where AED is a semicircle and ABCD is a rectangle. (CBSE 2015)



33. In fig. OAPBO is a sector of a circle of radius 10.5 cm. Find the perimeter of the sector.



34. In the given fig, APB and CQD are semi circles of diameter 7 cm each, while ARC and BSD are semicircles of diameter 14 cm each. Find the perimeter of the shaded region. (Use $\pi = \frac{22}{7}$) (Delhi, 2011)



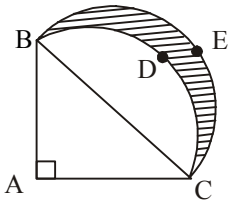
SHORT ANSWER TYPE II QUESTIONS

35. 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.

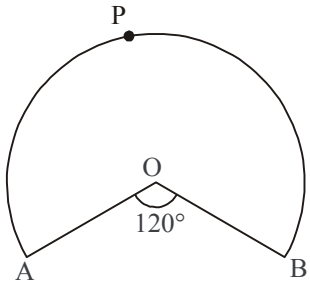
36. The length of the minute hand of a clock is 5 cm. Find the area swept by the minute hand during the time period 6:05 am to 6:40 am.

37. In figure ABDC is a quadrant of a circle of a radius 28 cm and a semi circle BEC is drawn with BC as diameter find the area of shaded region:

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



38. 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.



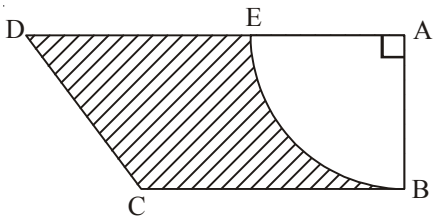
39. Circular footpath of width 2 m is constructed at the rate of ₹ 20 per square meter, around a circular park of radius 1500 m. Find the total cost of construction of the foot path. (Take $\pi = 3.14$)

40. 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.

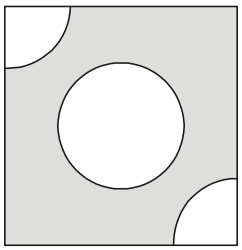
41. In a circle with centre O and radius 4 cm, and of angle 30°. Find the area of minor sector and major sector AOB. (Use $\pi = 3.14$)

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

43. Figure ABCD is a trapezium of area 24.5 cm, In it AD||BC, $\angle DAB = 90°$, AD = 10 cm, BC= 4cm. If ABE is a quadrant of a circle. Find the area of the shaded region. $\left(\text{Use } \pi = \frac{22}{7}\right)$

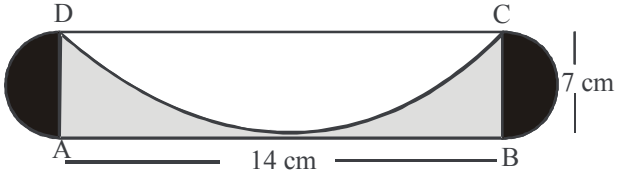


44. From each of the two opposite corners of a square of side 8 cm, a quadrant of a circle of radius 1.4 cm is cut. Another circle of radius 4.2 cm is also cut from the centre as shown in fig. Find the area of the shaded portion. (Use $\pi = \frac{22}{7}$).



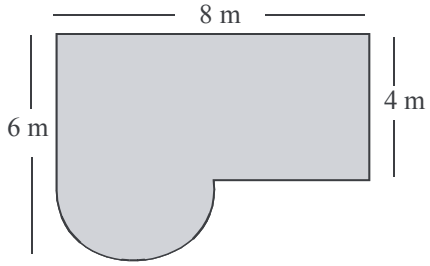
45. A sector of 100° cut off from a circle contains area 70.65 cm². Find the radius of the circle. (Use $\pi = 3.14$)

46. In fig. ABCD is a rectangle with AB= 14 cm and BC= 7 cm. Taking DC, BC and AD as diameter, three semicircles are drawn. Find the area of the shaded portion.



47. 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 $\pi = 3.14$)

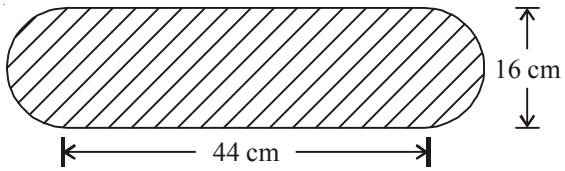
48. Find the area of the shaded region shown in the fig. (NCERT – Exemplar)



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

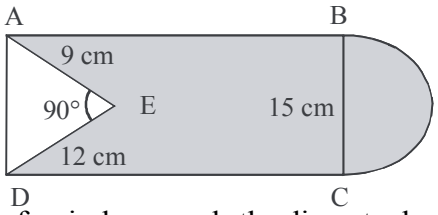
50. A piece of wire 11 cm long is bent into the form of an arc of a circle subtending an angle of 45° at its centre. Find the radius of the circle.

51. Find the area of the shaded region.



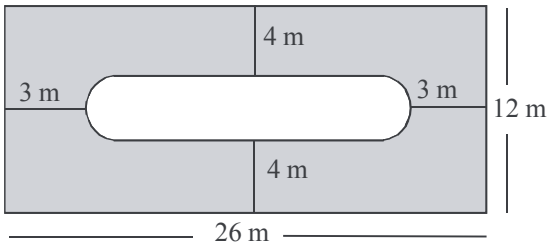
52. In fig. from a rectangular region ABCD with AB= 20 cm, a right triangle AED with AE= 9 cm and DE= 12 cm, is cut off. On the other end, taking BC as diameter, a semi circle is added on outside the region. Find the area of the shaded region.

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



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

54. Find the area of the shaded region. **(NCERT Exemplar)**



LONG ANSWER TYPE QUESTIONS

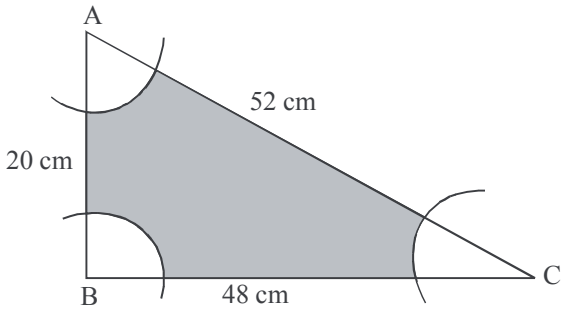
55. Two circles touch externally. The sum of their areas is 130π sq. cm and the distance between their centres is 14 cm. Find the radii of the circles.

56. Three circles each of radius 7 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between the circles.

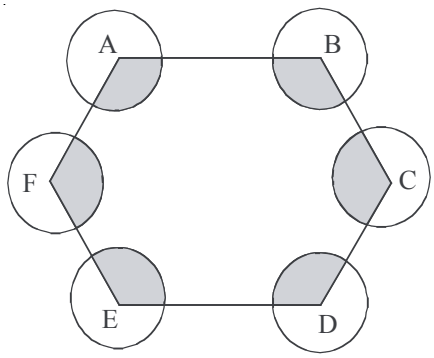
57. Find the number of revolutions made by a circular wheel of area 6.16 m² in rolling a distance of 572 m.

58. All the vertices of a rhombus lie on a circle. Find the area of the rhombus, if area of the circle is 2464 cm².

59. With vertices A, B and C of a triangle ABC as centres, arcs are drawn with radius 6 cm each in fig. If AB= 20 cm, BC= 48 cm and CA= 52 cm, then find the area of the shaded region. $\left(\text{Use } \pi = \frac{22}{7}\right)$

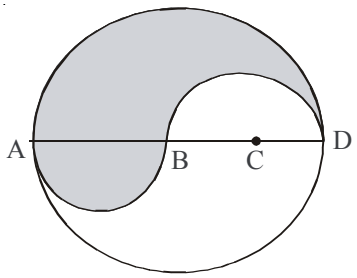


60. ABCDEF is a regular hexagon. With vertices A, B, C, D, E and F as the centres, circles of same radius '*r*' are drawn. Find the area of the shaded portion as shown in the given figure.

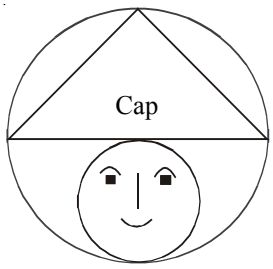


61. ABCD is a diameter of a circle of radius 6 cm. The lengths AB, BC and CD are equal. Semicircles are drawn on AB and BD as diameter as shown in the fig. Find the perimeter and area of the shaded region.

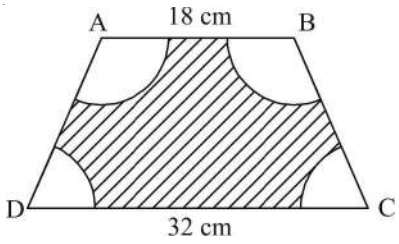
$\left(\text{Use } \pi = \frac{22}{7}\right)$



62. A poor artist on the street makes funny cartoons for children and earns his living. Once he made a comic face by drawing a circle within a circle, the radius of the bigger circle being 30 cm and that of smaller being 20 cm as shown in the figure. What is the area of the cap given in this figure?

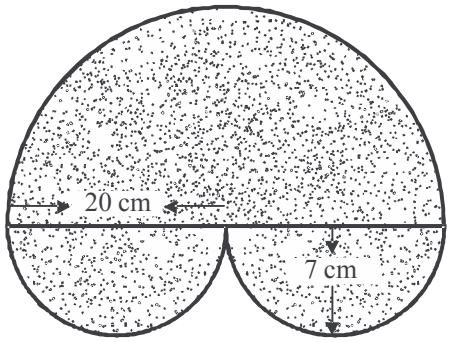


63. In the given figure ABCD is a trapzium with AB || DC, AB = 18 cm, DC = 32 cm and distance between AB and DC is 14 cm. If arc of equal radii 7 cm with centres A B, C and D have been drawn, then find the area of shaded region. $\left(\text{Use } \pi = \frac{22}{7}\right)$



64. Find the area of the shaded region as shown in the given figure.

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



ANSWERS AND HINTS

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

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

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

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

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

5. $\frac{\text{distance}}{\text{circumference}} = \frac{11 \times 1000 \times 7 \times 100}{2 \times 22 \times 25} = 7000$

6. $\pi r^2 = 616 \Rightarrow r = 14$ cm or $2\pi r = 88$ cm

7. Side of the square is equal to the diameter of the circle

$\Rightarrow$ r = 3 cm or $\pi r^2 = \pi(3)^2 = 9\pi$ cm^2.

8. $\pi R^2 = \pi r_1^2 + \pi r_2^2 \Rightarrow R = 25$ and diameter = 50 cm.

9. $2\pi r = 2 \times \frac{22}{7} \times 35 = 220$ cm , Side of square $\frac{220}{4} = 55$ cm

Area of square = 55 × 55 = 3025 cm^2

10. $l = \frac{\theta}{360°} \times 2\pi r \quad \Rightarrow \quad 3\pi = \frac{\theta}{360°} \times 2\pi \times 6 \quad \Rightarrow \quad \theta = 90°$

11. $\frac{\theta}{360°} \times \pi r^2$

12. $\frac{2\pi r_1}{2\pi r_2} = \frac{2}{3} \Rightarrow r_1 = \frac{2}{3} r_2$ or $\frac{\pi r_1^2}{\pi r_2^2} = \frac{\left(\frac{2}{3} r_2\right)^2}{r_2^2} = 4:9$

13. $(2\pi r - r) = 37$ or $r = 7$, $2\pi r = 2 \times \frac{22}{7} \times 7 = 44$ cm

14. 96%

15. $\frac{210° \times 22 \times 6 \times 6}{360° \times 7} = 66$ cm^2 ($\theta = 210°$) (11: 20 to 11: 55 = 35 minutes)

16. 280 cm^2

17. 124.74 cm^2

18. 10.27 cm^2

19. $A = \frac{1}{2} lr$

20. $2\pi r$

21. πs^2

22. $\frac{\theta}{360°} \times 2\pi r$

23. $\frac{\theta}{360°} \times \pi r^2$

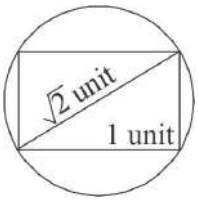
24. Area of the corresponding triangle

25. $2\pi r = 22$, $r = \frac{7}{2}$

Area of quadrant = $\frac{\pi r^2}{4} = \frac{22 \times 7 \times 7}{7 \times 4 \times 2 \times 2} = 9.625$ cm^2

26. $l = \frac{\theta}{360°} \times 2\pi r \Rightarrow 5\pi = \frac{\theta}{360°} \times 2\pi \times 10 \Rightarrow \theta = 90°$

27.



If side of square is 1 unit, by Pythagoras Theorem

Diameter $\sqrt{2}$ unit.

Area of square = 1 × 1 = 1 sq units.

Area of Circle = $\pi r^2 = \pi \times \frac{\sqrt{2}}{2} \times \frac{\sqrt{2}}{2} = \frac{\pi}{2} = \frac{11}{7}$

Required ratio = 11 : 7

28. 154 cm^2

29. $2\pi r = 4$ unit or $\frac{2\pi r}{4 \text{ unit}} = \frac{\text{Perimeter of circle}}{\text{Perimeter of square}}$ (Let side of square = 1 unit)

$$r = \frac{7}{11} \text{ unit}$$

$$\frac{\pi r^2}{1} = \frac{22}{7} \times \frac{7}{11} \times \frac{7}{11} = \frac{14}{11} \quad \text{or} \quad 14 : 11$$

30. Area of equilateral triangle = $\frac{\sqrt{3}}{4}a^2$

$$\text{Area of circle} = \pi\left(\frac{a}{2}\right)^2$$

$$\text{Required ratio} = \sqrt{3} : \pi$$

31. $\frac{\theta}{360°}\pi r^2 = \pi r^2 \times \frac{5}{18}$

$\theta = 100°$

32. 20 cm + 14 cm + 20 cm + πr

20 cm + 14 cm + 20 cm + $\frac{22}{7} \times 7$ = 76 cm

33. $\frac{\theta}{360^\circ} \times 2\pi r = \frac{60 \times 2 \times 22 \times 105}{360^\circ \times 7 \times 10} = 11 \text{ cm}$

Perimeter = 10.5 + 10.5 + 11 cm = 32 cm

34. Perimeter of shaded region = Perimeters of semi circles,

$= \text{ARC} + \text{APB} + \text{BSD} + \text{CQD}$

$= \pi (r_1 + r_2 + r_3 + r_4)$

$= \frac{22}{7}\left[7 + \frac{7}{2} + 7 + \frac{7}{2}\right] = \frac{22}{7} \times 21 = 66 \text{ cm}$

35. $54\ \pi = \frac{\theta \times \pi \times 36 \times 36}{360^\circ}$

$\theta = 15^\circ$

$l = \frac{\theta}{360^\circ} \times 2\pi r = \frac{15^\circ \times 2 \times \pi \times 36}{360^\circ} = 3\ \pi \text{ cm}$

36. Area $= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{210^\circ \times 22 \times 5 \times 5}{360^\circ \times 7} = \frac{1650}{36} = 45 \cdot \frac{5}{6} \text{cm}^2$

($\theta = 210^\circ$ in 35 minutes)

37. AC = 28 cm, BC = $28\sqrt{2}$ cm (by Pythagoras Theorem).

radius = $14\sqrt{2}$ cm $= \frac{\text{BC}}{2}$

Shaded region = Area of semicircle – Area of segment BCD

$= \frac{1}{2}\pi(14\sqrt{2})^2 - \frac{90^\circ}{360^\circ} \times \pi\ (28)^2 + \frac{1}{2} \times 28 \times 28$

$= 392 \text{ cm}^2$

38. $l = \frac{240^\circ \times 2 \times 22 \times 35}{360^\circ \times 7 \times 10}$

$= 14.67$

Length of OAPBO = 14.6 + 3.5 + 3.5

$= 21.67 \text{ cm}$

39. $\pi (r_2^2 - r_1^2) = \pi[(1502)^2 - (1500)^2] \times 20$

$= 3.14\ [(1502)^2 - (1500)^2] \times 20$

$= ₹\ 377051.2$

40. Circumference of cycle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 30$ cm

$= 188.57$ cm

Speed of cycle $= \frac{18857 \times 140 \times 60}{100 \times 1000}$

$= 15.84$ km/h

41. Area of Minor sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{30°}{360°} \times 3.14 \times 4 \times 4\ \text{cm}^2$

$= 4.19\ \text{cm}^2$ (approx.)

Area of major sector $= \frac{\theta}{360°} \times \pi r^2$

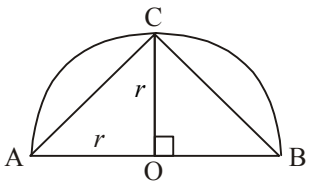
$= \frac{330°}{360°} \times 3.14 \times 4 \times 4$

$= 46.1\ \text{cm}^2$ (approx)

42. Area of $\Delta = \frac{1}{2}$ base $\times$ height

$= \frac{1}{2}\ AB \times OC$

$= \frac{1}{2}\ 2r \times r = r^2$ square unit



43. Let AB = h cm

Area of trapezium $= \frac{1}{2}(AD + BC) \times AB$

$24.5 = \frac{1}{2}(10 + 4) \times h$ (AB = h)

$h = 3.5$ cm

Area of quadrant ABE $= \frac{90°}{360°} \times \pi (3.5)^2$ sq.cm

$= 9.625$ sq.cm

Area of shaded region $= 24.5 - 9.625$

$= 14.875$ sq.cm

44. Area of shaded portion =

Area of square – Area of circle – (Area of 2 quadrants)

$$= 64 - \frac{22 \times 42 \times 42}{7 \times 10 \times 10} - \frac{22 \times 14 \times 14 \times 1}{7 \times 10 \times 10 \times 2}$$

$= 64 - 55.44 - 3.08$

$= 5.48$ cm^2

45.
$$\frac{7065}{100} = \frac{100° \times 314 \times r^2}{360° \times 100}$$

$$\frac{7065 \times 360}{100 \times 314} = r^2$$

$9 = r$

$r = 9$ cm.

46. Area of shaded portion $= \pi r^2 + \left[AB \times BC - \frac{\pi\left(\frac{DC}{2}\right)^2}{2} \right]$

$$= \frac{22}{7} \times (3.5)^2 + \left[98 - \frac{22 \times 7 \times 7}{7 \times 2} \right]$$

$= 38.5 + [98 - 77]$

$= 38.5 + 21$

$= 59.5$ cm^2

47. Four semicircluar means 2 circles ,

Area of 2 circles $= 2\pi r^2$

$= 2 \times 3.14 \times 20 \times 20$

$= 2512$ sq.m

Total cost $= 2512 \times 1.25$

$=$ ₹ 3140

48. Area of shaded region $= l \times b + \frac{\pi r^2}{2}$

$= 8 \times 4 + \pi \times \frac{2 \times 2}{2}$

$= (32 + 2\pi)\ \text{cm}^2$

49. Area of the segment = Area of sector – Area of Δ

Area of sector $= \frac{120°}{360°} \times \frac{22}{7} \times 21 \times 21 = 462\ \text{cm}^2$

Area of $\Delta = \frac{441}{4}\sqrt{3}\ \text{cm}^2$

Area of segment $= \left(462 - \frac{441}{4}\sqrt{3}\right)\ \text{cm}^2$

$= \frac{21}{4}\left(88 - 21\sqrt{3}\right)\text{cm}^2$

50. $l = \frac{\theta}{360°} \times 2\pi r$

$11 = \frac{45°}{360°} \times \frac{2 \times 22 \times r}{7}$

$14 = r$

$r = 14\ \text{cm}$

51. Shaded Area $= l \times b + \pi r^2$

$= (44 \times 16 + \pi \times 8 \times 8)$

$= (704 + 64\pi)\ \text{cm}^2$

52. Shaded Area $= 20 \times 15 + 28.12\ \pi - \frac{1}{2} \times 12 \times 9$

$= 334.39\ \text{cm}^2$

53. $2\pi r = 2r + 16.8$

$2 \times \frac{22}{7} r - 2r = \frac{168}{10}$ or $2r\left(\frac{22}{7} - 1\right) = \frac{168}{10}$

or, $2r\left(\frac{15}{7}\right) = \frac{168}{10}$ or $r = \frac{168 \times 7}{10 \times 2 \times 15} = \frac{1176}{300} = 3.92\ \text{cm}$

54. Area of shaded region = Area of rectangle – [Area of 2 semicircles + Area of rectangle]

$$= L \times B - \left[2\frac{\pi r^2}{2} + l \times b\right]$$

$$= 26 \times 12 - [\pi \times 2 \times 2 + 16 \times 4]$$

$$= 312 - 4\pi - 64 = (248 - 4\pi) \text{ m}^2$$

55. $\pi r_1^2 + \pi r_2^2 = 130\ \pi \Rightarrow r_1^2 + r_2^2 = 130$ ...(1)

$\Rightarrow$ $r_1 + r_2 = 14$ …(2)

Substitute the value of r_1 from (2) in (1) and solve.

$$2r_2^2 - 28\, r_2 + 66 = 0$$

$$r_2^2 - 14r_2 + 33 = 0 \qquad \text{(Neglecting – ve)}$$

$$r_2 = 11 \text{ cm and } r_1 = 3 \text{ cm}$$

56. Area of shaded region = Area of Δ – Area of 3 sectors.

$$\text{area } \Delta = \frac{\sqrt{3}}{4} \times 14 \times 14 = \frac{\sqrt{3}}{4} \times 196 = 49\sqrt{3}$$

$$\text{Area of 3 Sectors} = 3 \times \frac{60°}{360°} \times \frac{22}{7} \times 7 \times 7 = 77 \text{ sq. cm}$$

$$\therefore \text{ required Area} = (49\sqrt{3} - 77) \text{ cm}^2$$

57. $\pi r^2 = \frac{616}{100}$ or $r^2 = 1.96$ or $r = 1.4$ m

$$2\pi r = 2 \times \frac{22}{7} \times \frac{14}{10} = \frac{616}{100} = 8.8 \text{ m}$$

Number of revolutions = $\frac{572}{8.8} = 65$

58. $\pi r^2 = 2464 \text{ cm}^2$

$$r = 28 \text{ cm} \quad \text{or} \quad d = 28 + 28 = 56 \text{ cm}$$

$$\text{Area of rhombus} = \frac{1}{2}d_1d_2 \text{ or } \frac{1}{2}d_2^2 (d_1 = d_2)$$

$$= \frac{1}{2} \times 56 \times 56 = 1568 \text{ cm}^2$$

59. By converse of Pythagoras theorem ΔABC is right Δ.

$\therefore$ Area of shaded region = Area of Δ – Area of 3 sectors.

$$= \frac{1}{2} \times 48 \times 20 - \frac{\pi r^2}{360^\circ}(\theta_1 + \theta_2 + \theta_3)$$

$$= 480 - \frac{22 \times 6 \times 6}{7 \times 360^\circ}(180^\circ)$$

$$= 480 - 56.57$$

$$= 423.43 \text{ cm}^2$$

60. $2\pi r^2$ (Area is equal to 2 circles.)

61.
$$\text{Perimeter} = \frac{2\pi r_1}{2} + \frac{2\pi r_2}{2} + \frac{2\pi r_3}{2}$$

$$= \left[2 \times \frac{22}{7} \times \frac{6}{2} + 2 \times \frac{22}{7} \times \frac{4}{2} \times 2 \times \frac{22}{7} \times \frac{2}{2}\right]$$

$$= 2 \times \frac{22}{7}[3 + 2 + 1] = 37.71 \text{ cm}$$

$$\text{Area} = \left[\pi \frac{r_1^2}{2} - \pi \frac{r_2^2}{2} + \pi \frac{r_3^2}{2}\right]$$

$$= 31.71 \text{ cm}^2$$

62. Radius of bigger circle O = 30 cm

Radius of Smaller circle O′ = 20 cm

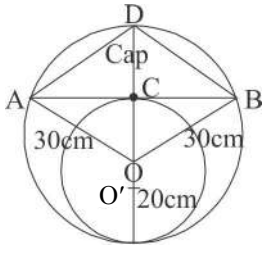
Difference of their radii = (30 – 20) = 10 cm

AB is tangent to small circle

Radius = O′C i.e. OD $\perp$ AB

$\therefore$ $\angle OCA = 90^\circ = \angle OCB$

In Δ OCA by Phythagoras Theorem



$$AC = 20\sqrt{2}\text{ cm}$$

$$\Rightarrow \quad AB = 2 \times 20\sqrt{2}\text{ cm}$$

$$= 40\sqrt{2}\text{ cm}$$

$$CD = \text{Radius of bigger circle-OC} \qquad O'$$

$$= 30–10 = 20\text{ cm}$$

$$\text{Area of cap} = \frac{1}{2}AB \times CD$$

$$= \frac{1}{2} \times 40\sqrt{2} \times 20\text{ cm}^2$$

$$= 400\sqrt{2}\text{ cm}^2$$

63. $$\text{Area of trapezium} = \frac{1}{2} \times h\,(a + b)$$

$$= \frac{1}{2} \times 14 \times (18 + 32) = 350\text{ cm}^2$$

$$\text{Area of four sectors} = \frac{\pi r^2}{360^\circ} \times (\angle A + \angle B + \angle C + \angle D)$$

$$= \frac{\pi \times 7 \times 7}{360^\circ} \times 360^\circ = 154\text{ cm}^2$$

$$\text{area of shaded region} = 350 – 154 = 196\text{ cm}^2$$

64. $$\text{Area of shaded region} = \left(\frac{\pi r_1^2}{2} + \frac{\pi r_2^2}{2} + \frac{\pi r_3^2}{2}\right)$$

$$= \pi\left(\frac{17 \times 17}{2} + \frac{10 \times 10}{2} + \frac{7 \times 7}{2}\right)$$

$$= 688.28\text{ cm}^2$$

PRACTICE-TEST

AREAS RELATED TO CIRCLES

Time : 1 Hr. ***M.M.: 20***

SECTION-A

1. If the circumference of two circles are equal, then what is the ratio between their areas? **1**

2. If the diameter of a protractor is 21 cm, then find its perimeter. **1**

3. Area of a circle of radius P is _____ . **1**

4. Choose the correct answer.

   If the perimeter and the area of a circle are numerically equal then the radius of the circle is **1**

   (a) 2 units (b) π units (c) 4 units (d) 7 units

SECTION-B

5. The length of minute hand of a clock is 14 cm. Find the area swept by the minute hand in 8 minutes. **2**

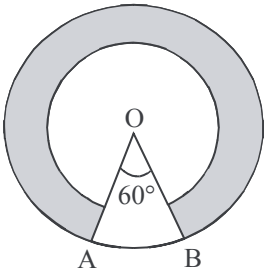
6. Find the area of a circle whose circumference is 22 cm. **2**

7. Find the area of a quadrant of a circle whose circumference is 44 cm. **2**

SECTION-C

8. A horse is tied to a pole with 28 cm long string. Find the area where the horse can graze. **3**

9. In fig. two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB = 60°$ find the area of the shaded region. (Use $\pi = \frac{22}{7}$) **3**



SECTION-D

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