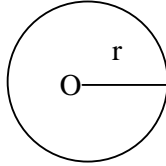


MENSURATION-III

CIRCLE:

A circle is a geometrical figure consisting of all those points in a plane which are at a given distance from a fixed point in the same plane. The fixed point is called the centre and the constant distance is known as the *radius*.



A circle with centre O and radius r is generally denoted by C (O, r)

CHORD OF CIRCLE:

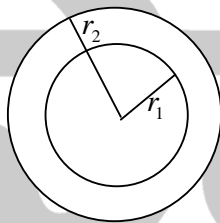
A line segment joining any two points on a circle is called a chord of the circle.

DIAMETER:

A chord passing through the centre of a circle is known as its diameter.
Diameter of a circle is twice its radius.

CONCENTRIC CIRCLES:

Circles having the same centre but with different radii are said to be concentric circles.



CIRCUMFERENCE:

The perimeter of a circle is called its *Circumference*.

The ratio of the Circumference (C) of a circle and its diameter (D) is always constant, which is π .

$$\frac{C}{D} = \pi$$

$$\Rightarrow C = \pi D = 2\pi r$$

AREA OF A CIRCLE:

The Area (A) of a circle of radius (r) is given by $A = \pi r^2$

PROBLEMS

1. The side of a square is 5 cm which is 13 cm, less than the diameter of a circle. What is the **approximate** area of the circle?

1) 245 sq cm 2) 235 sq cm 3) 265 sq cm 4) 255 sq cm 5) 275 sq cm

ANSWER: 4

Diameter (D) of circle = 5 + 13 = 18 cm

$$\text{Area of circle (A)} = \frac{\pi D^2}{4} = \frac{3.14 \times 18^2}{4} = 3.14 \times 81 \cong 255 \text{ sq cm}$$

2. The diameter of a circle is 105 cm less than the circumference. What is the diameter of the circle?
 1) 42 cm 2) 44 cm 3) 48 cm 4) 49 cm 5) None of these

ANSWER: 4

If 'D' be the diameter of the circle then its circumference is πD

$$\therefore \pi D - D = 105$$

$$\left(\frac{22}{7} - 1\right) D = 105$$

$$\therefore \frac{15}{7} \times D = 105$$

$$\therefore D = \frac{105 \times 7}{15} = 49$$

3. The total area of a circle and a square is equal to 2611 sq cm. The diameter of the circle is 42 cm. What is the sum of the circumference of the circle and the perimeter of the square?

- 1) 272 cm 2) 380 cm 3) 280 cm 4) Cannot be determined 5) None of these

ANSWER: 1

Diameter of circle = 42 cm

$$\therefore \text{Its area} = \frac{1}{4} \times \frac{22}{7} \times 42^2 = 1386 \text{ sq cm}$$

$$\Rightarrow \text{Area of square} = 2611 - 1386 = 1225$$

$$\therefore \text{Side of square} = \sqrt{1225} = 35$$

$$\text{Circumference of circle} = \frac{22}{7} \times 42 = 132$$

$$\text{Perimeter of square} = 4 \times 35 = 140$$

$$\therefore \text{Required total} = 132 + 140 = 272$$

4. The area of a circle is 154 sq cm. What is the circumference of a circle?
 1) 28 cm 2) 44 cm 3) 88 cm 4) 108 cm 5) None of these

ANSWER: 2

If C and A are circumference and area of the circle, then $C^2 = 4\pi A$

$$\therefore C^2 = 4 \times \frac{22}{7} \times 154 = 4 \times 22^2 = 2^2 \times 22^2$$

$$\therefore C = \sqrt{2^2 \times 22^2} = 2 \times 22 = 44 \text{ cm}$$

5. The radius of a circle is 1 cm less than half the side of a square whose area is 256 sq cm. What is the area of the circle?

- 1) 132 sq cm 2) 154 sq cm 3) 144 sq cm 4) 165 sq cm 5) None of these

ANSWER: 2

Area of square = 256

$$\therefore \text{Side of square} = \sqrt{256} = 16$$

$$\text{Radius of circle (R)} = \frac{16}{2} - 1 = 7$$

$$\therefore \text{Area of circle} = \frac{22}{7} \times 7^2 = 154 \text{ sq cm}$$

6. The area of a circular plot is twice the area of a rectangular plot. If the area of the rectangular plot is 11088 sq m, what is the perimeter of the circular plot

- 1) 484 m 2) 572 m 3) 528 m 4) 440 m 5) None of these

ANSWER: 3

$$\text{Area of circular plot (A)} = 2 \times 11088 = 22176$$

$$\therefore C^2 = 4 \times \frac{22}{7} \times 22176$$

$$C = \sqrt{4 \times 22 \times 3168} = \sqrt{4 \times 22 \times 22 \times 144} = 2 \times 22 \times 12 = 528$$

7. The circumference of a circle is equal to the perimeter of a square. The side of the square is 33 cm. What is **double** the diameter of the circle?

- 1) 42 cm 2) 21 cm 3) 10.5 cm 4) 94 cm 5) None of these

ANSWER: 5

$$\text{Side of square} = 33$$

$$\therefore \text{Its perimeter} = 33 \times 4 = 132$$

$$\text{Circumference (C)} = \pi D = 132$$

$$D = \frac{132 \times 7}{22} = 42$$

$$\therefore 2D = 2 \times 42 = 84$$

8. If the circumference of a circle is decreased by 50%, then the percentage of decrease in its area is

- 1) 25 2) 50 3) 60 4) 75 5) None of these

ANSWER: 4

If the circumference decreases by 50% then its radius also decreases by 50%.

$$\therefore \text{New radius} = \frac{1}{2} \times \text{Original radius}$$

$$\therefore \text{New area} = \left(\frac{1}{2}\right)^2 \times \text{Original area} = \frac{1}{4} \times \text{Original area}$$

$$\therefore \text{Area decreased} = 1 - \frac{1}{4} = \frac{3}{4} = 75\%$$

9. The sum of the circumference of a circle and the perimeter of a square is equal to 272 cm. The diameter of the circle is 56 cm. What is the sum of the area of the circle and the area of the square?

- 1) 2464 sq cm 2) 2644 sq cm 3) 3040 sq cm 4) Cannot be determined 5) None of these

ANSWER: 3

$$\text{Diameter of circle} = 56 \text{ cm}$$

$$\therefore \text{Its circumference} = \frac{22}{7} \times 56 = 176 \text{ cm}$$

$$\text{Perimeter of square} = 272 - 176 = 96 \text{ cm}$$

$$\therefore \text{Side of square} = \frac{96}{4} = 24 \text{ cm}$$

$$\begin{aligned} \text{Area of circle} + \text{Area of square} &= \frac{22}{7} \times \left(\frac{56}{2}\right)^2 + 24^2 \\ &= \frac{22}{7} \times 28^2 + 24^2 \\ &= 2464 + 576 = 3040 \end{aligned}$$

10. The radius of circle A is twice that of circle B and the radius of circle B is twice that of circle C. Their area will be in the ratio

- 1) 16 : 4 : 1 2) 4 : 2 : 1 3) 1 : 2 : 4 4) 1 : 4 : 16 5) None of these

ANSWER: 1

Radius of C be 1, then radius of B will be 2 and Radius of A will be 4.

$$\text{Area of C} = \pi(1)^2 = \pi$$

$$\text{Area of B} = \pi(2)^2 = 4\pi$$

$$\text{Area of A} = \pi(4)^2 = 16\pi$$

$$\text{Required ratio} = 16\pi : 4\pi : \pi = 16 : 4 : 1$$

11. The cost of building a fence around a circular field is ` 7,700 @ ` 14 per foot. What is the area of the circular field?

- 1) 24062.5 sq ft 2) 23864.4 sq ft 3) 24644.5 sq ft 4) Cannot be determined
5) None of these

ANSWER: 1

Cost of fencing = circumference \times unit cost

$$7700 = C \times 14$$

$$\therefore C = \frac{7700}{14} = 550$$

$$\text{Area of circle A} = \frac{C^2}{4\pi} = \frac{550^2}{4\pi} = \frac{550 \times 550 \times 7}{88} = \frac{25 \times 275 \times 7}{2} = \frac{48125}{2} = 24062.5$$

12. There are two circles of different radii. The area of a square is 196 sq cm whose side is half the radius of the larger circle. The radius of the smaller circle is three-seventh that of the larger circle. What is the circumference of the smaller circle?

- 1) 12 π cm 2) 16 π cm 3) 24 π cm 4) 32 π cm 5) None of these

ANSWER: 3

$$\text{Area of square} = 196$$

$$\text{Side of square} = \sqrt{196} = 14$$

$$\therefore \text{Radius of larger circle} = 2 \times 14 = 28$$

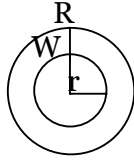
$$\text{Radius of smaller circle} = \frac{3}{7} \times 28 = 12$$

$$\text{Circumference of smaller circle} = 2 \times \pi \times 12 = 24\pi$$

13. A circular road runs round a circular ground. If the difference between the circumference of the outer circle and inner circle is 44 m, find the width of road.

- 1) 8 m 2) 7 m 3) 17 m 4) 9 m 5) None of these

ANSWER:



If R and r be the radii of the outer and inner circle respectively.

Then width of the road = $W = (R - r)$

Also $2\pi(R - r) = 44$

$$\therefore (R - r) = \frac{44}{2\pi} = \frac{-44 \times 7}{-44} = 7$$

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