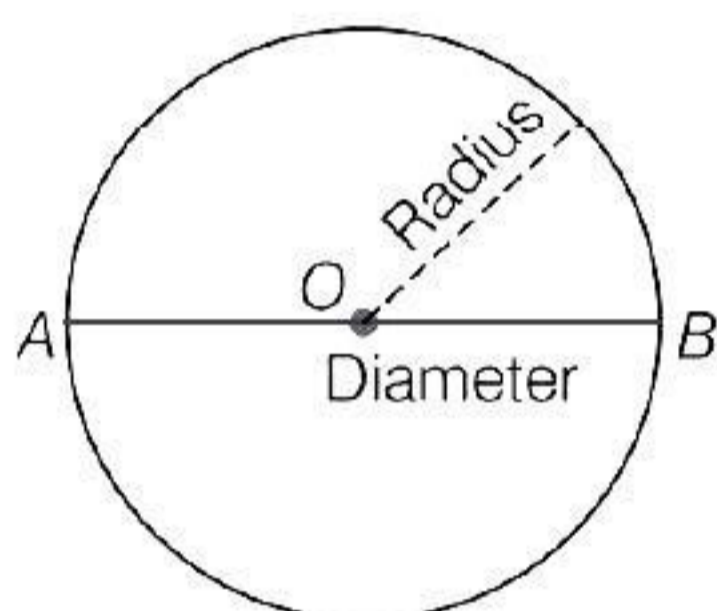


# Areas Related to Circles

## Quick Revision

### Circle

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



### Circumference (Perimeter) of a Circle

The distance covered by travelling once around a circle is called the circumference or the length of boundary of a circle.

$\therefore$  Circumference =  $\pi \times \text{Diameter} = \pi \times 2r$  units  
where,  $r$  is the radius of circle.

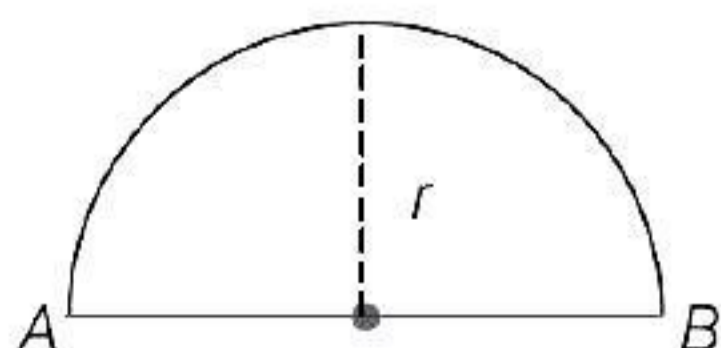
### Area of a Circle

The space occupied in a circular region is called area of a circle.

$\therefore$  Area of a circle =  $\pi r^2$  sq units

### Semi-circle

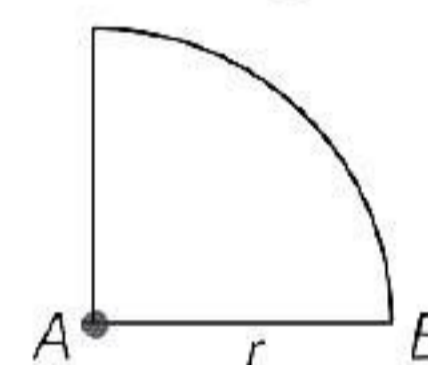
A diameter divides the circle into two parts, each part is called semi-circle.



- (i) Perimeter of semi-circle =  $\frac{2\pi r}{2} + 2r$   
=  $(\pi r + 2r)$  units
- (ii) Area of semi-circle =  $\frac{1}{2}(\pi r^2)$  sq units

### Quadrant of a Circle

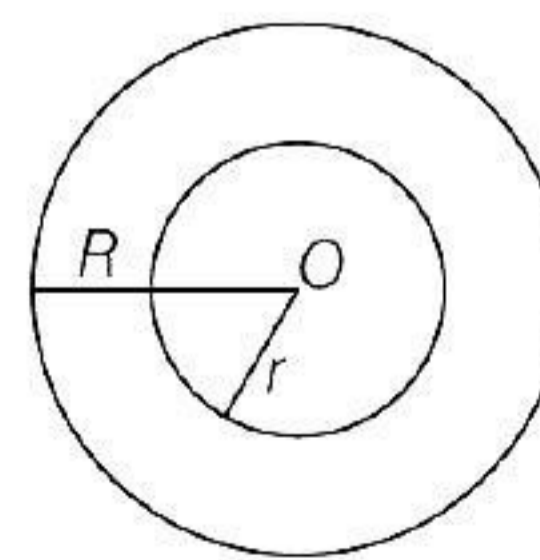
If a circle is divided into four equal parts, then each part of a circle is said to be quadrant of a circle.



- (i) Perimeter of a quadrant =  $\frac{2\pi r}{4} + 2r$   
=  $\left(\frac{\pi r}{2} + 2r\right)$  units
- (ii) Area of a quadrant =  $\left(\frac{\pi r^2}{4}\right)$  sq units

### Circular Ring

It is a plane figure bounded by the circumference of two concentric circles of two different radii.



Area of ring =  $\pi(R^2 - r^2)$  sq units.

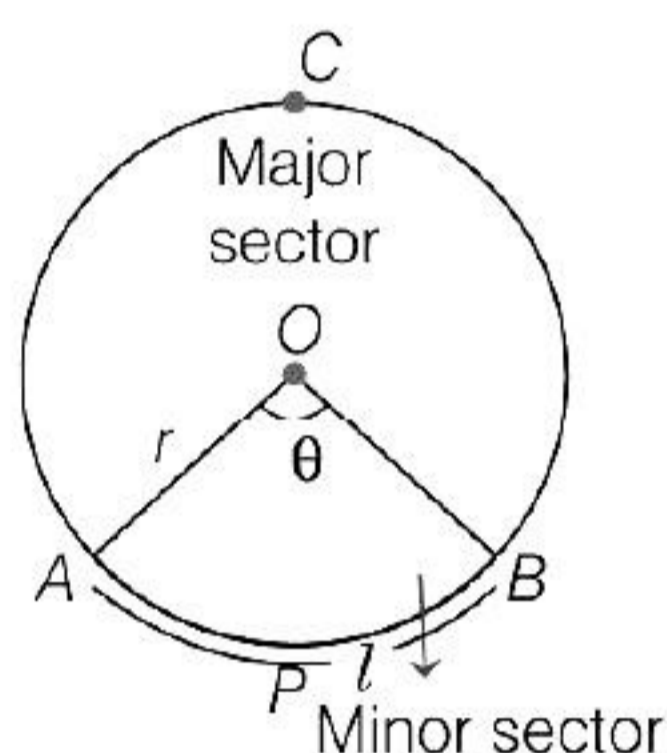
### Sector of a Circle

The region enclosed by two radii and the corresponding arc of a circle is called the sector of circle.

In the figure, unshaded region  $OACBO$  is called the **major sector** and shaded region  $OAPBO$  is called the **minor sector** of a circle.

### Length of an Arc of a Sector

The arc corresponding to a sector is called the arc of the sector.



Length of an arc of a sector,  $l = \frac{\theta}{360^\circ} \times 2\pi r$

### Area of Sector of a Circle

(i) Area of the sector =  $\frac{\theta}{360^\circ} \times \pi r^2$

(ii) Area of sector in terms of length of arc =  $\frac{1}{2} lr$

(iii) Area of the major sector =  $\pi r^2 - \text{Area of minor sector}$

(iv) Area of minor sector =  $\pi r^2 - \text{Area of major sector}$

### Note

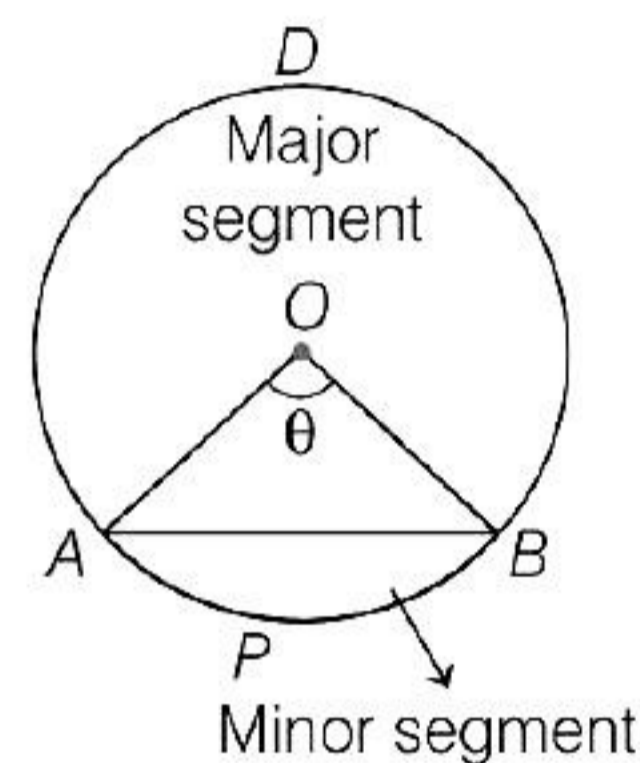
(i) If  $\theta = 180^\circ$ , then sector becomes a semi-circular region and its area =  $\frac{1}{2} \pi r^2$ .

(ii) If  $\theta = 90^\circ$ , then sector becomes a quadrant of a circle and its area =  $\frac{1}{4} \pi r^2$ .

### Segment of a Circle

The region bounded by a chord and the corresponding arc of the circle is called the segment of the circle.

The segment containing the minor arc is called the **minor segment** and the segment containing the major arc is called the **major segment**.



(i) Area of a segment = Area of corresponding sector – Area of triangle formed by chord and the radii of the circle.

(ii) Area of major segment =  $\pi r^2 - \text{Area of minor segment}$

(iii) Area of minor segment =  $\pi r^2 - \text{Area of major segment}$

### Areas of Combinations of Plane Figures

We have already known some combination of plane figure which are combination of two or more plane figures such as window designs, flower beds, circular paths etc. To calculate these types of figures we have to use some formulae, which are given below

(i) Area of triangle =  $\frac{1}{2} \times \text{Base} \times \text{Height}$

(ii) Area of equilateral triangle =  $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

(iii) Area of rectangle = Length  $\times$  Breadth

(iv) Area of square =  $(\text{Side})^2$

# Objective Questions

## Multiple Choice Questions

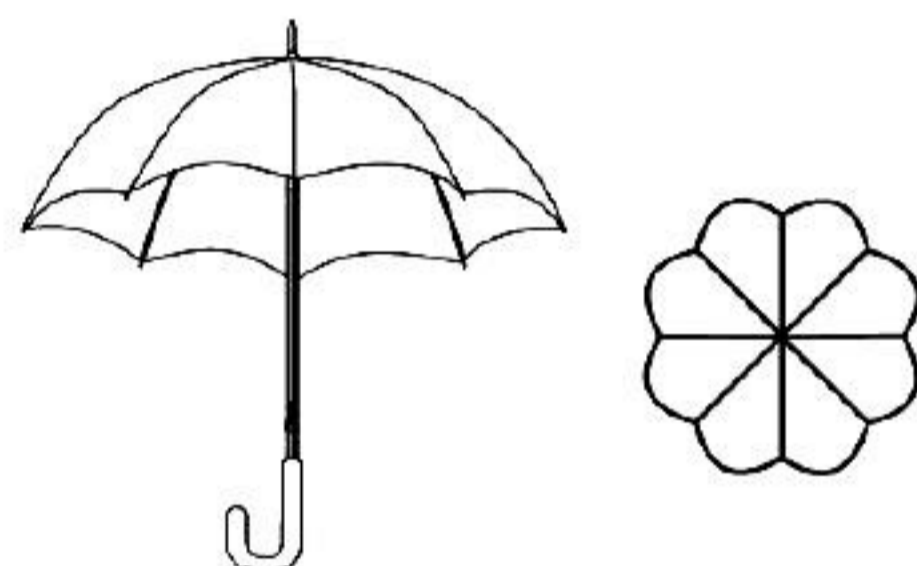
- If the sum of the circumferences of two circles with radii  $R_1$  and  $R_2$  is equal to the circumference of a circle of radius  $R$ , then *[NCERT Exemplar]*
  - $R_1 + R_2 = R$
  - $R_1 + R_2 > R$
  - $R_1 + R_2 < R$
  - Nothing definite can be said about the relation among  $R_1$ ,  $R_2$  and  $R$ .
- In covering a distance  $s$  m, a circular wheel of radius  $r$  m makes ..... revolution.
  - $\frac{2s}{\pi r}$
  - $\frac{s}{2\pi r}$
  - $\frac{s}{\pi r}$
  - None of these
- The distance travelled by a circular wheel of diameter  $d$  cm in one revolution is equal to ..... cm.
  - $\frac{\pi d}{2}$
  - $2\pi d$
  - $\frac{\pi d}{4}$
  - $\pi d$
- The perimeter of a square circumscribing a circle of radius  $a$  cm is equal to ..... cm.
  - $8a$
  - $4a$
  - $2a$
  - $\frac{a}{2}$
- The radii of two circles are 13 cm and 6 cm, respectively. Then, the radius of the circle which has circumference equal to sum of the circumferences of the two circles is
  - 17 cm
  - 19 cm
  - 7 cm
  - 11 cm
- The circumference of a circle exceeds the diameter by 25.8 cm, then the radius of the circle is
  - 6.02 cm
  - 5.02 cm
  - 4.02 cm
  - 5.58 cm
- If the perimeter of a protractor is 72 cm, then its area is
  - $12 \text{ cm}^2$
  - $13 \text{ cm}^2$
  - $14 \text{ cm}^2$
  - None of these
- The short and long hands of a clock are 6 cm and 8 cm long, respectively. Then, the sum of the distance travelled by their tips in 1 day is [take  $\pi = 22/7$ ]
  - 1282.29 cm
  - 1228.30 cm
  - 1382.30 cm
  - 1198.20 cm
- The radius of the wheel of a bus is 25 cm. If the speed of the bus is 33 km/h, then how many revolutions will the wheel make in 1 min?
  - 250
  - 520
  - 420
  - 350
- Areas of two circles are equal. Is it necessary that their circumferences are equal?
  - True
  - False
  - Cannot say
  - Partially True/False
- Circumference of two circles are equal. Is it necessary that their areas be equal?
  - True
  - False
  - Cannot say
  - Partially True/False
- The numerical value of the area of a circle is greater than the numerical value of its circumference.
  - True
  - False
  - Cannot say
  - Partially True/False
- Area of the largest triangle that can be inscribed in a semi-circle of radius  $r$  units is *[NCERT Exemplar]*
  - $r^2$  sq units
  - $\frac{1}{2} r^2$  sq units
  - $2r^2$  sq units
  - $\sqrt{2} r^2$  sq units

- 14.** If the perimeter of a circle is equal to that of a square, then the ratio of their areas is *[NCERT Exemplar]*  
 (a) 22 : 7 (b) 14 : 11  
 (c) 7 : 22 (d) 11 : 14
- 15.** If the area of a circle is  $2464 \text{ cm}^2$ , then the diameter of circle is  
 (a) 57 cm (b) 56 cm  
 (c) 54 cm (d) None of these
- 16.** If the area of a semi-circular field is  $30800 \text{ m}^2$ , then the perimeter of the field is  
 (a) 420 cm (b) 720 m  
 (c) 580 m (d) None of these
- 17.** The cost of fencing a circular field at the rate of ₹ 36 per m is ₹ 11880. The field is to be ploughed at the rate of ₹ 0.60 per  $\text{m}^2$ . Then, the cost of ploughing the field is *[take  $\pi = 22/7$ ]*  
 (a) ₹ 5197.5 (b) ₹ 866.25  
 (c) ₹ 10395 (d) None of these
- 18.** A circular park is surrounded by a road 21 m wide. If the radius of the park is 105 m, then the area of the road is  
 (a)  $1524.62 \text{ cm}^2$  (b)  $15246 \text{ cm}^2$   
 (c)  $15640.20 \text{ cm}^2$  (d) None of these
- 19.** Circular footpath of width 2 m is constructed at the rate of ₹ 20 per  $\text{m}^2$  around a circular park of radius 1500 m. Then, the total cost of construction of the footpath is *[take,  $\pi = 3.14$ ]*  
 (a) ₹ 37705.12 (b) ₹ 18852.56  
 (c) ₹ 377051.2 (d) None of these
- 20.** Area of segment of a circle is less than the area of its corresponding sector?  
 (a) True (b) False  
 (c) Cannot say (d) Partially True/False
- 21.** The areas of two sectors of two different circles are equal. Is it necessary that their corresponding arc lengths are equal?  
 (a) True (b) False  
 (c) Cannot say (d) Partially True/False
- 22.** Tick the correct answer in the following question. 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)  $\frac{p}{720^\circ} \times 2\pi R^2$
- 23.** Find the area of sector of central angle  $x^\circ$  of a circle with radius  $4r$ .  
 (a)  $\frac{\pi x r^2}{45^\circ}$  (b)  $\frac{2\pi x r^2}{360^\circ}$   
 (c)  $\frac{2\pi x r^2}{45^\circ}$  (d)  $\frac{4\pi x r^2}{180^\circ}$
- 24.** The area of a sector of a circle with radius 6 cm, if angle of the sector  $60^\circ$  is  
 (a)  $\frac{132}{14} \text{ cm}^2$  (b)  $\frac{36}{7} \text{ cm}^2$   
 (c)  $\frac{132}{7} \text{ cm}^2$  (d) None of these
- 25.** An arc of a circle is of length  $5\pi$  cm and the sector it bounds has an area of  $20\pi \text{ cm}^2$ , then radius of the circle is *[NCERT Exemplar]*  
 (a) 4 cm (b) 8 cm  
 (c) 12 cm (d) 16 cm
- 26.** The length of minute hand of a clock is 14 cm. Then, the area swept by the minute hand in one minute is *[take  $\pi = \frac{22}{7}$ ]*  
 (a)  $28 \text{ cm}^2$  (b)  $10.27 \text{ cm}^2$   
 (c)  $14.7 \text{ cm}^2$  (d)  $12.8 \text{ cm}^2$
- 27.** A pendulum swings through an angle  $60^\circ$  and describes an arc 8.8 cm in length. Then, the length of pendulum is *[use  $\pi = \frac{22}{7}$ ]*  
 (a) 8.40 cm (b) 16.8 cm  
 (c) 4.20 cm (d) 8.90 cm

**28.** A car has two wipers which do not overlap each other. Each wiper has a blade of length  $r$  cm sweeping through an angle of  $60^\circ$ . The area cleaned at each sweep of blades is

- (a)  $\frac{1}{3}\pi r \text{ cm}^2$                       (b)  $\frac{2}{3}\pi r \text{ cm}^2$   
 (c)  $\frac{1}{3}\pi r^2 \text{ cm}^2$                       (d)  $\frac{2}{3}\pi r^2 \text{ cm}^2$

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



- (a)  $\frac{22275}{56} \text{ cm}^2$                       (b)  $\frac{22275}{28} \text{ cm}^2$   
 (c)  $\frac{22285}{28} \text{ cm}^2$                       (d) None of these

**30.** To warn ships for underwater rocks, a light house spreads a red coloured light over a sector of angle  $80^\circ$  to a distance of 16.5 km. Then, the area of the sea over which the ships are warned is

[take  $\pi = 3.14$ ]

- (a)  $189.97 \text{ km}^2$                       (b)  $1899.7 \text{ km}^2$   
 (c)  $1709.73 \text{ km}^2$                       (d) None of these

**31.** In a circle of radius 42 cm, an arc subtends an angle of  $60^\circ$  at the centre. Then, the length of the arc is

- (a) 44 cm                                  (b) 24 cm  
 (c) 48 cm                                  (d) 46 cm

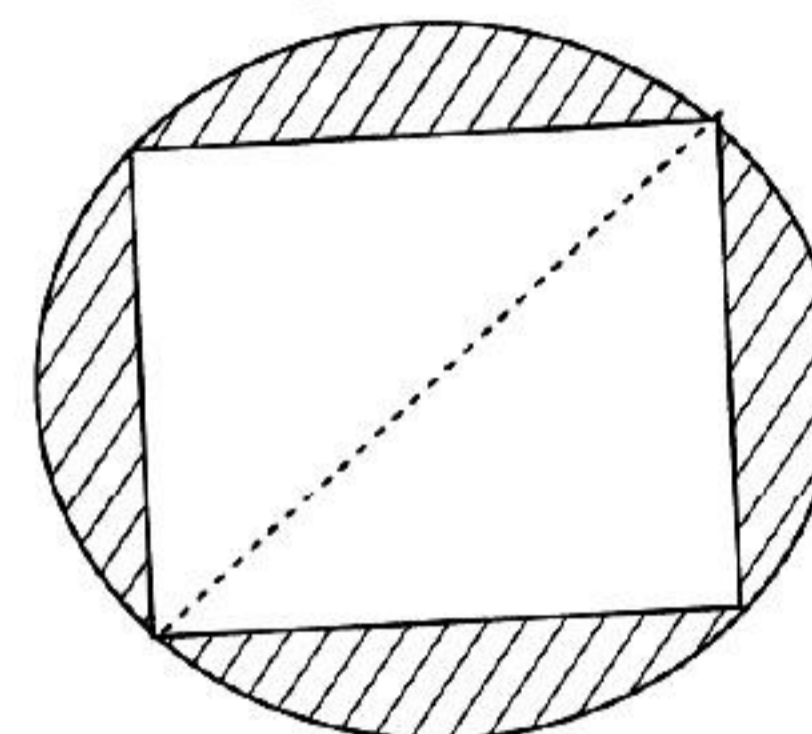
**32.** In a circle of radius 28 cm, an arc subtends an angle of  $45^\circ$  at the centre. Then, the length of the arc and the area of the sector is

- (a) 44 cm,  $154 \text{ cm}^2$                       (b) 22 cm,  $154 \text{ cm}^2$   
 (c) 22 cm,  $308 \text{ cm}^2$                       (d) None of these

**33.** Is the area of the circle inscribed in a square of side  $a$  cm is .....

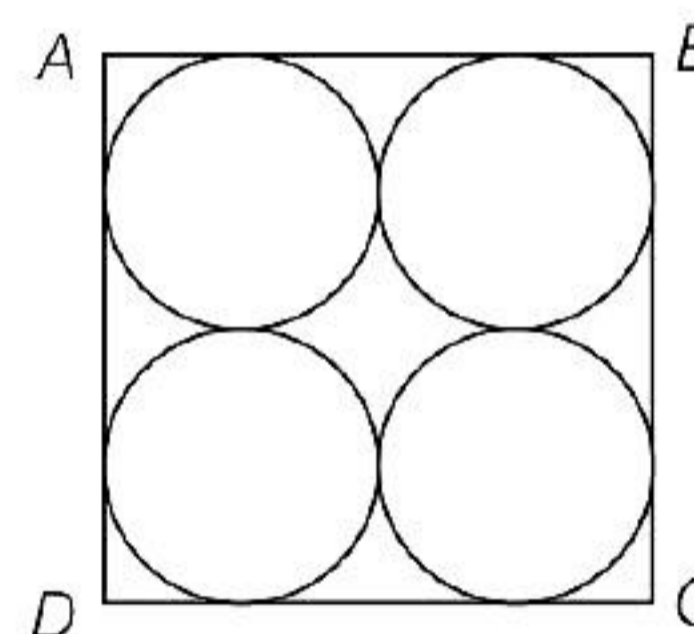
- (a)  $\pi a^2 \text{ cm}^2$                                   (b)  $\frac{\pi a^2}{2} \text{ cm}^2$   
 (c)  $\frac{\pi a^2}{4} \text{ cm}^2$                                   (d)  $2\pi a^2 \text{ cm}^2$

**34.** In figure, a square of diagonal 8 cm is inscribed in a circle, then the area of the shaded region is [NCERT Exemplar]



- (a)  $(32\pi - 16) \text{ cm}^2$                       (b)  $(16\pi - 32) \text{ cm}^2$   
 (c)  $(11\pi - 32) \text{ cm}^2$                       (d)  $(16\pi - 64) \text{ cm}^2$

**35.** The area of the shaded region in figure as shown below where  $ABCD$  is a square of side 12 cm is equal to [NCERT Exemplar]

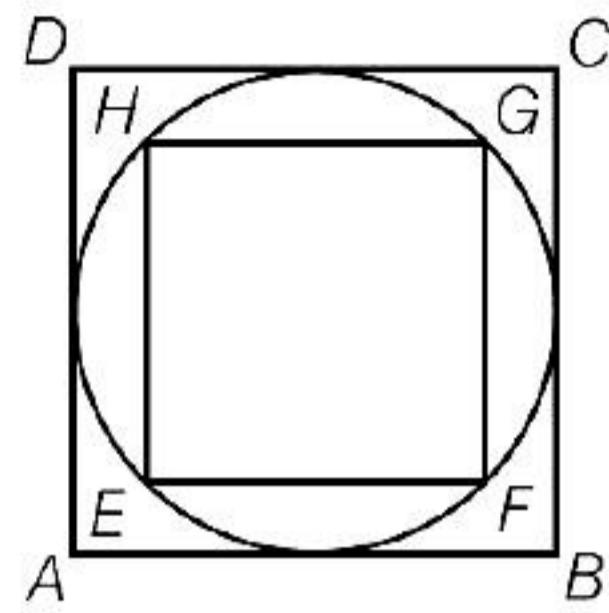


- (a)  $15.43 \text{ cm}^2$                                   (b)  $198 \text{ cm}^2$   
 (c)  $31.72 \text{ cm}^2$                                   (d)  $30.86 \text{ cm}^2$

**36.** A cow is tied with a rope of length 14 m at the corner of a rectangular field of dimensions 20 m  $\times$  16 m. Then, the area of the field in which the cow can graze is [NCERT Exemplar]

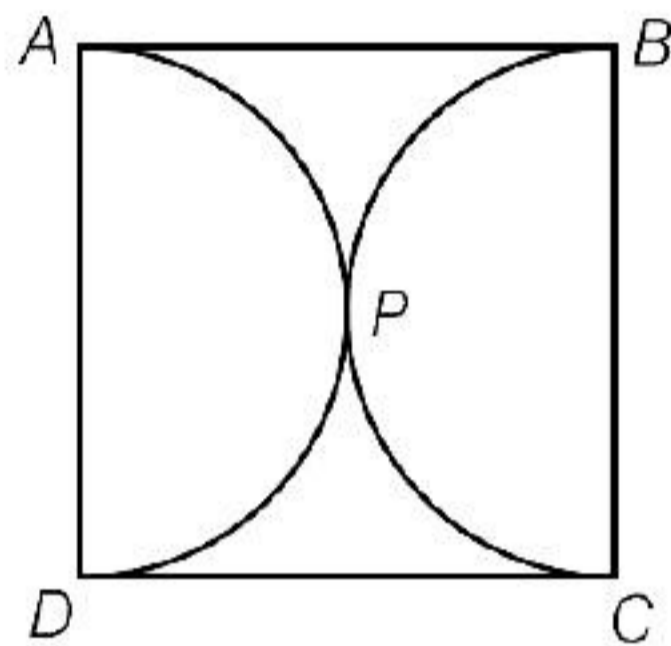
- (a)  $154 \text{ m}^2$                                       (b)  $196 \text{ m}^2$   
 (c)  $228 \text{ m}^2$                                       (d)  $144 \text{ m}^2$

**37.** In the given figure, a square is inscribed in a circle of diameter  $d$  and another square is circumscribing the circle. Then, the ratio between area of inner square to outer square.



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

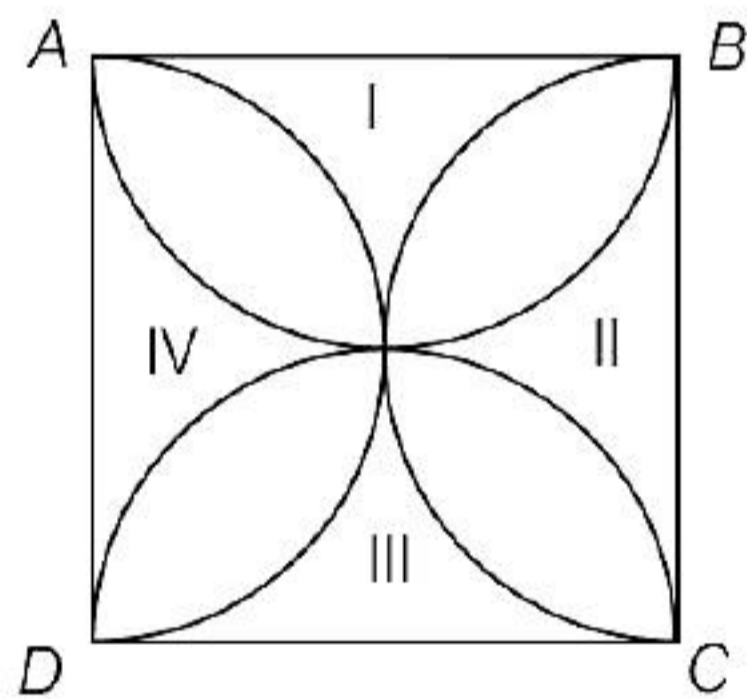
38. The area of the shaded region in figure, if  $ABCD$  is a square of side 14 cm and  $APD$  and  $BPC$  are semi circles is



- (a)  $196 \text{ cm}^2$
- (b)  $84 \text{ cm}^2$
- (c)  $21 \text{ cm}^2$
- (d)  $42 \text{ cm}^2$

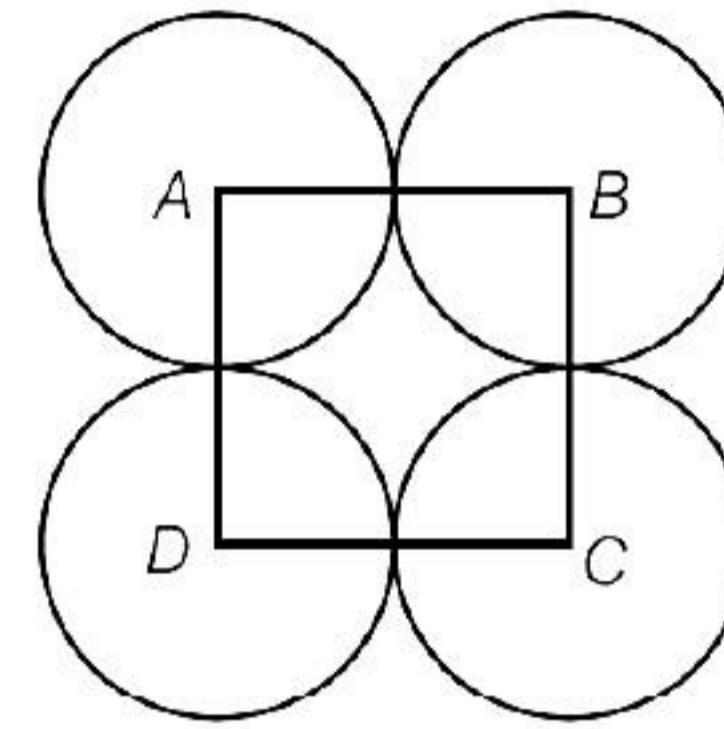
39. The area of shaded design in the given figure is (where  $ABCD$  is a square of side 10 cm and semi-circles are drawn with each of the side as diameter.)

[take  $\pi = 3.14$ ]



- (a)  $57 \text{ cm}^2$
- (b)  $67 \text{ cm}^2$
- (c)  $86 \text{ cm}^2$
- (d)  $52 \text{ cm}^2$

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

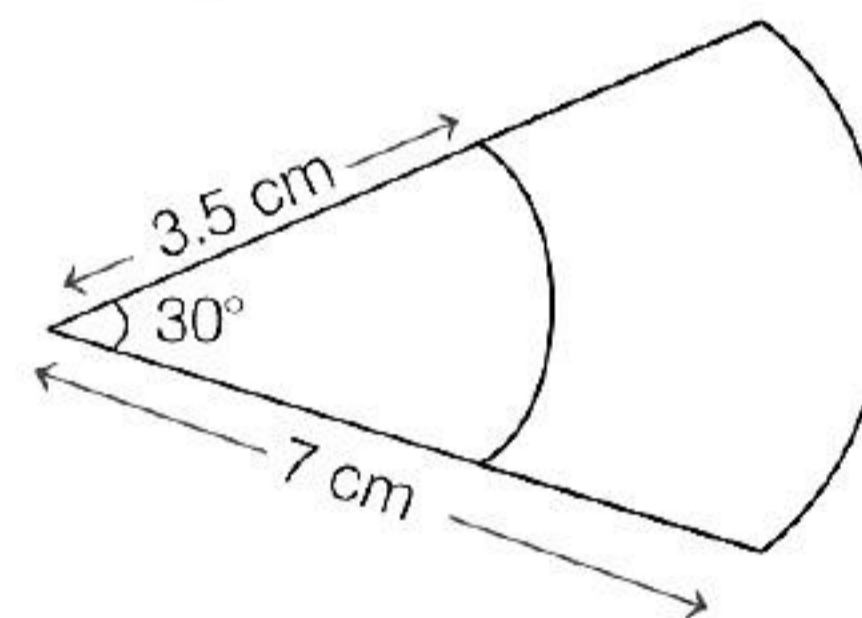


- (a)  $154 \text{ cm}^2$
- (b)  $21 \text{ cm}^2$
- (c)  $42 \text{ cm}^2$
- (d)  $184 \text{ cm}^2$

41. Is the area of the largest circle that can be drawn inside a rectangle of length  $a$  cm and breadth  $b$  cm ( $a > b$ ) is .....  $\text{cm}^2$ .

- (a)  $\frac{\pi b^2}{4}$
- (b)  $\frac{\pi a^2}{4}$
- (c)  $\frac{\pi(b^2 - a^2)}{4}$
- (d)  $\frac{\pi(b - a)^2}{4}$

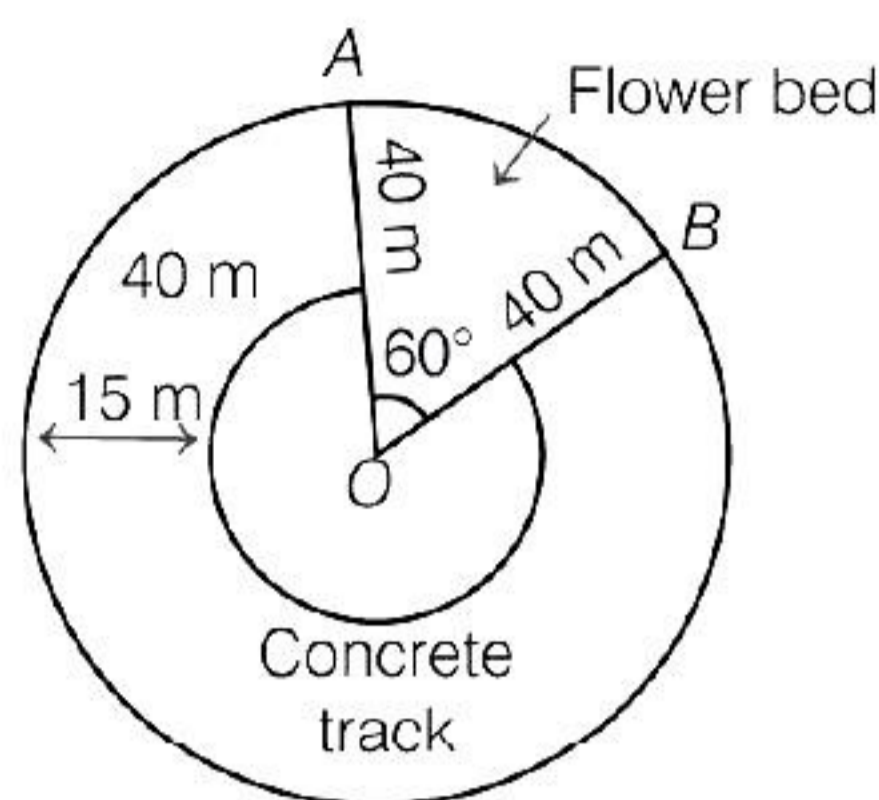
42. In the given figure, sectors of two concentric circles of radii 7 cm and 3.5 cm are shown, then the area of the shaded region is



- (a)  $96.25 \text{ cm}^2$
- (b)  $88.2 \text{ cm}^2$
- (c)  $9.625 \text{ cm}^2$
- (d)  $8.42 \text{ cm}^2$

43. In figure,  $AOB$  is a flower bed in the shape of a sector of a circle of radius 40 m and  $\angle AOB = 60^\circ$ . Also, a 15 m wide concrete track is made as shown in the figure. Flower bed is made at the rate of ₹ 2.40 per  $\text{m}^2$  and rate of making the concrete track is ₹ 20 per  $\text{m}^2$ , then the total amount spent for the job is

[take  $\pi = 3.14$ ]

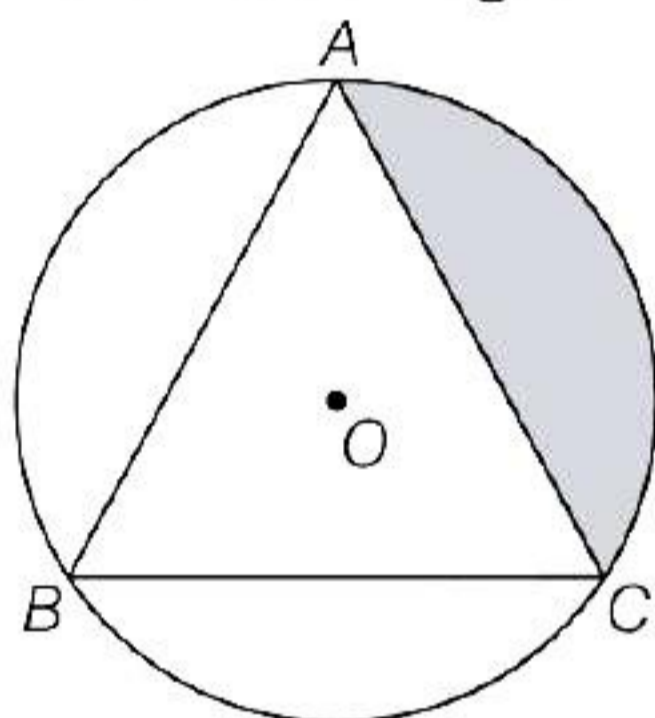


- (a) ₹ 2009
- (b) ₹ 53034.60
- (c) ₹ 5303.460
- (d) None of the above

44. A chord of a circle of radius 10 cm subtends a right angle at the centre. Then, the area of the minor segment is

- (a) 78.5 cm<sup>2</sup>
- (b) 28.5 cm<sup>2</sup>
- (c) 50 cm<sup>2</sup>
- (d) 128.5 cm<sup>2</sup>

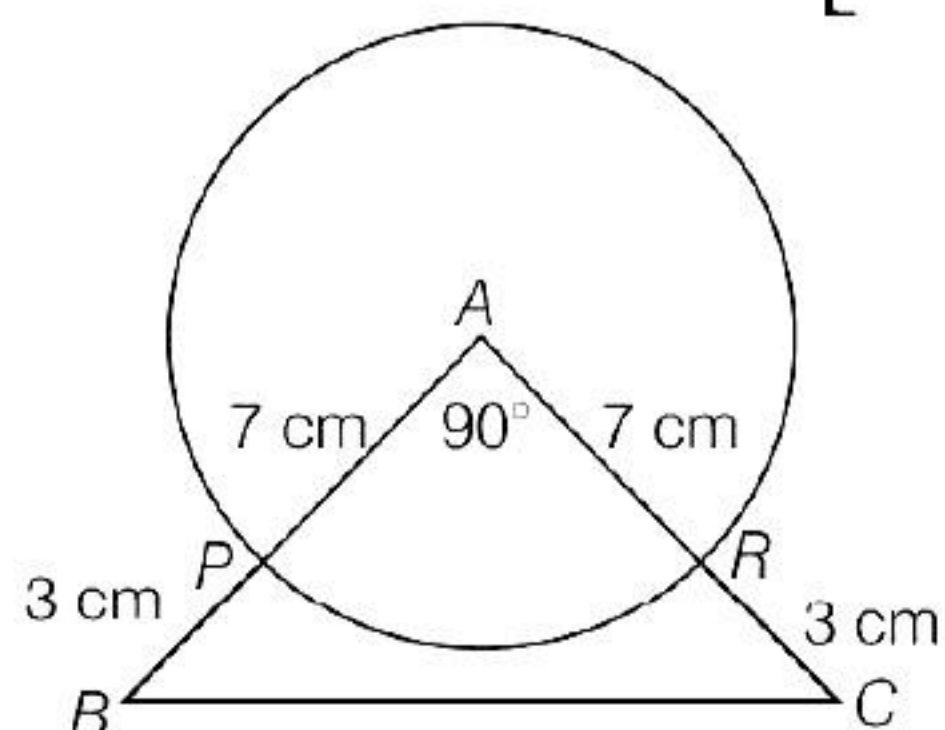
45. In the given figure, ABC is an equilateral triangle inscribed in a circle of radius 4 cm with centre O, then the area of the shaded region is



- (a)  $\frac{5}{3}(5\pi - 3\sqrt{3})\text{cm}^2$
- (b)  $\frac{4}{3}(4\pi - 3\sqrt{3})\text{cm}^2$
- (c)  $\frac{2}{3}(2\pi - \sqrt{3})\text{cm}^2$
- (d)  $\frac{7}{3}(7\pi - 3\sqrt{3})\text{cm}^2$

46. A memento is made as shown in the figure. Its base PBCR is silver plated from the front side at the rate of ₹ 20 per cm<sup>2</sup>. Then, the total cost of the silver plating is

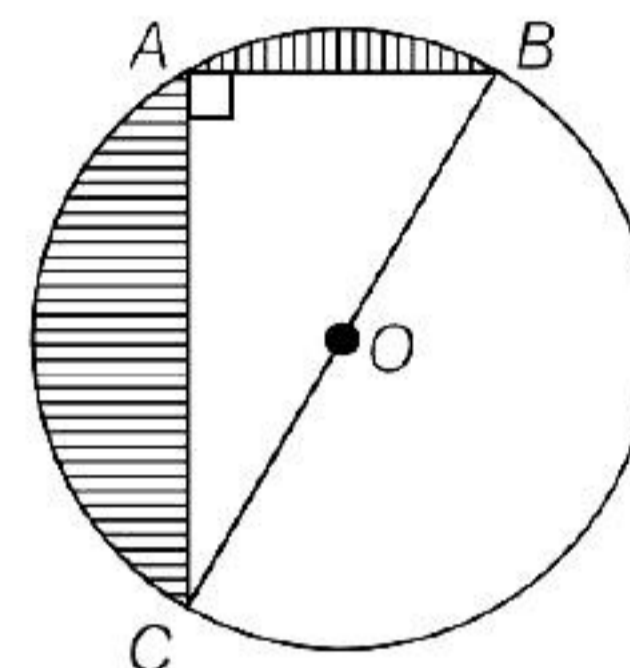
[take  $\pi = \frac{22}{7}$ ]



- (a) ₹ 460
- (b) ₹ 115
- (c) ₹ 230
- (d) None of these

47. Find the area of the shaded region in figure, if AC = 20 cm, AB = 15 cm and O is the centre of the circle.

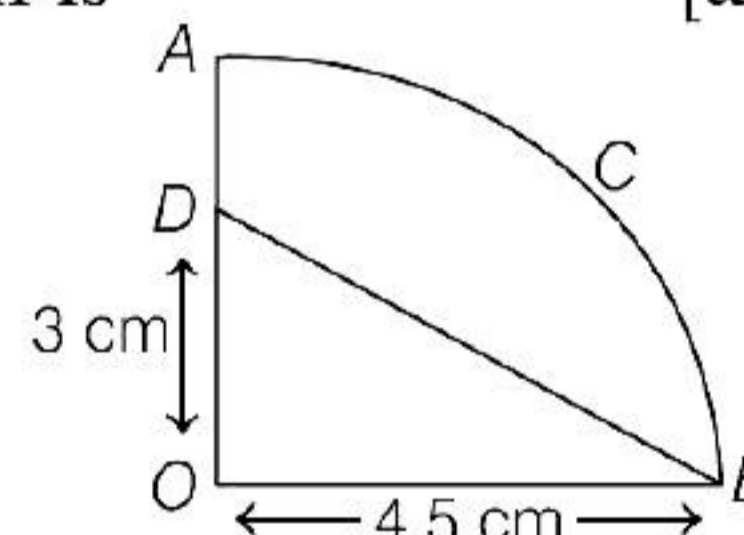
[take  $\pi = \frac{22}{7}$ ]



- (a) 95.54 cm<sup>2</sup>
- (b) 95.45 cm<sup>2</sup>
- (c) 59.54 cm<sup>2</sup>
- (d) None of the above

48. In the given figure, OACBO represents a quadrant of a circle of radius 4.5 cm with centre O. Then, the area of shaded portion is

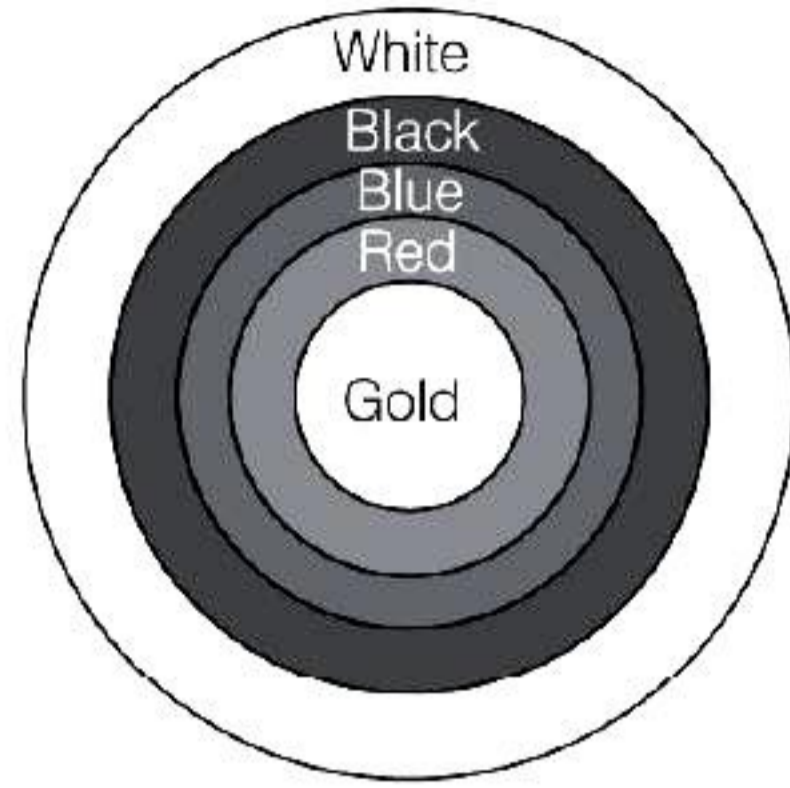
[take  $\pi = 22/7$ ]



- (a) 15.91 cm<sup>2</sup>
- (b) 9.16 cm<sup>2</sup>
- (c) 6.75 cm<sup>2</sup>
- (d) 22.66 cm<sup>2</sup>

49. In this section, each question has two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (a), (b), (c) and (d) out of which one is correct.

Figure depicts an archery target marked with its five scoring areas from the centres outwards as Gold, Red, Blue, Black and White. The diameter of the region representing Gold score is 14 cm and each of the other bands is 7 cm wide. Then match the following.



	List I		List II
P.	Area of Gold score	1.	462 cm <sup>2</sup>
Q.	Area of Red score	2.	770 cm <sup>2</sup>
R.	Area of Blue score	3.	154 cm <sup>2</sup>
S.	Area of Black score	4.	1078 cm <sup>2</sup>

**Codes**

- (a) P → 2, Q → 1, R → 4, S → 3
- (b) P → 3, Q → 1, R → 2, S → 4
- (c) P → 1, Q → 4, R → 2, S → 3
- (d) P → 1, Q → 3, R → 4, S → 2

50. Following question has four statements (A, B, C and D) given in Column I and five statements (p, q, r, s, t) in Column-II. Any given statement in Column-I can have correct matching with one or more statement(s) given in Column-II.

	Column I		Column II
A.	<p>OA = 26 cm, OC = 23 m Area of shaded region = ?</p>	(p)	30 cm <sup>2</sup>

B.	<p>AD = 6.5 cm, CA = 5 cm Area of ΔABC = ?</p>	(q)	115 m <sup>2</sup>
C.	<p>BC = 6 m, AB = 8 cm Area of the shaded region = ?</p>	(r)	35 cm <sup>2</sup>
D.	<p>OB = 14.8 m Area of the shaded region = ?</p>	(s)	0.003 m <sup>2</sup>
		(t)	30 m <sup>2</sup>

**Codes**

- (a) (A) → p,s; (B) → q; (C) → q; (D) → r,s
- (b) (A) → q; (B) → p,s; (C) → p,s; (D) → q
- (c) (A) → p,s; (B) → q; (C) → p,s; (D) → r,s
- (d) None of the above

**Assertion-Reasoning MCQs**

**Directions** (Q. Nos. 51-60) Each of these questions contains two statements : Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.



- (a) A is true, R is true; R is a correct explanation for A.  
 (b) A is true, R is true; R is not a correct explanation for A.  
 (c) A is true; R is false.  
 (d) A is false; R is true.

**51. Assertion** If the circumference of a circle is 176 cm, then its radius is 28 cm.

**Reason** Circumference =  $2\pi \times$  radius

**52. Assertion** If a wire of length 22 cm is bent in the shape of a circle, then area of the circle so formed is  $40 \text{ cm}^2$ .

**Reason** Circumference of the circle = length of the wire.

**53. Assertion** The diameter of a wheel is 4.2 m. It makes 75 revolutions in one minute. The speed of the wheel is 59.4 km/h.

**Reason** Distance travelled in one minute = Circumference  $\times$  Number of revolutions in one minute.

**54. Assertion** If the circumference of two circles are in the ratio 2 : 3, then ratio of their areas is 4 : 9.

**Reason** The circumference of a circle of radius  $r$  is  $2\pi r$  and its area is  $\pi r^2$ .

**55. Assertion** The area of a circular playground is  $22176 \text{ m}^2$ , the cost of fencing this ground at the rate of ₹ 50 per m is ₹ 26400.

**Reason** If  $R$  and  $r$  be the radius of outer and inner circular path, then area of the ring will be  $\pi(R^2 - r^2)$ .

**56. Assertion** If the outer and inner diameter of a circular path is 10 m and 6 m, then area of the path is  $16\pi \text{ m}^2$ .

**Reason** If  $R$  and  $r$  be the radius of outer and inner circular path respectively, then  
 area of path =  $\pi(R^2 - r^2)$ .

**57. Assertion** In the figure,  $O$  is the centre of a circle. The area of sector  $OAPB$  is  $\frac{5}{18}$  of the area of the circle, then the value of  $x$  is  $100^\circ$

**Reason** Length of an arc of a circle with radius  $r$  and central angle  $\theta$  is given by  $l = \frac{\theta}{360^\circ} \times \pi r^2$ .

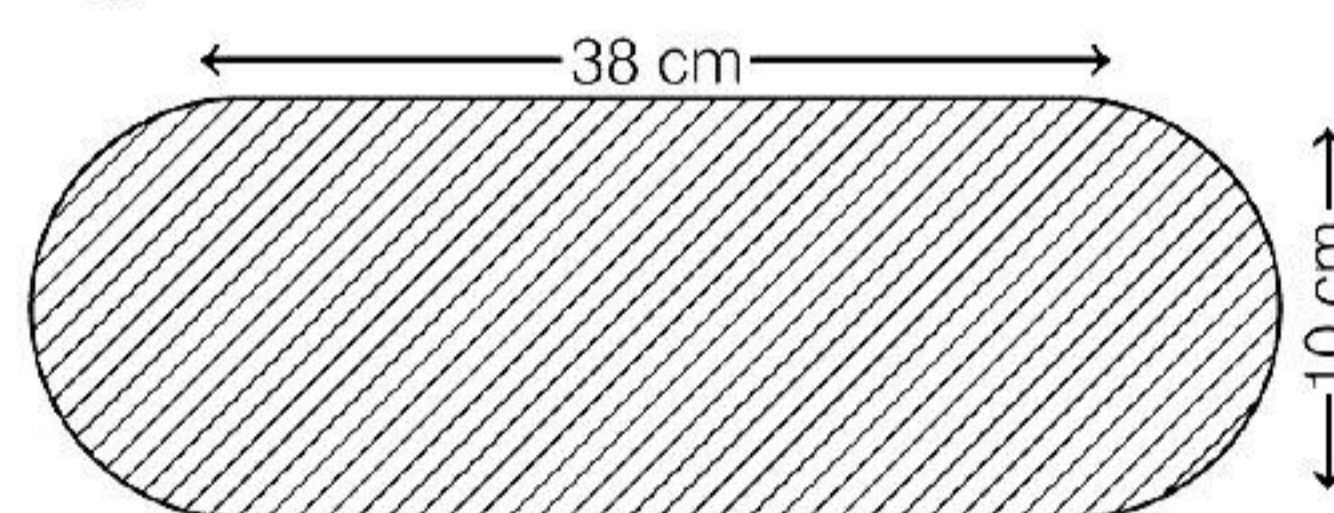
**58. Assertion** The area of the sector of a circle of radius 5 cm is  $9.75 \text{ cm}^2$ , if the corresponding arc length is 3.5 cm.

**Reason** Area of a sector of a circle of radius  $r$  and central angle  $\theta$  is  $\frac{\theta}{360^\circ} \pi r^2$ .

**59. Assertion** Area of the square inscribed in a circle of radius  $r$  is  $2r^2$  sq units.

**Reason** Area of the major segment of a circle = Area of the circle – Area of minor segment.

**60. Assertion** The area of the flower bed (with semi-circular ends) shown in figure.

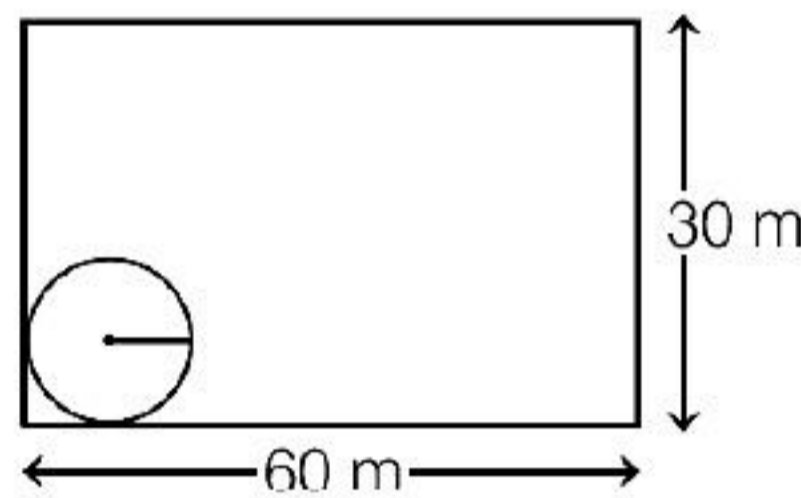
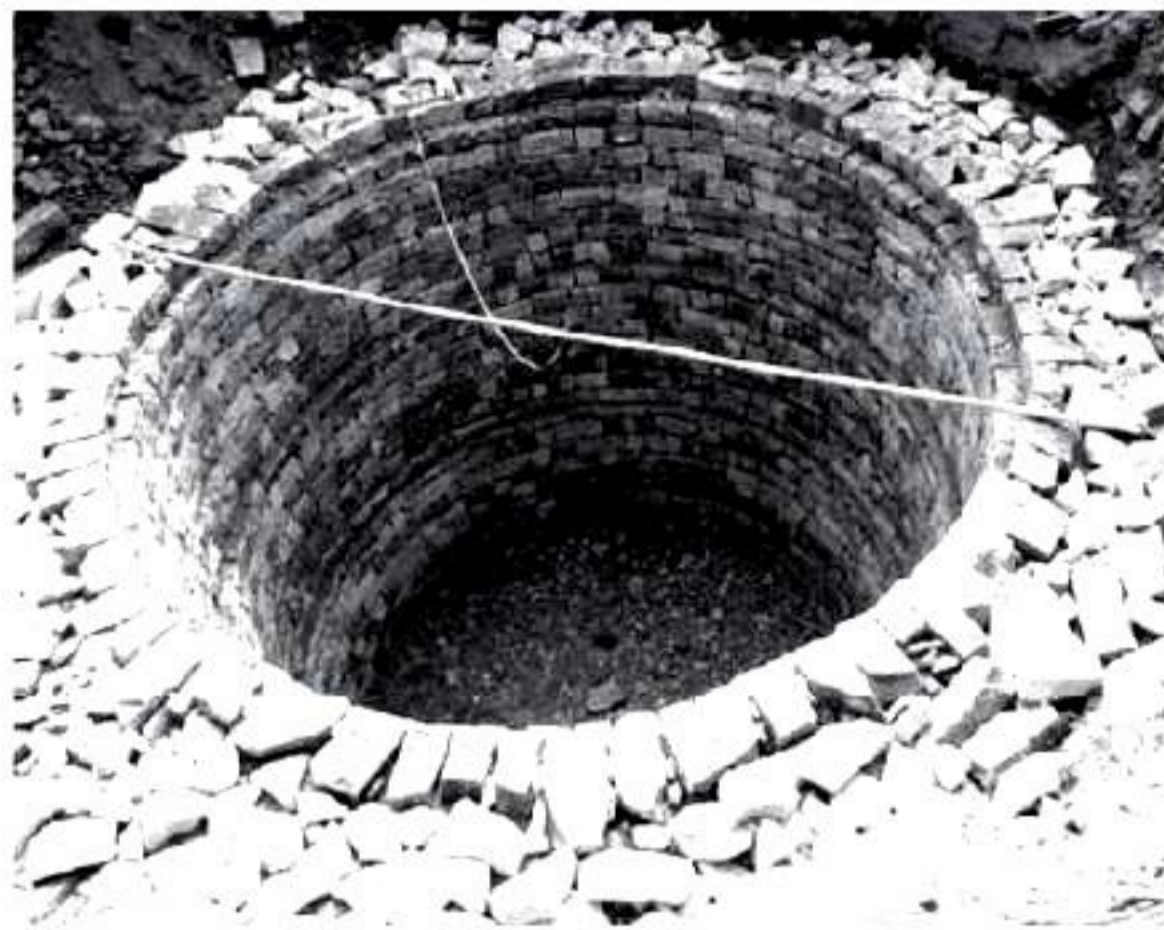


is  $(380 + 50\pi) \text{ cm}^2$

**Reason** Area of the semi-circle is  $\frac{\pi r^2}{2}$   
 and area of rectangle is length  $\times$  breadth.

### Case Based MCQs

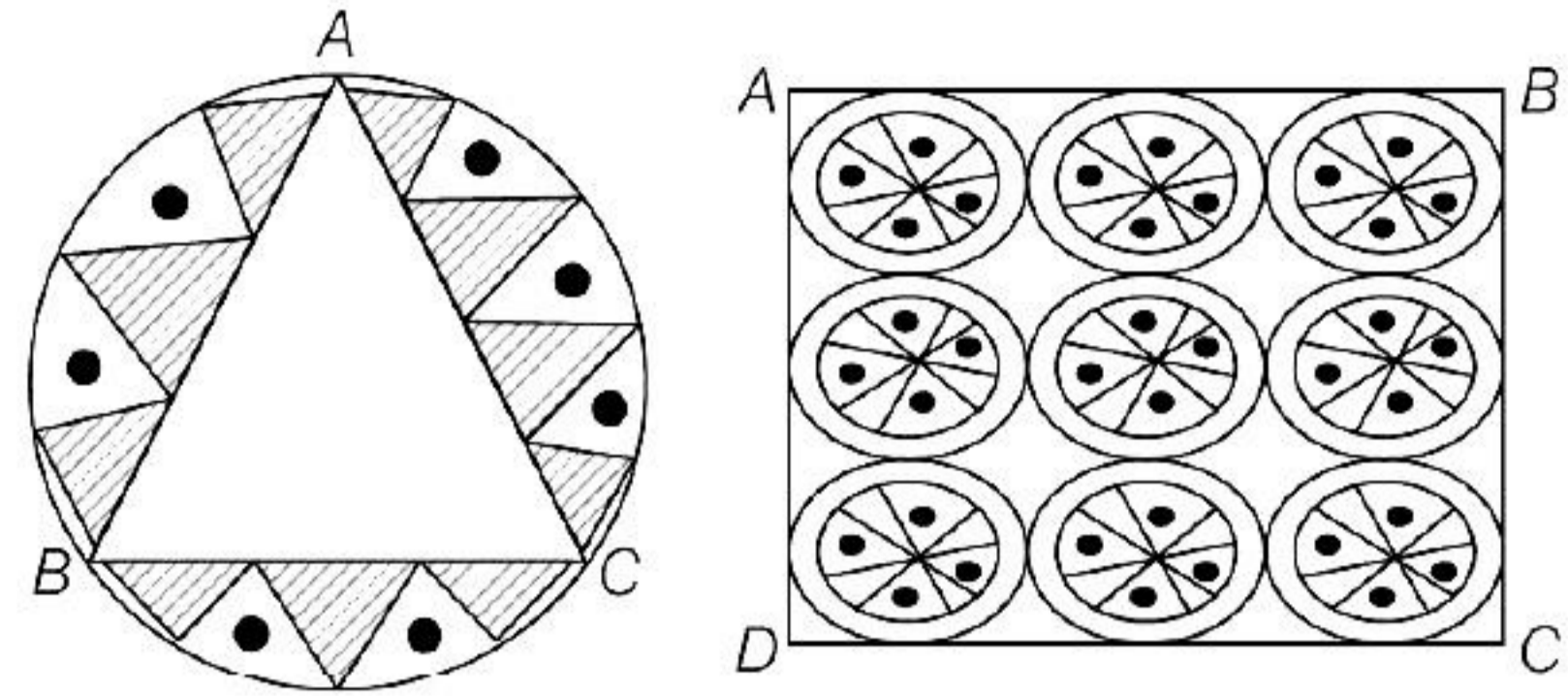
**61.** A farmer has a rectangular field of length 60 m and breadth 30 m. By the farmer a pit of diameter 14 m is dug 12 m deep to make a well. The earth taken out is spread in the field.



Based on the above information, answer the following questions.

- (i) Find the volume of the earth taken out.
  - (a)  $1460 \text{ m}^3$
  - (b)  $1462 \text{ m}^3$
  - (c)  $1848 \text{ m}^3$
  - (d)  $1850 \text{ m}^3$
- (ii) The area of the rectangular field is
  - (a)  $1420 \text{ m}^2$
  - (b)  $1430 \text{ m}^2$
  - (c)  $1840 \text{ m}^2$
  - (d)  $1800 \text{ m}^2$
- (iii) Find the area of the top of the pit.
  - (a)  $38.5 \text{ m}^2$
  - (b)  $40.5 \text{ m}^2$
  - (c)  $41.5 \text{ m}^2$
  - (d) None of these
- (iv) The area of the remaining field is
  - (a)  $1402.3 \text{ m}^2$
  - (b)  $1184 \text{ m}^2$
  - (c)  $1646 \text{ m}^2$
  - (d)  $411.5 \text{ m}^2$
- (v) Find the level rise in the field.
  - (a) 0.5 m
  - (b) 3 m
  - (c) 1.12 m
  - (d) 2.12 m

**62.** Pookalam is the flower bed or flower pattern designed during Onam in Kerala. It is similar as Rangoli in North India and Kolam in Tamil Nadu. During the festival of Onam, your school is planning to conduct a Pookalam competition. Your friend who is a partner in competition, suggests two designs given below. Observe these carefully.



**Design I** This design is made with a circle of radius 32 cm leaving equilateral triangle  $ABC$  in the middle as shown in the given figure.

**Design II** This Pookalam is made with 9 circular design each of radius 7 cm.  
[CBSE Question Bank]

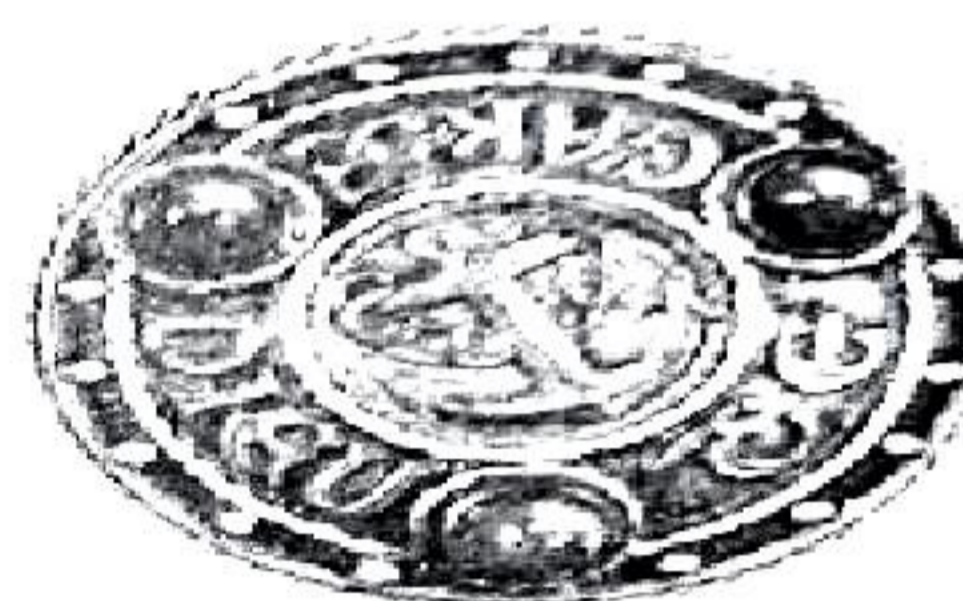
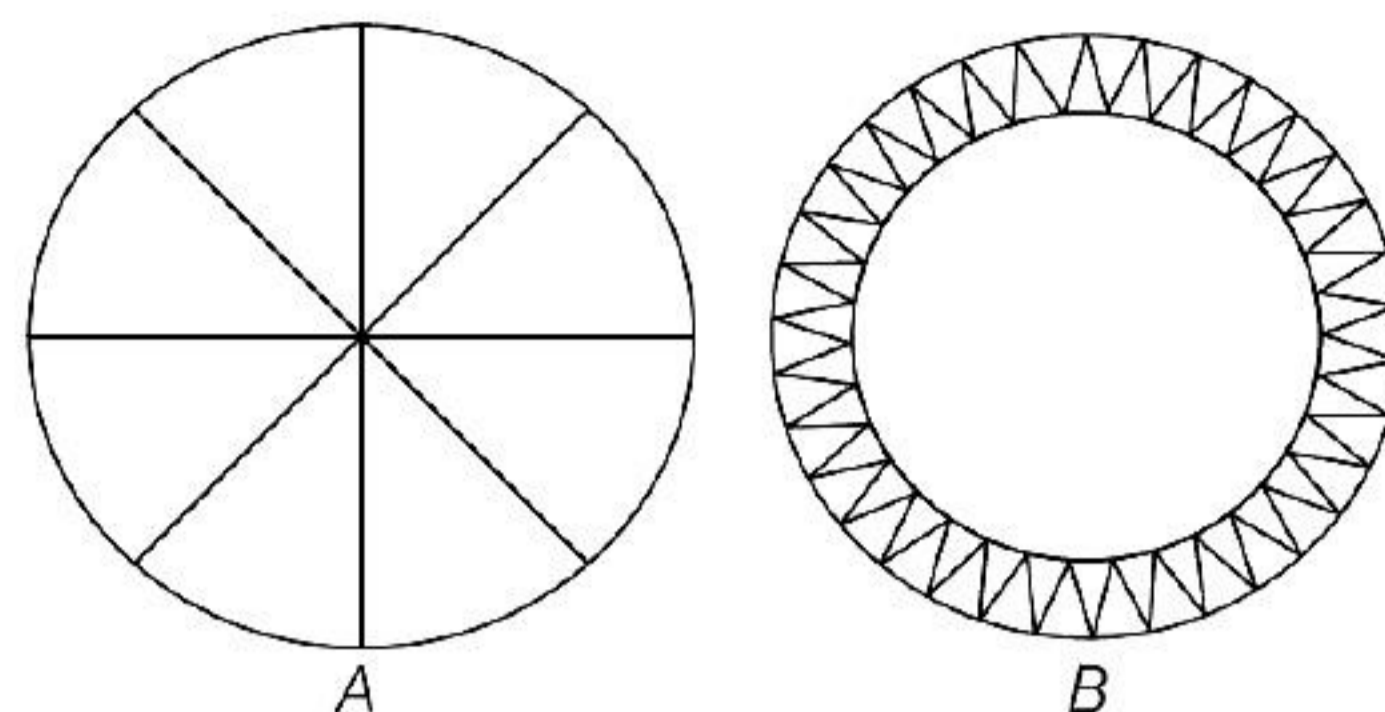
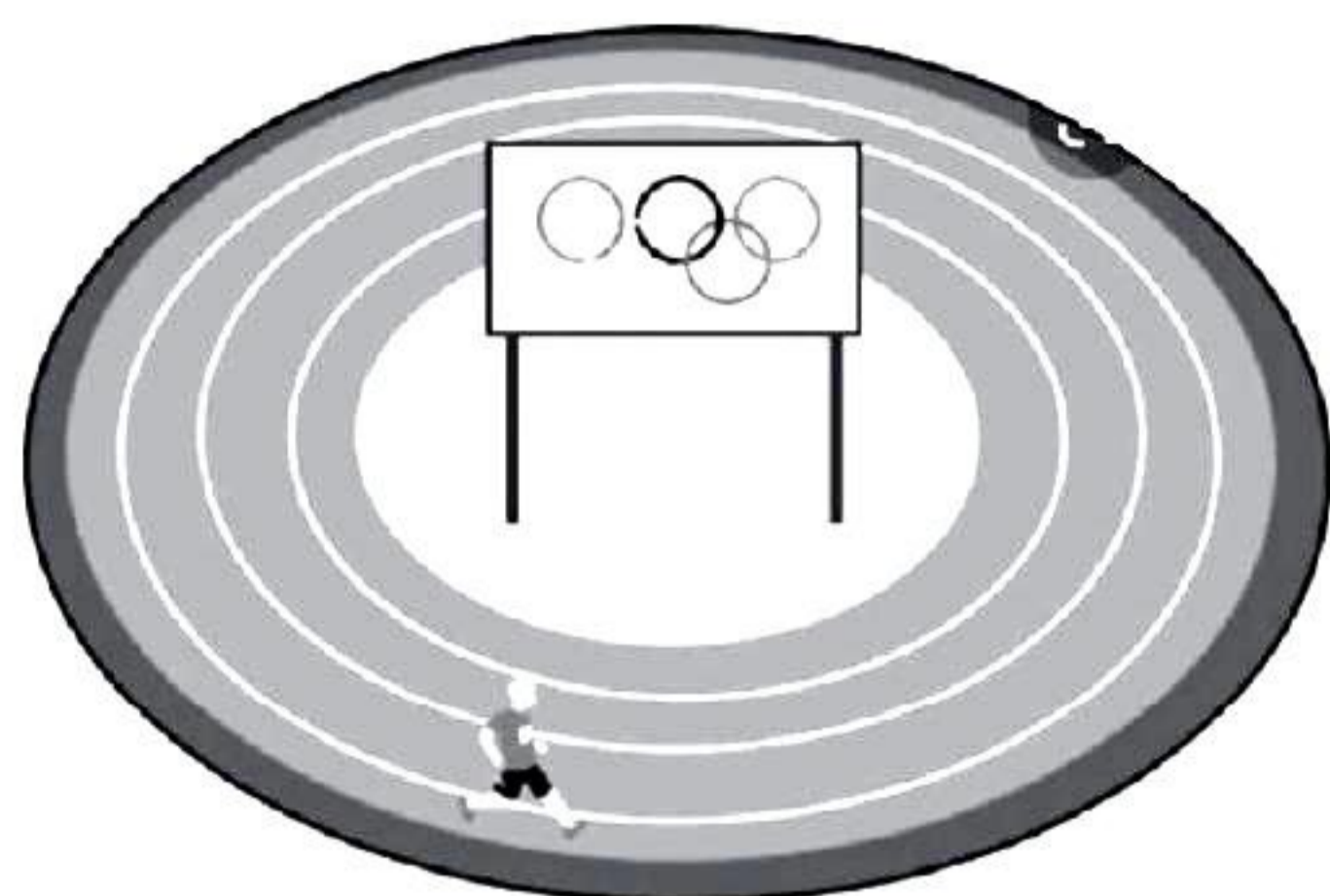
**Refer Design I**

- (i) The side of equilateral triangle is
  - (a)  $12\sqrt{3} \text{ cm}$
  - (b)  $32\sqrt{3} \text{ cm}$
  - (c) 48 cm
  - (d) 64 cm
- (ii) The altitude of the equilateral triangle is
  - (a) 8 cm
  - (b) 12 cm
  - (c) 48 cm
  - (d) 52 cm

**Refer Design II**

- (iii) The area of square is
  - (a)  $1264 \text{ cm}^2$
  - (b)  $1764 \text{ cm}^2$
  - (c)  $1830 \text{ cm}^2$
  - (d)  $1944 \text{ cm}^2$
- (iv) Area of each circular design is
  - (a)  $124 \text{ cm}^2$
  - (b)  $132 \text{ cm}^2$
  - (c)  $144 \text{ cm}^2$
  - (d)  $154 \text{ cm}^2$
- (v) Area of the remaining portion of the square  $ABCD$  is
  - (a)  $378 \text{ cm}^2$
  - (b)  $260 \text{ cm}^2$
  - (c)  $340 \text{ cm}^2$
  - (d)  $278 \text{ cm}^2$

**63.** There is a race competition between all participants of a sports club, so that the sports committee can choose better person for a marathon. The race track in the club is in the form of a ring whose inner most circumference 176 m and the outer most circumference is 352 m.



Based on the above information, answer the following questions.

- (i) Find the radius of the outer most circle.
- (a) 48 m                      (b) 49 m  
(c) 50 m                      (d) 56 m
- (ii) Find the radius of the inner most circle.
- (a) 28 m  
(b) 40 m  
(c) 42 m  
(d) 44 m
- (iii) Find the width of the track.
- (a) 17 m  
(b) 28 m  
(c) 19 m  
(d) 10 m
- (iv) Find the area of the race track.
- (a)  $7010\text{ m}^2$   
(b)  $7392\text{ m}^2$   
(c)  $8000\text{ m}^2$   
(d)  $9002\text{ m}^2$
- (v) If the cost of painting on the race track is ₹5 per  $\text{m}^2$ , find the total cost for painting the whole race track.
- (a) ₹36960  
(b) ₹36430  
(c) ₹3580  
(d) None of the above

**64.** A brooch is a small piece of jewellery which has a pin at the back so it can be fastened on a dress, blouse or coat. Designs of some brooch are shown below. Observe them carefully.

**Design A** Brooch A is made with silver wire in the form of a circle with diameter 28 mm. The wire used for making 4 diameters which divide the circle into 8 equal parts.

**Design B** Brooch b is made two colours\_ Gold and silver. Outer part is made with Gold. The circumference of silver part is 44 mm and the gold part is 3mm wide everywhere.

[CBSE Question Bank]

**Refer to Design A**

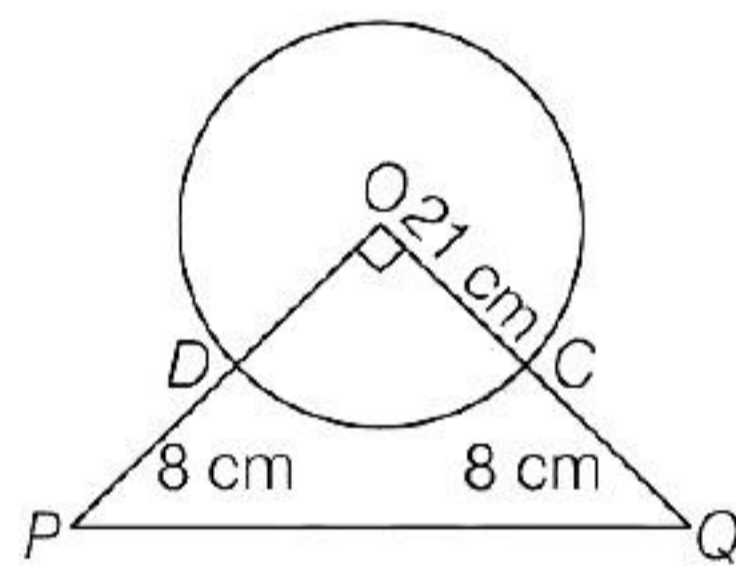
- (i) The total length of silver wire required is
- (a) 180 mm                      (b) 200 mm  
(c) 250 mm                      (d) 280 mm
- (ii) The area of each sector of the brooch is
- (a)  $44\text{ mm}^2$                       (b)  $52\text{ mm}^2$   
(c)  $77\text{ mm}^2$                       (d)  $68\text{ mm}^2$

**Refer to Design B**

- (iii) The circumference of outer part (golden) is
- (a) 48.49 mm                      (b) 82.2 mm  
(c) 72.50 mm                      (d) 62.86 mm
- (iv) The difference of areas of golden and silver parts is
- (a)  $18\pi\text{ mm}^2$                       (b)  $44\pi\text{ mm}^2$   
(c)  $51\pi\text{ mm}^2$                       (d)  $64\pi\text{ mm}^2$

- (v) A boy is playing with brooch B. He makes revolution with it along its edge. How many complete revolutions must it take to cover  $80\pi$  mm ?  
 (a) 2 (b) 3  
 (c) 4 (d) 5

65. Committee of a club select a round glass trophy for awarding best director in film festival. Design of each trophy is made as shown in the figure, where its base PQRS is golden plated from the front side and painted at the rate of ₹5 per  $\text{cm}^2$ .



- (i) Find the area of sector OSRO.  
 (a)  $254\text{ cm}^2$  (b)  $348\text{ cm}^2$   
 (c)  $344.5\text{ cm}^2$  (d)  $346.5\text{ cm}^2$
- (ii) Find the area of  $\Delta POQ$ .  
 (a)  $210\text{ cm}^2$  (b)  $420.5\text{ cm}^2$   
 (c)  $418.2\text{ cm}^2$  (d)  $300\text{ cm}^2$
- (iii) Find the total cost of golden plating.  
 (a) ₹276 (b) ₹280  
 (c) ₹284 (d) ₹370
- (iv) Find the area of major sector formed in the given figure.  
 (a)  $1400\text{ cm}^2$  (b)  $1039.5\text{ cm}^2$   
 (c)  $1462\text{ cm}^2$  (d)  $1472\text{ cm}^2$
- (v) Find the length of arc SR.  
 (a) 16 cm (b) 18 cm  
 (c) 20 cm (d) 33 cm

66. Heena hold a Japanese fan in her hand as shown in the figure. It is shaped like a sector of a circle and made of a thin material such as paper or feather. The inner and outer radii are 6 cm and 10 cm respectively. The fan has three colours i.e. Pink, Blue and Black.



Based on the above information, answer the following questions.

- (i) If the region containing blue colour makes an angle of  $80^\circ$  at the centre, then find the area of the region having blue colour.  
 (a)  $49.17\text{ cm}^2$  (b)  $44.69\text{ cm}^2$   
 (c)  $41.17\text{ cm}^2$  (d)  $43.17\text{ cm}^2$
- (ii) If the region containing black colour makes an angle of  $40^\circ$  at the centre, then find the area of the region having green colour.  
 (a)  $22.34\text{ cm}^2$  (b)  $18.38\text{ cm}^2$   
 (c)  $19.9\text{ cm}^2$  (d)  $21.12\text{ cm}^2$
- (iii) If the region containing pink colour makes an angle of  $30^\circ$  at the centre, then find the perimeter of the region containing pink colour.  
 (a) 12.9 cm (b) 14.2 cm  
 (c) 15.4 cm (d) 16.38 cm
- (iv) Find the area of the region having radius 6 cm.  
 (a)  $42.57\text{ cm}^2$  (b)  $47.14\text{ cm}^2$   
 (c)  $42\text{ cm}^2$  (d)  $26.57\text{ cm}^2$
- (v) The region given in the figure represents.  
 (a) minor sector (b) major sector  
 (c) minor segment (d) major segment

## ANSWERS

### Multiple Choice Questions

1. (a)    2. (b)    3. (d)    4. (a)    5. (b)    6. (a)    7. (d)    8. (a)    9. (d)    10. (a)  
 11. (a)    12. (b)    13. (a)    14. (b)    15. (b)    16. (b)    17. (a)    18. (b)    19. (c)    20. (c)  
 21. (a)    22. (d)    23. (c)    24. (c)    25. (b)    26. (b)    27. (a)    28. (c)    29. (b)    30. (a)  
 31. (a)    32. (c)    33. (c)    34. (b)    35. (d)    36. (a)    37. (d)    38. (d)    39. (a)    40. (c)  
 41. (a)    42. (c)    43. (b)    44. (b)    45. (b)    46. (c)    47. (a)    48. (b)    49. (b)    50. (d)

### Assertion and Reason

51. (a)    52. (d)    53. (a)    54. (a)    55. (b)    56. (a)    57. (c)    58. (d)    59. (d)    60. (d)

### Case Based

61. (i) - (c); (ii) - (d); (iii) - (d); (iv) - (c); (v) - (c)    62. (i) - (b); (ii) - (c); (iii) - (b); (iv) - (d); (v) - (a)  
 63. (i) - (d); (ii) - (a); (iii) - (b); (iv) - (b); (v) - (a)    64. (i) - (b); (ii) - (c); (iii) - (d); (iv) - (c); (v) - (c)  
 65. (i) - (d); (ii) - (b); (iii) - (d); (iv) - (b); (v) - (d)    66. (i) - (b); (ii) - (a); (iii) - (d); (iv) - (b); (v) - (a)

## SOLUTIONS

1. According to the given condition,  
Circumference of circle

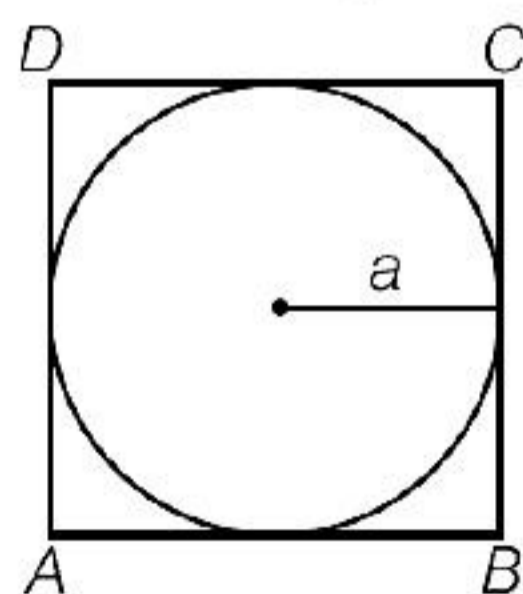
$$= \text{Circumference of first circle} \\ + \text{Circumference of second circle}$$

$$\therefore 2\pi R = 2\pi R_1 + 2\pi R_2 \\ \Rightarrow R = R_1 + R_2$$

2. The distance covered in one revolution is  $2\pi r$  [its circumference]

$$\therefore \text{Number of revolution} \\ = \frac{\text{Total distance travelled}}{\text{Circumference}} \\ = \frac{s}{2\pi r}$$

3. Because the distance travelled by the wheel in one revolution is equal to its circumference i.e.  $\pi d$ .  
 4. Given, radius of circle,  $r = a$  cm



$$\therefore \text{Diameter of circle, } d = 2 \times \text{Radius} = 2a \text{ cm}$$

$$\therefore \text{Side of a square} = \text{Diameter of circle} \\ = 2a \text{ cm}$$

$$\therefore \text{Perimeter of a square} = 4 \times (\text{Side}) = 4 \times 2a \\ = 8a \text{ cm}$$

5. Let  $r$  cm be the radius of the required circle.  
According to the question, we have  
Circumference of the required circle having radius  $r$  cm

$$= \text{Circumference of the circle having} \\ \text{radius } 13 \text{ cm} \\ + \text{Circumference of the circle} \\ \text{having radius } 6 \text{ cm}$$

$$\therefore 2\pi r = 2\pi(13) + 2\pi(6) \\ [\because \text{circumference of circle} = 2\pi r] \\ \Rightarrow 2\pi r = 2\pi(13 + 6) \\ \Rightarrow r = 19 \text{ cm}$$

Hence, the radius of the required circle is 19 cm.

6. Given, circumference of a circle  
= Diameter of a circle + 25.8  
 $\Rightarrow 2\pi r = 2r + 25.8$   
 $\Rightarrow 2r(\pi - 1) = 25.8 \Rightarrow (\pi - 1)r = 12.9$   
 $\Rightarrow r = 12.9 \times \frac{7}{15} \Rightarrow r = 6.02 \text{ cm}$

7. Given, perimeter of a protractor = 72 cm  
 $\therefore \pi r + 2r = 72$  [ $\because$  perimeter of a protractor = perimeter of semi-circle]  
 where,  $r$  is the radius of circle.

$$\Rightarrow r \left( \frac{22}{7} + 2 \right) = 72 \Rightarrow r \times \frac{36}{7} = 72$$

$$\Rightarrow r = 2 \times 7 \Rightarrow r = 14 \text{ cm}$$

$$\therefore \text{Area of protractor} = \frac{\pi r^2}{2} = \frac{22}{7} \times \frac{(14)^2}{2} = 308 \text{ cm}^2$$

- 8.** In 1 day, i.e. 24 h, short (hour) hand of the clock make 2 revolutions and long (minute) hand make 24 revolutions.

In 1 revolution, distance travelled by tip of hour hand = Circumference of circle of

$$\text{radius } 6 \text{ cm} = 2 \times \frac{22}{7} \times 6$$

In 1 revolution distance travelled by tip of minute hand = Circumference of circle of

$$\text{radius } 8 \text{ cm} = 2 \times \frac{22}{7} \times 8$$

$\therefore$  Sum of distances travelled by tips of both hand in 1 day

$$\begin{aligned} &= 2 \times 2 \times \frac{22}{7} \times 6 + 24 \times 2 \times \frac{22}{7} \times 8 \\ &= 2 \times \frac{22}{7} (12 + 192) = 2 \times \frac{22}{7} \times 204 \\ &= 1282.29 \text{ cm (approx).} \end{aligned}$$

- 9.** In 1 h, distance covered by wheel = 33 km

In 1 min, distance covered by wheel

$$= \frac{33 \times 1000}{60} \text{ m} = 550 \text{ m}$$

Now, number of revolutions made in 1 min

$$\begin{aligned} &= \frac{\text{Distance covered by wheel}}{\text{Circumference of the wheel}} \\ &= \frac{550}{2 \times \frac{22}{7} \times \frac{25}{100}} \left[ \because 25 \text{ cm} = \frac{25}{100} \text{ m} \right] \\ &= \frac{550 \times 7 \times 100}{2 \times 22 \times 25} = 350 \end{aligned}$$

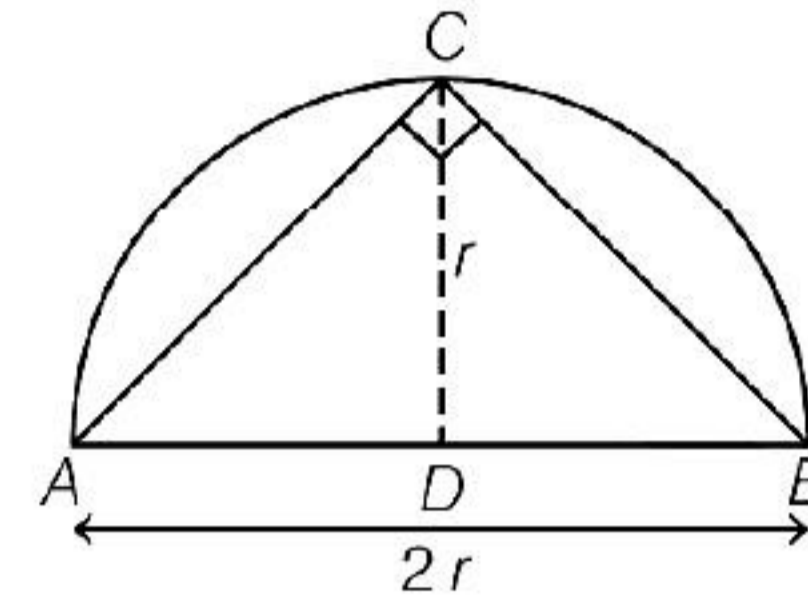
- 10.** If areas of two circles are equal, then their corresponding radii are equal. So, their circumference will be equal.

- 11.** If circumference of two circles are equal, then their corresponding radii are equal. So, their areas will be equal.

- 12.** If  $0 < r < 2$ , then numerical value of circumference is greater than numerical value of area of circle and if  $r > 2$ , area is greater than circumference.

- 13.** Take a point  $C$  on the circumference of the semi-circle and join it by the end points of diameter  $A$  and  $B$ .

$$\therefore \angle C = 90^\circ \quad \begin{array}{l} \text{[by property of circle]} \\ \text{[angle in a semi-circle are right angle]} \end{array}$$



So,  $\triangle ABC$  is right angled triangle.

$$\begin{aligned} \therefore \text{Area of largest } \triangle ABC &= \frac{1}{2} \times AB \times CD \\ &= \frac{1}{2} \times 2r \times r \\ &= r^2 \text{ sq units} \end{aligned}$$

- 14.** Let radius of circle be  $r$  and side of a square be  $a$ .

According to the given condition,

Perimeter of a circle = Perimeter of a square

$$\therefore 2\pi r = 4a \Rightarrow a = \frac{\pi r}{2} \quad \dots(i)$$

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

[from Eq. (i)]

$$= \frac{\pi r^2}{\pi^2 r^2 / 4} = \frac{4}{\pi} = \frac{4}{22/7} = \frac{28}{22} = \frac{14}{11}$$

- 15.** Given, area of circle =  $2464 \text{ cm}^2$

$$\pi r^2 = 2464 \Rightarrow r^2 = \frac{2464 \times 7}{22}$$

$$\Rightarrow r^2 = 784 \Rightarrow r = 28 \quad \text{[taking square root]}$$

$\therefore$  Diameter of a circle =  $2r = 2 \times 28 = 56 \text{ cm}$

- 16.** Let the radius of the field be  $r$ .

$$\text{Then, } \frac{1}{2} \pi r^2 = 30800 \Rightarrow \frac{1}{2} \times \frac{22}{7} \times r^2 = 30800$$

$$\Rightarrow r^2 = 30800 \times 2 \times \frac{7}{22} = 19600 \Rightarrow r = 140 \text{ m}$$

[taking positive square root]

Thus, perimeter of the field =  $\pi r + 2r$

$$\begin{aligned} &= \frac{22}{7} \times 140 + 2 \times 140 \\ &= 440 + 280 = 720 \text{ m} \end{aligned}$$

17. Length of the fence of a circular field

$$\begin{aligned} &= \frac{\text{Total cost}}{\text{Rate}} = \frac{11880}{36} \\ &= 330 \text{ m} \end{aligned}$$

So, the circumference of the field is 330 m.

Let  $r$  be the radius of the field, then

$$\begin{aligned} \therefore 2\pi r &= 330 \\ [\because \text{circumference of circular field} &= 2\pi r] \\ \Rightarrow 2 \times \frac{22}{7} \times r &= 330 \\ \Rightarrow r &= \frac{330 \times 7}{2 \times 22} = 52.5 \text{ m} \end{aligned}$$

So, the radius of the field is 52.5 m.

Now, area of the field =  $\pi r^2$

$$\begin{aligned} &= \frac{22}{7} \times 52.5 \times 52.5 \\ &= 22 \times 7.5 \times 52.5 \text{ m}^2 \end{aligned}$$

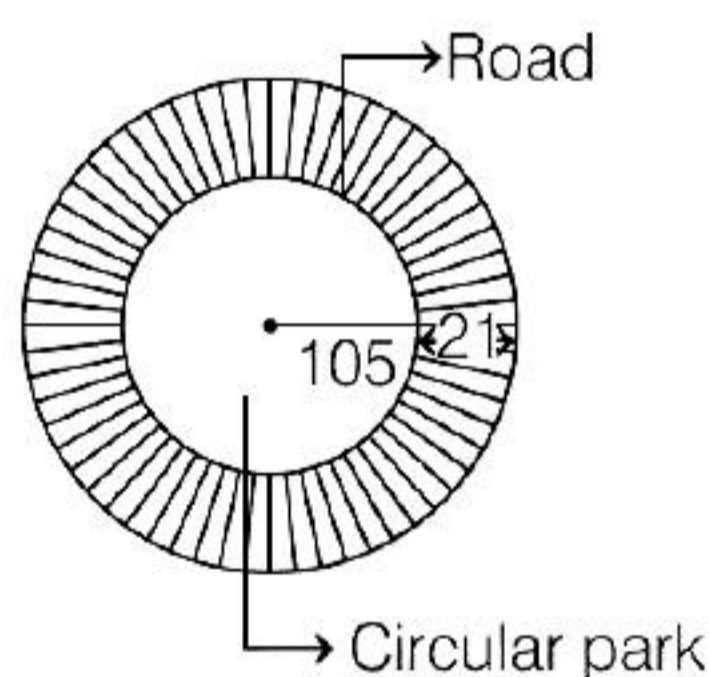
Given, cost of ploughing 1 m<sup>2</sup> of the field

$$= ₹ 0.60$$

So, total cost of ploughing the field

$$= 0.6 \times 22 \times 7.5 \times 52.5 = ₹ 5197.5$$

18. Given that, a circular park is surrounded by a road.



Width of the road = 21 m

Radius of the park ( $r_i$ ) = 105 m

$\therefore$  Radius of whole circular portion (park + road),

$$r_e = 105 + 21 = 126 \text{ m}$$

Now, area of road

$$\begin{aligned} &= \text{Area of whole circular portion} \\ &\quad - \text{Area of circular park} \\ &= \pi r_e^2 - \pi r_i^2 \quad [\because \text{area of circle} = \pi r^2] \\ &= \pi (r_e^2 - r_i^2) \\ &= \pi \{(126^2 - (105)^2)\} \\ &= \frac{22}{7} \times (126 + 105)(126 - 105) \end{aligned}$$

$$\begin{aligned} &= \frac{22}{7} \times 231 \times 21 \\ &\quad [\because (a^2 - b^2) = (a - b)(a + b)] \\ &= 66 \times 231 = 15246 \text{ cm}^2 \end{aligned}$$

Hence, the required area of the road is 15246 cm<sup>2</sup>.

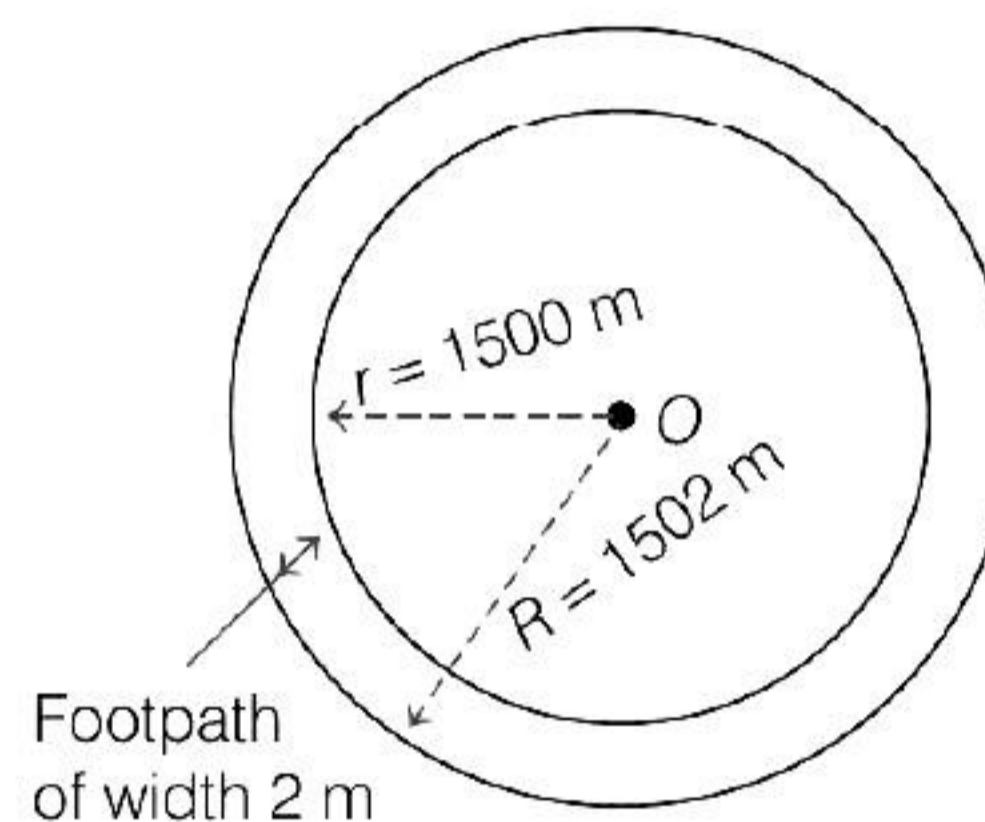
19. Radius of the park, i.e. inner radius of the park,  $r = 1500$  m

Width of the footpath around the park

$$= 2 \text{ m}$$

Let  $R$  be the outer radius of the park including the footpath.

$$\text{Then, } R = (1500 + 2) \text{ m} = 1502 \text{ m}$$



Now, area of the footpath

$$\begin{aligned} &= \pi R^2 - \pi r^2 \\ &= \pi \{R^2 - r^2\} \\ &= 314 \{(1502)^2 - (1500)^2\} \\ &= 314 \{(1502 + 1500)(1502 - 1500)\} \\ &= 314 \times 6004 = 18852.56 \text{ m}^2 \end{aligned}$$

$\therefore$  Total cost of construction of the footpath at the rate of ₹ 20 per m<sup>2</sup>

$$\begin{aligned} &= 20 \times 18852.56 \\ &= ₹ 377051.2 \end{aligned}$$

20. It is true only in the case of minor segment. But in case of major segment area is always greater than the area of sector.

21. It is true for arcs of the same circle. But in different circle, it is not possible.

22. Given, sector angle =  $p$  and radius of circle =  $R$

$$\begin{aligned} \therefore \text{Area of sector} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{p}{360^\circ} \times \pi R^2 \\ &= \frac{p}{720^\circ} \times 2\pi R^2 \end{aligned}$$

**23.** Area of the sector with central angle  $\theta$

and radius  $r$  is  $\frac{\theta}{360^\circ} \times \pi r^2$

Here, radius is  $4r$  and angle  $x^\circ$ .

$$\begin{aligned} \therefore \text{Area of sector} &= \frac{x^\circ}{360^\circ} \times \pi(4r)^2 \\ &= \frac{16\pi x r^2}{360^\circ} \\ &= \frac{2\pi x r^2}{45^\circ} \end{aligned}$$

**24.** We know that, area of sector of a circle

$$= \frac{\theta}{360^\circ} \times \pi r^2$$

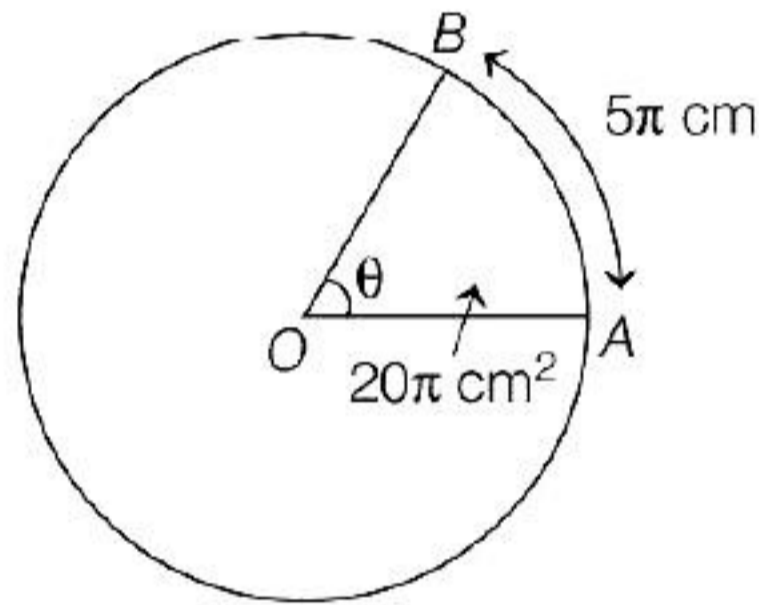
Given, radius of circle,  $r = 6$  cm

and angle of sector,  $\theta = 60^\circ$

$\therefore$  Area of sector of a circle

$$= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times (6)^2 = \frac{132}{7} \text{ cm}^2$$

**25.** Let the radius of the circle be  $r$  cm and the arc  $AB$  of length  $5\pi$  cm subtends angle  $\theta$  at the centre  $O$  of the circle.



Then, arc  $AB = 5\pi$  cm and area of the sector

$$OAB = 20\pi \text{ cm}^2$$

$$\Rightarrow \frac{\theta}{360^\circ} \times 2\pi r = 5\pi$$

and  $\frac{\theta}{360^\circ} \times \pi r^2 = 20\pi$

$$\Rightarrow \frac{\frac{\theta}{360^\circ} \times \pi r^2}{\frac{\theta}{360^\circ} \times 2\pi r} = \frac{20\pi}{5\pi}$$

$$\Rightarrow \frac{r}{2} = 4 \Rightarrow r = 8 \text{ cm}$$

**26.** The minute hand of a clock describes a circle of radius equal to its length, i.e. 14 cm in 1 h. So, the angle described by minute hand in 60 min =  $360^\circ$ .

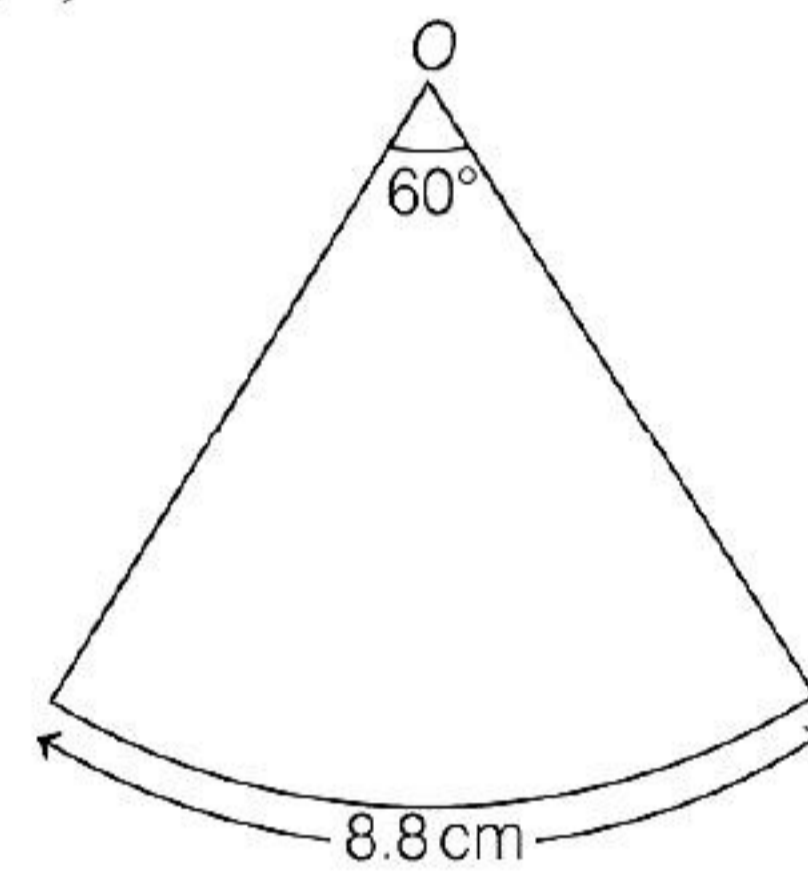
$\therefore$  Angle described by minute hand in

$$1 \text{ min} = \frac{360^\circ}{60} = 6^\circ$$

So, the area swept by the minute hand in 1 min is the area of a sector of angle  $6^\circ$  in a circle of radius 14 cm.

$$\begin{aligned} \therefore \text{Required area} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{6^\circ}{360^\circ} \times \frac{22}{7} \times (14)^2 \\ &= \frac{1}{60} \times \frac{22}{7} \times 14 \times 14 = 10.27 \text{ cm}^2 \end{aligned}$$

**27.** As per question, length of an arc of a sector of angle,



$$\theta = 60^\circ$$

$$l = \frac{\theta}{360^\circ} \times 2\pi r$$

$$\Rightarrow 8.8 = \frac{60}{360^\circ} \times 2 \times \frac{22}{7} \times r$$

$$\Rightarrow 8.8 = \frac{1}{3} \times \frac{22}{7} \times r \Rightarrow r = \frac{8.8 \times 21}{22}$$

$$\therefore r = 8.40 \text{ cm}$$

**28.** Given, central angle ( $\theta$ ) =  $60^\circ$

$$\text{Area of sector} = \frac{60^\circ}{360^\circ} \times \pi r^2$$

For both the area we have to multiply by 2.

$$\text{Then, area} = 2 \times \frac{60^\circ}{360^\circ} \times \pi r^2 = \frac{1}{3} \pi r^2 \text{ cm}^2$$

**29.** Given, umbrella to be a flat circle.

So, the central angle of an umbrella is  $360^\circ$ .

Since, umbrella has 8 ribs.

$$\therefore \text{Angle between two ribs} = \frac{360^\circ}{8} = 45^\circ$$

Area between two ribs

$$= \text{Area of one sector of the umbrella}$$

$$= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{45^\circ}{360^\circ} \times \frac{22}{7} \times (45)^2$$

[ $\because r = 45$ , given]

$$= \frac{22}{7 \times 8} \times 45 \times 45 = \frac{22275}{28} \text{ cm}^2$$



30. Given, sector angle,

$$\theta = 80^\circ$$

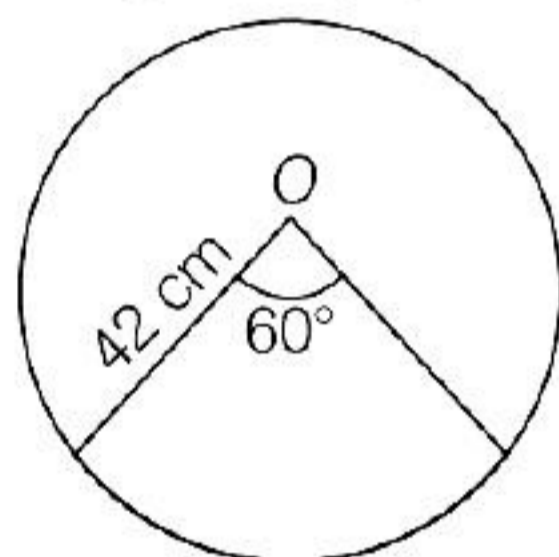
and distance or radius,

$$r = 16.5 \text{ km}$$

$$\begin{aligned} \therefore \text{Area of sector} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{80^\circ}{360^\circ} \times 314 \times (16.5)^2 \\ &= \frac{2 \times 314 \times 272.25}{9} \\ &= \frac{1709.73}{9} = 189.97 \text{ km}^2 \end{aligned}$$

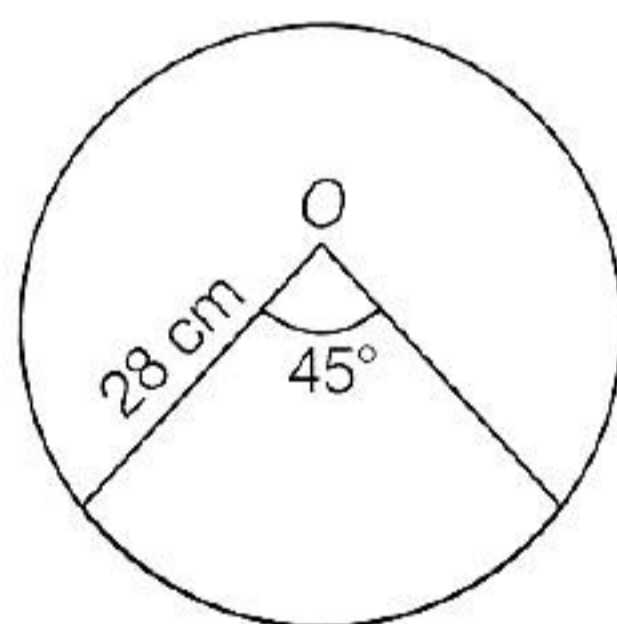
which is the required area of the sea over which the ships are warned.

31. Given,  $r = 42 \text{ cm}$  and  $\theta = 60^\circ$



$$\begin{aligned} \therefore \text{Arc length} &= \frac{\theta}{360^\circ} \times 2\pi r \\ &= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 42 \\ &= \frac{1}{6} \times 2 \times 22 \times 6 = 44 \text{ cm} \end{aligned}$$

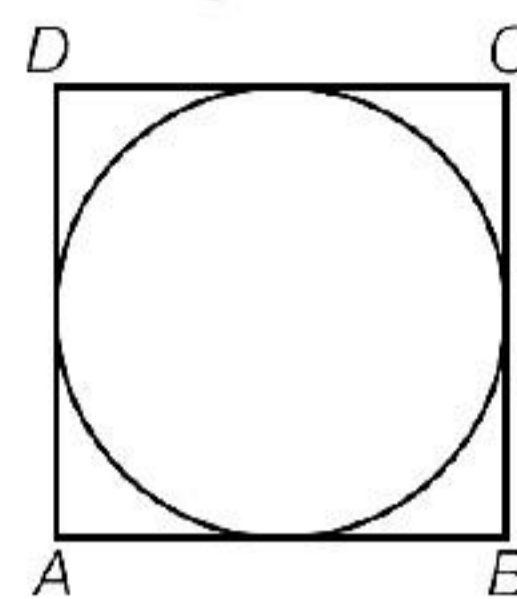
32. Given,  $r = 28 \text{ cm}$  and  $\theta = 45^\circ$



$$\begin{aligned} \therefore \text{Arc length} &= \frac{\theta}{360^\circ} \times 2\pi r \\ &= \frac{45^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 28 \\ &= \frac{1}{8} \times 2 \times 22 \times 4 = 22 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Now, area of sector} &= \frac{1}{2} \times l \times r \\ &\quad [\text{where, } l = \text{arc length}] \\ &= \frac{1}{2} \times 22 \times 28 \\ &= 22 \times 14 = 308 \text{ cm}^2 \end{aligned}$$

33. Let  $ABCD$  be a square of side  $a$ .



$$\therefore \text{Diameter of circle} = \text{Side of square} = a$$

$$\therefore \text{Radius of circle} = \frac{a}{2}$$

$$\therefore \text{Area of circle} = \pi (\text{Radius})^2$$

$$= \pi \left(\frac{a}{2}\right)^2 = \frac{\pi a^2}{4}$$

$$\text{Hence, area of the circle is } \frac{\pi a^2}{4} \text{ cm}^2$$

34. Let the side of a square be  $a$  and the radius of circle be  $r$ .

$$\begin{aligned} \text{Given that, length of diagonal of square} \\ &= 8 \text{ cm} \end{aligned}$$

$$\Rightarrow a\sqrt{2} = 8$$

$$\Rightarrow a = 4\sqrt{2} \text{ cm}$$

Now, Diagonal of a square

$$= \text{Diameter of a circle}$$

$$\Rightarrow \text{Diameter of circle} = 8$$

$$\Rightarrow \text{Radius of circle } = r = \frac{\text{Diameter}}{2}$$

$$\Rightarrow r = \frac{8}{2} = 4 \text{ cm}$$

$$\therefore \text{Area of circle} = \pi r^2 = \pi(4)^2 = 16\pi \text{ cm}^2$$

$$\text{and Area of square} = a^2 = (4\sqrt{2})^2 = 32 \text{ cm}^2$$

So, the area of the shaded region

$$= \text{Area of circle} - \text{Area of square}$$

$$= (16\pi - 32) \text{ cm}^2$$

Hence, the required area of the shaded region is  $(16\pi - 32) \text{ cm}^2$ .

35.  $\therefore$  Area of square = (Side)<sup>2</sup>

$$\begin{aligned} \therefore \text{Area of square } ABCD &= 12 \times 12 \\ &= 144 \text{ cm}^2 \end{aligned}$$

$$\therefore \text{Diameter of each circle} = \frac{12}{2} = 6 \text{ cm}$$

[here, length = 12 cm]

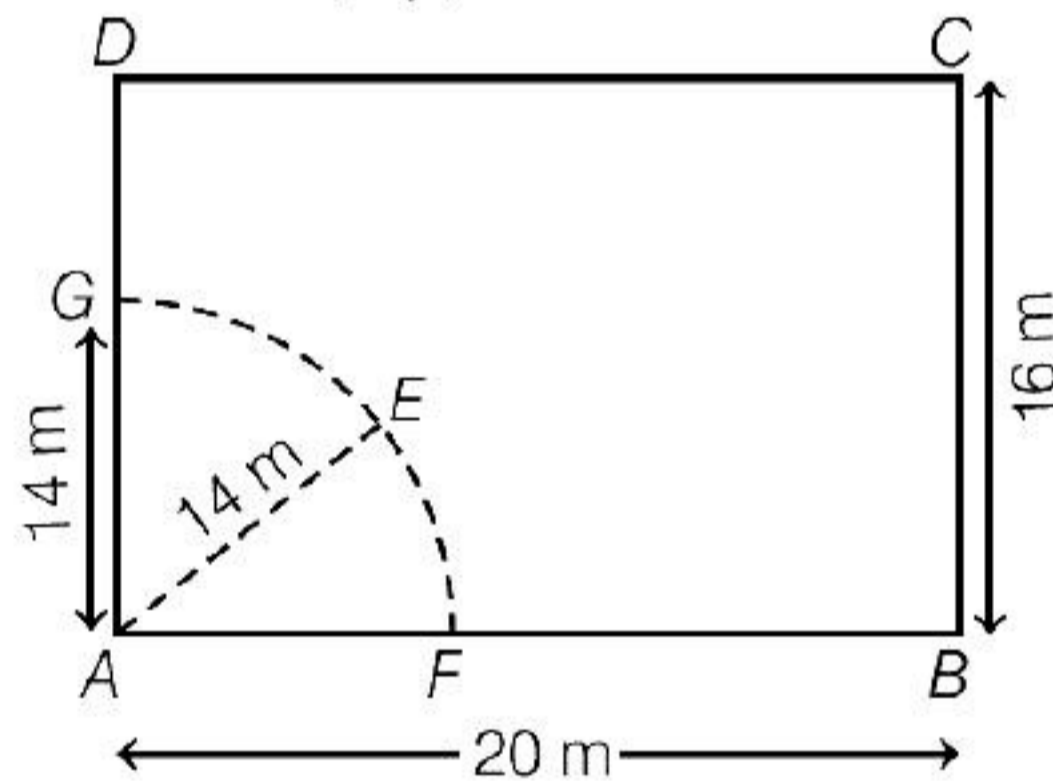
$$\therefore \text{Radius of each circle } (r) = \frac{6}{2} = 3 \text{ cm}$$

$$\begin{aligned} \text{Area of one circle} &= \pi r^2 \\ &= \frac{22}{7} \times 3 \times 3 = \frac{198}{7} \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Therefore, area of four circles} &= 4 \times \frac{198}{7} \\ &= \frac{792}{7} \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Hence, area of the shaded region} &= \text{Area of square} \\ &\quad - \text{Area of four circles} \\ &= 144 - \frac{792}{7} = \frac{1008 - 792}{7} \\ &= \frac{216}{7} = 30.86 \text{ cm}^2 \end{aligned}$$

- 36.** Let  $ABCD$  be a rectangular field of dimensions  $20 \text{ m} \times 16 \text{ m}$ . Suppose, a cow is tied at a point  $A$ . Let length of rope be  $AE = 14 \text{ m} = r$  (say).



$$\begin{aligned} \therefore \text{Area of the field in which the cow graze} &= \text{Area of sector } AFEAG \\ &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{90^\circ}{360^\circ} \times \pi \times (14)^2 \\ \text{[so, the angle between two adjacent sides of a rectangle is } 90^\circ\text{]} \\ &= \frac{1}{4} \times \frac{22}{7} \times 196 = 154 \text{ m}^2 \end{aligned}$$

- 37.** Given diameter of a circle is  $d$ .  
 $\therefore$  Diagonal of a inner square = Diameter of a circle =  $d$

Let side of a inner square  $EFGH$  be  $x$ .  
 In right angled  $\triangle EFG$ ,  
 $EG^2 = EF^2 + FG^2$   
 [by Pythagoras theorem]  
 $\Rightarrow d^2 = x^2 + x^2$   
 $\Rightarrow d^2 = 2x^2 \Rightarrow x^2 = \frac{d^2}{2}$

$\therefore$  Area of a inner square

$$EFGH = (\text{Side})^2 = x^2 = \frac{d^2}{2}$$

But side of a outer square  $ABCD$   
 = Diameter of a circle =  $d$

$\therefore$  Area of outer square =  $d^2$

$$\text{Ratio} = \frac{\text{Area of inner square}}{\text{Area of outer square}} = \frac{d^2}{2 \times d^2} = 1 : 2$$

- 38.** Given, side of square =  $14 \text{ cm}$   
 Also,  $APD$  and  $BPC$  are semi-circles, therefore  
 Their radius,  $r = \frac{14}{2} = 7 \text{ cm}$ .

$$\begin{aligned} \text{Now, area of semi-circle } APD &= \text{Area of semi-circle } BPC = \frac{\pi r^2}{2} \\ &= \frac{22}{7 \times 2} \times (7)^2 = 77 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{and area of square } ABCD &= (\text{Side})^2 = (14)^2 \\ &= 196 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Hence, area of shaded region} &= \text{Area of square} - (\text{Area of semi-circle } APD \\ &\quad + \text{Area of semi-circle } BPC) \\ &= 196 - (77 + 77) = 42 \text{ cm}^2 \end{aligned}$$

- 39.** Let the four unshaded regions be denoted by I, II, III and IV as shown in the figure.  
 Given, side of square =  $10 \text{ cm}$   
 Diameter of each semi-circle =  $10 \text{ cm}$   
 $\therefore$  Radius of each semi-circle =  $\frac{10}{2} = 5 \text{ cm}$

$$\begin{aligned} \text{Now, area of I region} + \text{area of III region} &= \text{Area of } ABCD \\ &\quad - \text{Area of two semi-circles} \\ &\quad \text{each of radius } 5 \text{ cm} \\ &= \left( 10 \times 10 - 2 \times \frac{1}{2} \pi \times 5^2 \right) \\ &= (100 - 3.14 \times 25) \\ &= (100 - 78.5) = 21.5 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Similarly, area of II region} &+ \text{area of IV region} = 21.5 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \therefore \text{Area of the shaded design} &= \text{Area of } ABCD \\ &\quad - \text{Area of (I + II + III + IV) region} \\ &= (100 - 2 \times 21.5) = (100 - 43) = 57 \text{ cm}^2 \end{aligned}$$

**40.** Given, side of square = 14 cm

i.e.  $AB = BC = CD = DA = 14$  cm

$$\begin{aligned} \therefore \text{Radius of circle} &= \frac{1}{2} (\text{Side of a square}) \\ &= \frac{14}{2} = 7 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Area of quadrant of one circle} &= \frac{\pi r^2}{4} \\ &= \frac{22}{7 \times 4} \times (7)^2 = \frac{154}{4} \text{ cm}^2 \end{aligned}$$

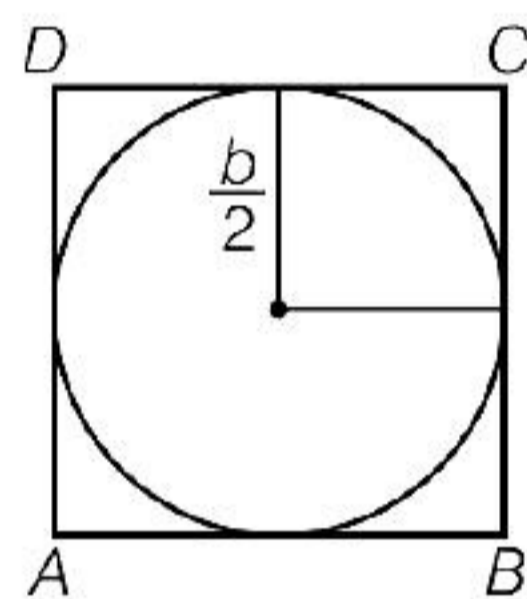
$$\begin{aligned} \therefore \text{Area of four quadrants of four circles} \\ &= 4 \left( \frac{154}{4} \right) = 154 \text{ cm}^2 \end{aligned}$$

$$\text{Now, area of square} = (\text{Side})^2 = (14)^2 = 196 \text{ cm}^2$$

Hence, area of shaded region

$$\begin{aligned} &= \text{Area of square} - \text{Area of four quadrants} \\ &= 196 - 154 = 42 \text{ cm}^2 \end{aligned}$$

**41.** Given,  $a > b$



$$\text{Radius of the circle, } r = \frac{b}{2} \text{ cm}$$

$$\therefore \text{Area of circle} = \pi \left( \frac{b}{2} \right)^2 = \frac{\pi b^2}{4} \text{ cm}^2$$

**42.** Area of shaded region

$$\begin{aligned} &= (\text{Area of sector having } r = 7 \text{ cm, } \theta = 30^\circ) \\ &\quad - (\text{Area of sector having } \\ &\quad \quad r = 3.5 = \frac{7}{2} \text{ cm, } \theta = 30^\circ) \\ &= \left[ \frac{22}{7} \times (7)^2 \times \frac{30^\circ}{360^\circ} \right] - \left[ \frac{22}{7} \times \left( \frac{7}{2} \right)^2 \times \frac{30^\circ}{360^\circ} \right] \\ &\quad \left[ \because \text{area of a sector} = \frac{\theta}{360^\circ} \times \pi r^2 \right] \\ &= \left( \frac{77}{6} - \frac{77}{24} \right) = \frac{308 - 77}{24} \\ &= \frac{231}{24} = \frac{77}{8} = 9.625 \text{ cm}^2 \end{aligned}$$

**43.** Given, radius of circle = 40 m and angle of sector =  $60^\circ$

Area of the sector

$$\begin{aligned} AOB &= \frac{60^\circ}{360^\circ} \times 3.14 \times (40)^2 \\ &= \frac{1}{6} \times 3.14 \times 1600 = \frac{2512}{3} \text{ m}^2 \end{aligned}$$

Amount spent for making the flower bed at the rate of ₹2.40 per  $\text{m}^2$

$$= ₹ 2.40 \times \frac{2512}{3} = ₹ 2009.60$$

Angles for the major sectors of both the circle at  $O$  is same, i.e.  $300^\circ$ .

Radius of inner circle =  $40 - 15 = 25$  m

Area of concrete track

$$= \left\{ \frac{300^\circ}{360^\circ} \times \pi \times (40)^2 - \frac{300^\circ}{360^\circ} \times \pi \times (25)^2 \right\}$$

[ $\because$  area of track = area of outer sector - area of inner sector]

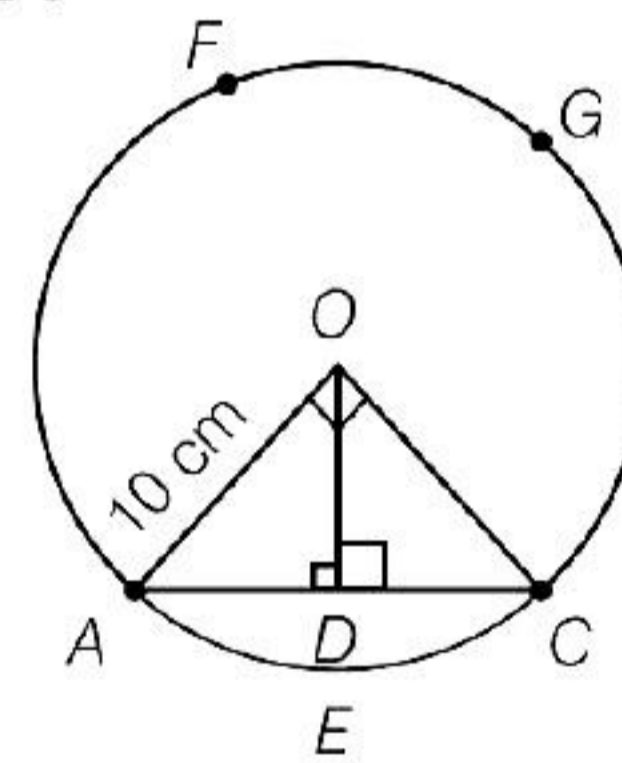
$$\begin{aligned} &= \frac{5}{6} \times \pi \times (1600 - 625) = \frac{5}{6} \times 3.14 \times 975 \\ &= 2551.25 \text{ m}^2 \end{aligned}$$

Amount spent for making the concrete track at the rate of ₹ 20 per  $\text{m}^2$

$$= 20 \times 2551.25 = ₹ 51025$$

Thus, the total amount spent for both the jobs = ₹ 2009.60 + ₹ 51025 = ₹ 53034.60

**44.** Given, radius of a circle,  $AO = 10$  cm and  $\angle AOC = 90^\circ$



$$\begin{aligned} \text{Area of } \triangle AOC &= \frac{1}{2} \times OA \times OC \\ &= \frac{1}{2} \times 10 \times 10 = 50 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of sector } OAECO &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{90^\circ}{360^\circ} \times 3.14 \times (10)^2 = \frac{314}{4} = 78.5 \text{ cm}^2 \end{aligned}$$

Area of minor segment  $AECDA$

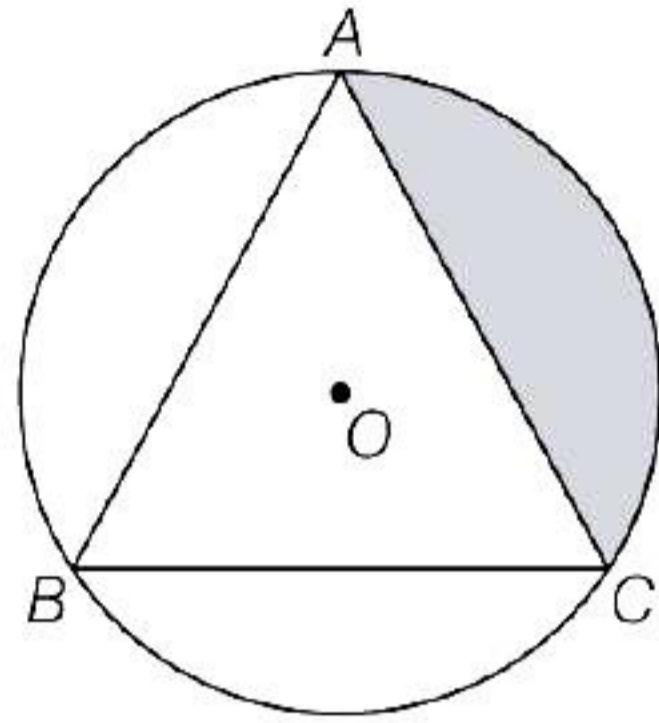
$$\begin{aligned} &= \text{Area of sector } OAECO - \text{Area of } \triangle AOC \\ &= 78.5 - 50 = 28.5 \text{ cm}^2 \end{aligned}$$

45. We have,  $R = 4$  cm

$$\therefore AB = BC = CA = R\sqrt{3} = 4\sqrt{3} \text{ cm}$$

$$\left[ \because R = \frac{2}{3}h \text{ and } h = \frac{\sqrt{3}}{2}a; \therefore R = \frac{a}{\sqrt{3}} \right]$$

$$\therefore \text{Required area} = \frac{1}{3} (\text{Area of the circle} - \text{Area of } \triangle ABC)$$



$$\begin{aligned} \therefore \text{Required area} &= \frac{1}{3} \left\{ \pi R^2 - \frac{\sqrt{3}}{4} \times (\text{Side})^2 \right\} \\ &= \frac{1}{3} \left\{ 16\pi - \frac{\sqrt{3}}{4} \times (4\sqrt{3})^2 \right\} \\ &= \frac{1}{3} (16\pi - 12\sqrt{3}) \\ &= \frac{4}{3} (4\pi - 3\sqrt{3}) \text{ cm}^2 \end{aligned}$$

46. From the figure, we have

$$AB = 7 + 3 = 10 \text{ cm}$$

$$AC = 7 + 3 = 10 \text{ cm}$$

$$\angle BAC = 90^\circ$$

Also, radius of circle =  $AP = AR = 7$  cm

$\therefore$  Area of right angled  $\triangle BAC$

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

$$= \frac{1}{2} \times 10 \times 10 = 50 \text{ cm}^2$$

Area of the sector

$$APR = \frac{90^\circ}{360^\circ} \times \pi r^2 = \frac{1}{4} \times \pi \times (7)^2$$

$$\left[ \because \text{area of sector} = \frac{\theta}{360^\circ} \times \pi r^2 \right]$$

$$= \frac{1}{4} \times \frac{22}{7} \times 49 = \frac{11 \times 7}{2} = 38.5 \text{ cm}^2$$

Then, area of base  $PBCR$  (shaded) which is to be silver plated

$$= \text{Area of the right angled } \triangle BAC$$

$$- \text{Area of the sector } APR$$

$$= 50 - 38.5 = 11.5 \text{ cm}^2$$

$\therefore$  Total cost of silver plating at the rate of ₹ 20 per  $\text{cm}^2$

$$= ₹ 20 \times 11.5 = ₹ 230$$

47. It is clear from the figure,  $BC$  is diameter of the circle

$$\therefore \angle BAC = 90^\circ$$

[ $\because$  angle in a semi-circle is a right angle]

Now, in right angle  $\triangle BAC$ ,

$$BC^2 = AB^2 + AC^2$$

[using Pythagoras theorem]

$$\therefore BC = \sqrt{(15)^2 + (20)^2}$$

[ $\because AC = 20$  cm,  $AB = 15$  cm]

$$\Rightarrow BC = \sqrt{625} \Rightarrow BC = 25 \text{ cm}$$

$$\therefore \text{Radius of the circle, } r = \frac{25}{2} \text{ cm}$$

Now, area of shaded region

$$= \text{Area of semi-circle} - \text{Area of } \triangle ABC$$

$$= \frac{\pi r^2}{2} - \frac{1}{2} \times AB \times AC$$

$$= \frac{1}{2} \times \frac{22}{7} \times \frac{25}{2} \times \frac{25}{2} - \frac{1}{2} \times 20 \times 15$$

$$= \frac{6875}{28} - 150 = 245.54 - 150 = 95.54 \text{ cm}^2$$

48. Area of quadrant  $OACBO = \frac{1}{4} \pi r^2$

$$= \frac{1}{4} \times \frac{22}{7} \times (4.5)^2 = 15.91 \text{ cm}^2$$

and area of  $\triangle BOD = \frac{1}{2} \times BO \times OD$

$$= \frac{1}{2} \times 4.5 \times 3 = 6.75 \text{ cm}^2$$

Hence, area of shaded portion

$$= \text{Area of quadrant } OACBO$$

$$- \text{Area of } \triangle BOD$$

$$= 15.91 - 6.75 = 9.16 \text{ cm}^2$$

49. We have,

$r$  = Radius of the region representing gold score = 7 cm

$r_1$  = Radius of the region representing gold and red scoring areas

$$= (7 + 7) \text{ cm} = 14 \text{ cm}$$

$r_2$  = Radius of the region representing gold, red and blue scoring areas

$$= (7 + 7 + 7) = 21 \text{ cm}$$

$$r_3 = \text{Radius of the region representing gold, red, blue and black scoring areas} \\ = (7 + 7 + 7 + 7) = 28 \text{ cm}$$

$$(P) \text{ Now, } A_1 = \text{Area of the region representing gold scoring area} \\ = \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154 \text{ cm}^2$$

$$(Q) A_2 = \text{Area of the region representing red scoring area} \\ = \pi r_1^2 - \pi r^2 = \frac{22}{7} (14^2 - 7^2) \\ = \frac{22}{7} (14 + 7) (14 - 7) = 462 \text{ cm}^2$$

$$(R) A_3 = \text{Area of the region representing blue scoring area} \\ = \pi r_2^2 - \pi r_1^2 = \frac{22}{7} (21^2 - 14^2) \\ = \frac{22}{7} (21 + 14) (21 - 14) = 770 \text{ cm}^2$$

$$(S) A_4 = \text{Area of the region representing black scoring area} \\ = \pi r_3^2 - \pi r_2^2 = \frac{22}{7} (28^2 - 21^2) \\ = \frac{22}{7} (28 + 21) (28 - 21) = 1078 \text{ cm}^2$$

$$50.(A) \text{ Area of the shaded region} \\ = \frac{90}{360^\circ} \pi [(26)^2 - (23)^2] \\ = \frac{1}{4} \times \frac{22}{7} [(26)^2 - (23)^2] \\ = \frac{1}{4} \times \frac{22}{7} [(26 + 23) (26 - 23)] \\ = 115.5 \approx 115 \text{ m}^2$$

$$(B) AB = 2 \times AD \\ = 2 \times 6.5 = 13 \text{ cm} \\ BC = \sqrt{(AB)^2 - (AC)^2} \\ = \sqrt{(13)^2 - (5)^2} = 12 \text{ cm} \\ \text{Area of } \triangle ABC = \frac{1}{2} \times AC \times BC \\ = \frac{1}{2} \times 5 \times 12 = 30 \text{ cm}^2 \\ = 0.003 \text{ m}^2$$

$$(C) AC^2 = AB^2 + BC^2 = 64 + 36 = 100 \\ AC = 10 \text{ cm}$$

$$\text{Area of the shaded region} \\ = (\text{area of the circle}) \\ - (\text{area of the rectangle } ABCD) \\ = \left[ \frac{22}{7} \times \left( \frac{10}{2} \right)^2 \right] - (8 \times 6) \\ = (78.57 - 48) = 30.57 \text{ cm}^2$$

$$(D) \text{ Area of the shaded region} \\ = \frac{60}{360^\circ} \times \frac{22}{7} \times (14.8)^2 \\ \left[ \because \text{area of sector} = \frac{\theta}{360^\circ} \times \pi r^2 \right] \\ = 114.7 \approx 115 \text{ m}^2$$

$$51. \quad C = 2 \times \frac{22}{7} \times r = 176 \\ \Rightarrow r = \frac{176 \times 7}{2 \times 22} = 28 \text{ cm}$$

Both Assertion and Reason are True.  
Also Reason is the True explanation of the Assertion.

$$52. \text{ Assertion is False, but reason is true.} \\ 2\pi r = 22 \\ r = 3.5 \text{ cm} \\ \therefore \text{Area of the circle} = \frac{22}{7} \times 3.5 \times 3.5 = 38.5 \text{ cm}^2$$

$$53. \text{ We have, diameter of wheel} = 4.2 \text{ m} \\ \text{Circumference of circle} = \text{one revolution} \\ = \pi \times 4.2 = \frac{22}{7} \times 4.2 = 13.2 \\ \text{Distance covered in 75 revolutions} \\ = (75 \times 13.2) \text{ m} \\ \text{Speed of wheel} = \frac{\text{Distance travelled}}{\text{Time taken}} \\ = \left( \frac{75 \times 13.2}{1/60} \times \frac{1}{1000} \right) \text{ km/h} \\ = 75 \times 13.2 \times 60 = 59.4 \text{ km/h}$$

$$54. \text{ Given, } \frac{2\pi r_1}{2\pi r_2} = \frac{2}{3} \\ \Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$$

Now, ratio of their area will be

$$\frac{\pi r_1^2}{\pi r_2^2} = \left( \frac{r_1}{r_2} \right)^2 = \left( \frac{2}{3} \right)^2 = \frac{4}{9}$$

Also, circumference of circle =  $2\pi r$

**55.** Given, area of a circular playground  
 $= 22176 \text{ m}^2$   
 $\therefore \pi r^2 = 22176$  [ $\because$  area of circle  $= \pi r^2$ ]  
 $\Rightarrow \frac{22}{7} r^2 = 22176 \Rightarrow r^2 = 1008 \times 7$   
 $\Rightarrow r^2 = 7056 \Rightarrow r = 84 \text{ m}$   
 $\therefore$  Circumference of a circle  
 $= 2 \pi r = 2 \times \frac{22}{7} \times 84$   
 $= 44 \times 12 = 528 \text{ m}$   
 $\therefore$  Cost of fencing this ground  
 $= 528 \times 50 = ₹26400$

**56.** Area of the path  $= \pi \left[ \left( \frac{10}{2} \right)^2 - \left( \frac{6}{2} \right)^2 \right]$   
 $= \pi (25 - 9) = 16\pi \text{ m}^2$

Both Assertion and Reason are True. Also, Reason is the True explanation of the Assertion.

**57.** Area of sector  $OAPB = \frac{x}{360^\circ} \times \pi r^2$   
 $\Rightarrow \frac{x}{360^\circ} \times \pi r^2 = \frac{5}{18} \pi r^2$   
 $\Rightarrow \frac{x}{360^\circ} = \frac{5}{18} \Rightarrow x = 100^\circ$

**58.** Let the central angle of the sector be  $\theta$ .  
 Given that, radius of the sector of circle

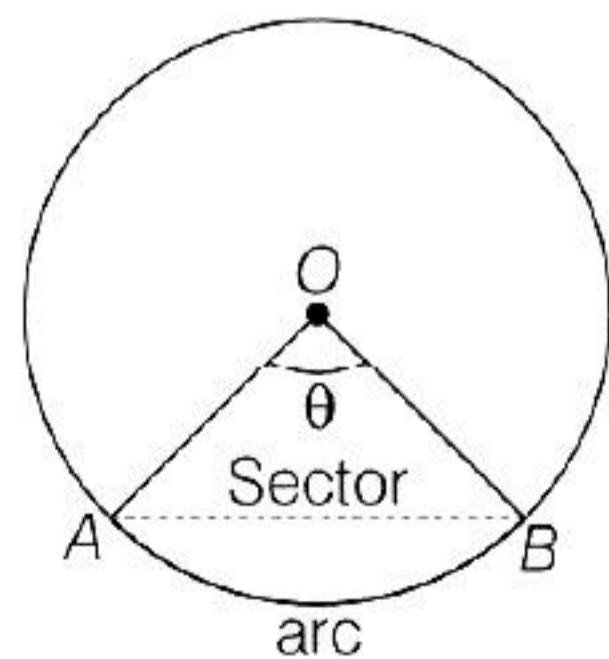
$$(r) = 5 \text{ cm}$$

and arc length ( $l$ ) = 3.5 cm

$\therefore$  Central angle of the sector,

$$\theta = \frac{\text{arc length } (l)}{\text{radius}}$$

$$\Rightarrow \theta = \frac{3.5}{5} = 0.7R \quad \left[ \because \theta = \frac{l}{r} \right]$$



$$\Rightarrow \theta = \left( 0.7 \times \frac{180}{\pi} \right)^\circ \quad \left[ \because 1R = \frac{180^\circ}{\pi} D^\circ \right]$$

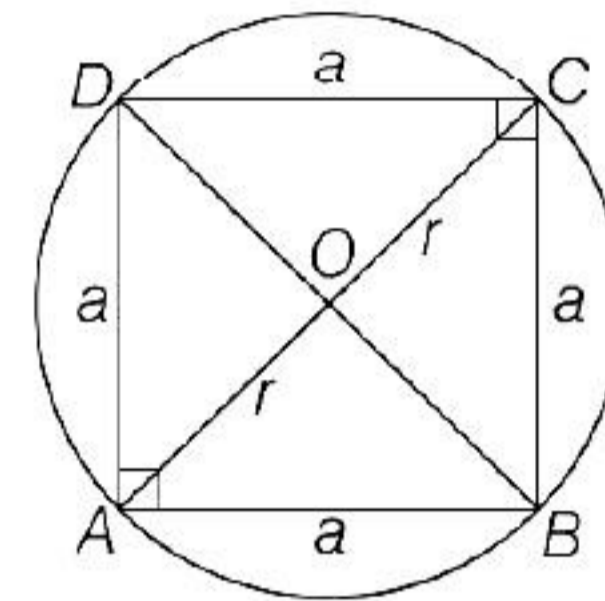
Now, area of sector with angle  $\theta = 0.7$

$$= \frac{\pi r^2}{360^\circ} \times (0.7) \times \frac{180^\circ}{\pi} = \frac{(5)^2}{2} \times 0.7$$

$$= \frac{25 \times 7}{2 \times 10} \times \frac{175}{20} = 8.75 \text{ cm}^2$$

Hence, required area of the sector of a circle is  $8.75 \text{ cm}^2$ .

**59.** Let  $r$  be the radius of circle and  $a$  be the side of square inscribed in a circle.



In  $\triangle ABC$ ,  $\angle B = 90^\circ$

$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow (2r)^2 = a^2 + a^2$$

$$\Rightarrow 4r^2 = 2a^2$$

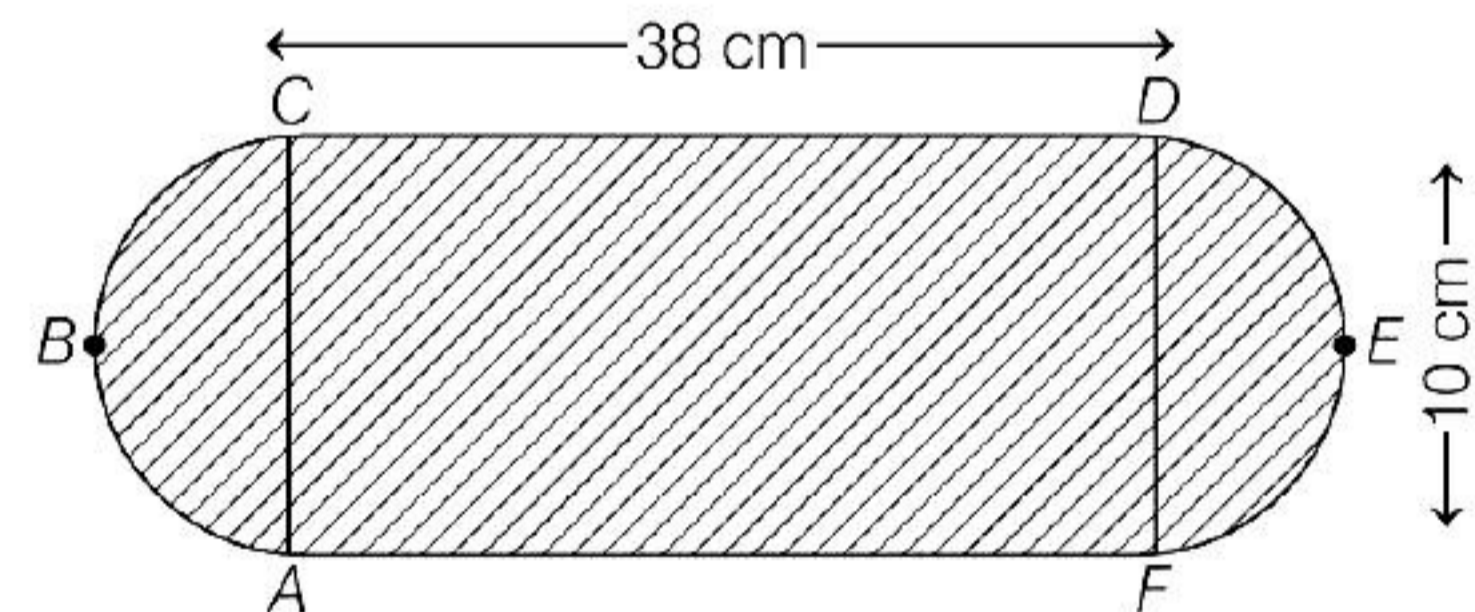
$$\Rightarrow a^2 = 2r^2 \quad [\because a^2 = \text{area of square}]$$

**60.** Length and breadth of a circular bed are 38 cm and 10 cm.

$\therefore$  Area of rectangle  $ACDF$

$$= \text{Length} \times \text{Breadth}$$

$$= 38 \times 10 = 380 \text{ cm}^2$$



Both ends of flower bed are semi-circles.

$\therefore$  Radius of semi-circle

$$= \frac{DF}{2} = \frac{10}{2} = 5 \text{ cm}$$

$\therefore$  Area of one semi-circles

$$= \frac{\pi r^2}{2} = \frac{\pi}{2} (5)^2 = \frac{25\pi}{2} \text{ cm}^2$$

$\therefore$  Area of two semi-circles

$$= 2 \times \frac{25}{2} \pi = 25 \pi \text{ cm}^2$$

$\therefore$  Total area of flower bed

$$= \text{Area of rectangle } ACDF$$

$$+ \text{Area of two semi-circles}$$

$$= (380 + 25\pi) \text{ cm}^2.$$

61. (i) Volume of the earth taken out can be given by the volume of the pit.

$$\text{Given, } r = \frac{14}{2} = 7 \text{ m}$$

$$\begin{aligned} \text{Volume} &= \pi \times (7)^2 \times 12 \\ &= \pi \times 49 \times 12 \\ &= \frac{22}{7} \times 7 \times 7 \times 12 \\ &= 1848 \text{ m}^3 \end{aligned}$$

(ii) Area of rectangular field = length  $\times$  breadth  
 $= 60 \times 30$   
 $= 1800 \text{ m}^2$

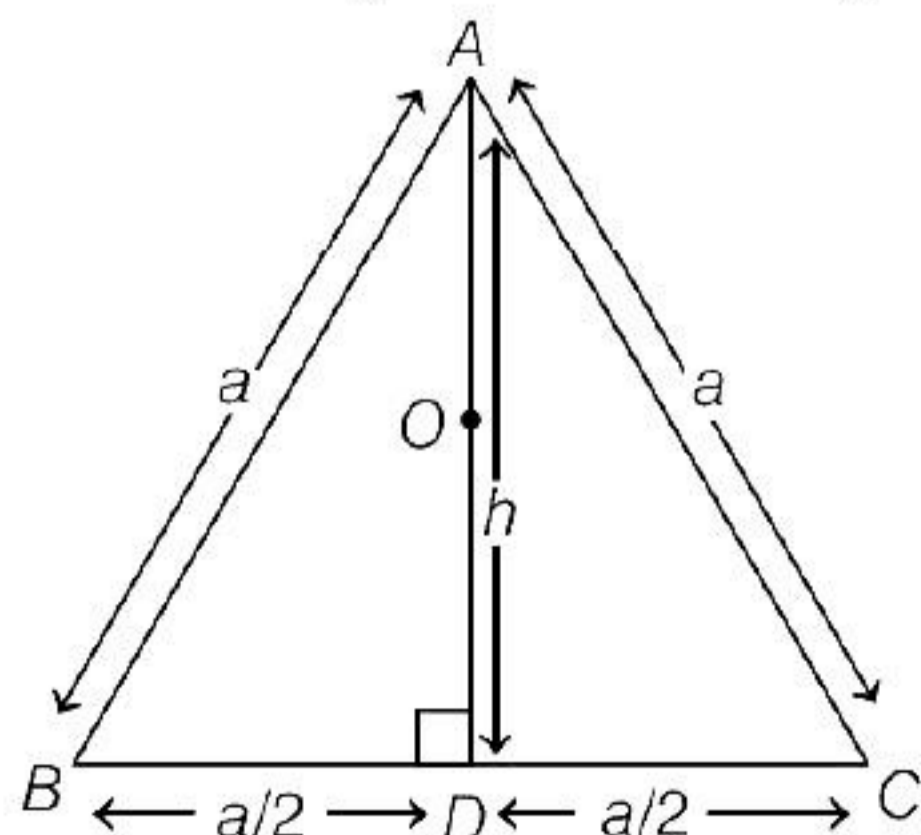
(iii) Area of top of the pit =  $\pi r^2$   
 $= \pi(7)^2$   
 $= \frac{22}{7} \times 49$   
 $= 154 \text{ m}^2$

(iv) Area of the remaining field  
 $=$  Area of the rectangular field  
 $\quad -$  area of top of pit  
 $= 1800 - 154$   
 $= 1646 \text{ m}^2$

(v) Level rise in the field  
 $= \frac{\text{Volume of the earth taken out}}{\text{Area of the remaining field}}$   
 $= \frac{1848}{1646} = 1.12 \text{ m}$

62. Directions (i-ii)

Given, radius of the circle = 32 cm  
 Let the side of the equilateral  $\triangle ABC$  be  $a$  cm.  
 Let  $h$  be the height of the triangle.



We know that in an equilateral triangle, centroid and circumcentre coincide.

$$\therefore AO = \frac{2}{3} h \text{ cm}$$

[ $\because$  centroid divides the median in the ratio 2 : 1]

which is equal to the radius of circle.

$$\therefore \frac{2}{3} h = 32 \Rightarrow h = 48 \text{ cm} \quad \dots(i)$$

Now, we draw a perpendicular from vertex  $A$  to side  $BC$  which bisects  $BC$  at  $D$ .

In right angled  $\triangle ADB$ ,

$$AB^2 = BD^2 + AD^2$$

[by Pythagoras theorem]

$$\Rightarrow a^2 = \left(\frac{a}{2}\right)^2 + h^2 \Rightarrow h^2 = a^2 - \frac{a^2}{4} = \frac{3a^2}{4}$$

$$\Rightarrow (48)^2 = \frac{3a^2}{4} \quad [\text{from Eq. (i)}]$$

$$\Rightarrow a^2 = 3072$$

$$\Rightarrow a = \sqrt{3072}$$

[taking positive square root]  
 $= 32\sqrt{3} \text{ cm}$

(i)  $32\sqrt{3} \text{ cm}$

(ii) 48 cm

Directions (iii-v)

Given, radius of each circle,  $r = 7 \text{ cm}$

$\therefore$  Diameter of circle,  $d = 14 \text{ cm}$

[ $\because$  diameter =  $2 \times$  radius]

In the given figure, horizontal three circles touch each other.

$\therefore$  Length of a side of square =  $3 \times$  Diameter of one circle =  $3 \times 14 = 42 \text{ cm}$

$$\begin{aligned} \text{Now, area of one circle} &= \pi r^2 = \pi (7)^2 \\ &= \frac{22}{7} \times (7)^2 = 154 \text{ cm}^2 \end{aligned}$$

$$\therefore \text{Area of nine circles} = 9 \times 154 = 1386 \text{ cm}^2$$

$$\begin{aligned} \text{Area of square } ABCD &= (\text{Side})^2 \\ &= (42)^2 = 1764 \text{ cm}^2 \end{aligned}$$

Hence, area of the remaining portion of the handkerchief

$$\begin{aligned} &= \text{Area of square} - \text{Area of nine circles} \\ &= 1764 - 1386 = 378 \text{ cm}^2 \end{aligned}$$

(iii)  $1764 \text{ cm}^2$

(iv)  $154 \text{ cm}^2$

(v)  $378 \text{ cm}^2$

63. (i) Let the radius of the outer most circle be  $R$ .

$$\begin{aligned} \therefore 2\pi R &= 352 \\ 2 \times \frac{22}{7} \times R &= 352 \\ R &= \frac{352 \times 7}{2 \times 22} \\ R &= 56 \text{ m} \end{aligned}$$

(ii) Let the radius of the inner most circle be  $r$ .

$$\begin{aligned} \therefore 2\pi r &= 176 \\ 2 \times \frac{22}{7} \times r &= 176 \\ r &= \frac{176 \times 7}{2 \times 22} \\ r &= 28 \text{ m} \end{aligned}$$

(iii) Width of the track = radius of the outer most circle – radius of the inner most circle  
 $= 56 - 28 = 28 \text{ m}$

(iv) Area of the race track = Area of the outer circle – Area of the inner circle  
 $= \pi R^2 - \pi r^2$   
 $= \frac{22}{7} (56^2 - 28^2)$   
 $= \frac{22}{7} \times 84 \times 28 = 7392 \text{ m}^2$

(v) Cost of the painting the whole race track  
 $= \text{Cost per m}^2 \times \text{Area of the track}$   
 $= 5 \times 7392 = ₹36960$

64. (i) Given, diameter of circle,  $d = 28 \text{ mm}$   
 $\therefore$  Circumference of circle  $= \pi d$  [ $\because d = 2r$ ]  
 $= \frac{22}{7} \times 28 = 88 \text{ mm}$

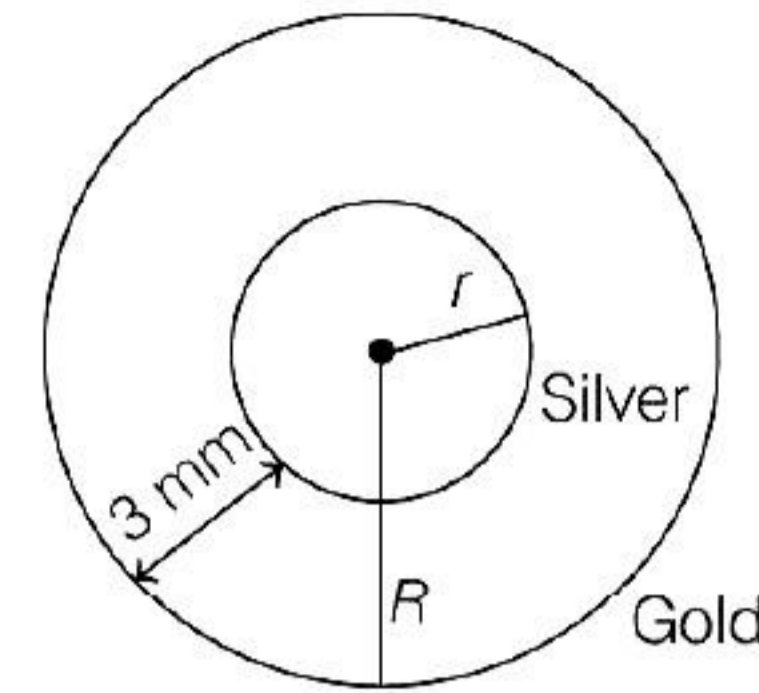
Now, length of 4 diameters  
 $= 4 \times 28 = 112 \text{ mm}$

Total length of the silver wire  $= \pi d + 4d$   
 $= 88 + 112 = 200 \text{ mm}$

(ii) Here, we see that total circle is divided into 8 parts.

$$\begin{aligned} \therefore \text{Area of each sector} &= \frac{1}{8} \times \text{Area of circle} \\ &= \frac{1}{8} \times \pi r^2 \\ &= \frac{1}{8} \times \frac{22}{7} \times 14 \times 14 \\ &= 77 \text{ mm}^2 \end{aligned}$$

Directions (iii-iv)



We have, circumference of silver part  
 $= 44 \text{ mm}$

$$\begin{aligned} \therefore 2\pi r &= 44 \\ \Rightarrow r &= \frac{44}{2 \times \frac{22}{7}} = 7 \text{ mm} \end{aligned}$$

$\therefore R = r + 3 = 7 + 3 = 10 \text{ mm}$

(iii) Circumference of golden part  $= 2\pi R$   
 $= 2 \times \frac{22}{7} \times 10$   
 $= 62.86 \text{ mm}$

(iv) Difference of areas  $= \pi R^2 - \pi r^2$   
 $= \pi(R^2 - r^2)$   
 $= (10^2 - 7^2) \pi$   
 $= 51\pi \text{ mm}^2$

(v) Required number of revolutions  
 $= \frac{\text{Distance covered}}{\text{Circumference}}$   
 $= \frac{80\pi}{2\pi R} = \frac{80\pi}{2\pi \times 10} = 4$

65. (i) The area  $OSRO$  is one-fourth of the total area.

$$\begin{aligned} \therefore \text{Area of the sector} &= \frac{1}{4} \pi r^2 \\ &= \frac{1}{4} \times \frac{22}{7} \times 21 \times 21 \quad [\because r = 21 \text{ cm}] \\ &= \frac{9702}{28} \\ &= 346.5 \text{ cm}^2 \end{aligned}$$

(ii) Area of  $POQ$  = Area of  $\Delta POQ$   
 $= \frac{1}{2} \times OP \times OQ$   
 $\left[ \text{Area} = \frac{1}{2} \times \text{base} \times \text{height} \right]$   
 $= \frac{1}{2} \times 29 \times 29 = 420.5 \text{ cm}^2$



- (iii) Cost of golden plating = (cost per unit)  
 × (Area of golden plated region)

Area of golden plated region = Area of  
 $\Delta OPQ$  – area of sector  $OSRO$ .

$$= 420.5 - 346.5 = 74 \text{ cm}^2$$

$$\therefore \text{Cost} = ₹ \times 74 = ₹ 370$$

- (iv) Area of major sector – Area of circle ( $\pi r^2$ )  
 – area of minor sector

$$= \pi r^2 - \frac{1}{4} \pi r^2$$

$$= \frac{3}{4} \pi r^2$$

$$= \frac{3}{4} \times \frac{22}{7} \times 21 \times 21$$

$$= \frac{29106}{28}$$

$$= 1039.5 \text{ cm}^2$$

- (v) Length of arc  $SR = \frac{\theta}{360^\circ} \times 2\pi r$   
 $= \frac{90^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 21$   
 $= \frac{83160}{2520} = 33 \text{ cm}$

66. (i) From the figure,

Area of the region having blue colour

$$= \frac{80^\circ}{360^\circ} \pi (10)^2 - \frac{80^\circ}{360^\circ} \times \pi (6)^2$$

$$= \frac{80^\circ}{360^\circ} \times \frac{22}{7} \times [(10)^2 - (6)^2]$$

$$= \frac{80^\circ}{360^\circ} \times \frac{22}{7} \times 16 \times 4$$

$$= \frac{112640}{2520}$$

$$= 44.69 \text{ cm}^2$$

- (ii) Similarly,

Area of the region having black colour

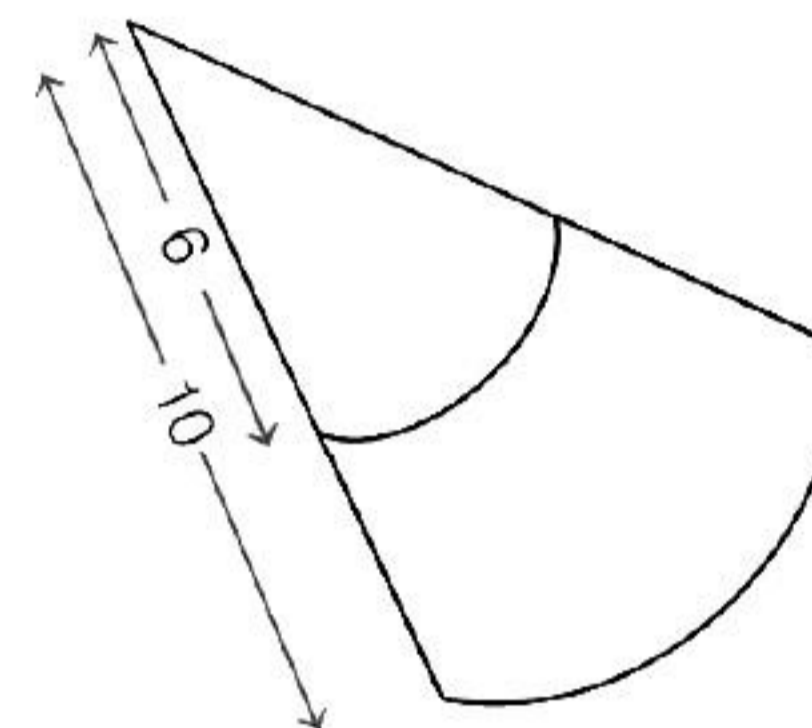
$$= \frac{40^\circ}{360^\circ} \times \frac{22}{7} \times 16 \times 4$$

$$= \frac{56320}{2520} = 22.34 \text{ cm}^2$$

- (iii) Similarly,

Perimeter of the region having pink colour

=  $2(10 - 6)$  + length of arc having radius  
 6 cm + length of arc having radius 10 cm.



$$= 8 + \frac{30^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 6 + \frac{30^\circ}{360^\circ}$$

$$\times 2 \times \frac{22}{7} \times 10$$

$$= 8 + \frac{7920}{2520} + \frac{13200}{2520}$$

$$= 8 + 3.142 + 5.238$$

$$= 16.38 \text{ cm}$$

- (iv) Total angle =  $80^\circ + 40^\circ + 30^\circ = 150^\circ$

$\therefore$  Area of the region

$$= \frac{150^\circ}{360^\circ} \times \frac{22}{7} \times 6 \times 6$$

$$= \frac{118,800}{2520} = 47.14 \text{ cm}^2$$

- (v) Total angle in the given sector =  $150^\circ$

Hence, it represents the minor sector.