12. MENSURATION OF PLANE FIGURES

Mensuration is science of measurement of the length of lines, areas of surfaces and volumes of solids.

■ Conversion of some important units

1 km = 10 hectometre = 100 decametre

= 1000 metre = 10,000 decimetre

= 1,00,000 centimetre = 10,00,000 millimetre

1 hectare = 10,000 square metre

1 acre = 100 square metre

1 square hectometre = 100 square decametre

1 square decametre = 100 square metre

1 square metre = 100 square decimetre

1 square decimetre = 100 square centimetre

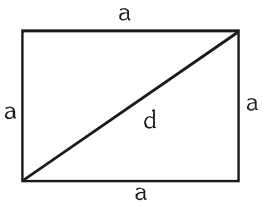
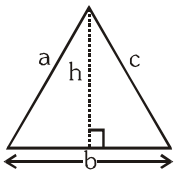
1 square centimetre = 100 square millimetre

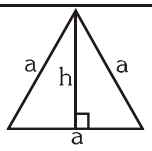
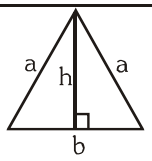
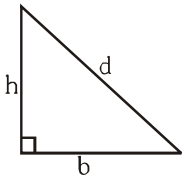
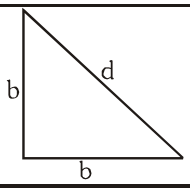
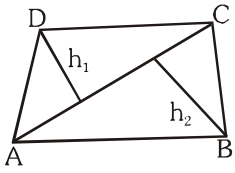
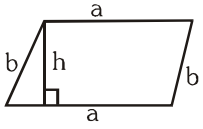
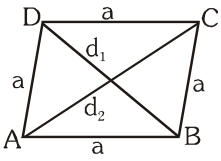
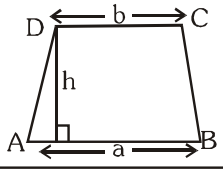
$\sqrt{2}$ =1.414, $\sqrt{3}$ =1.732,

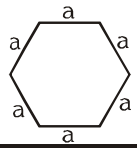
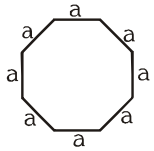
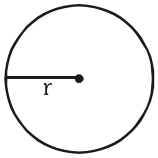
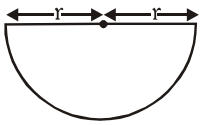
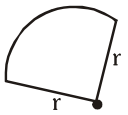
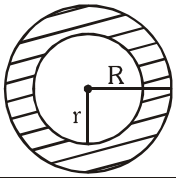
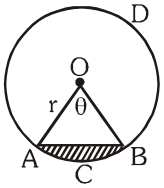
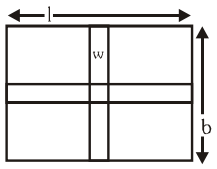
$\sqrt{5}$ =2.236, $\sqrt{6}$ =2.45

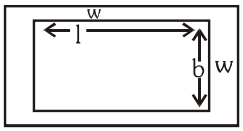
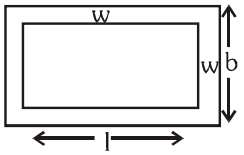
Weight = Volume × Density

■ Area and Perimeter of 2-D Figures (Plane figures)

S. No.	Name	Figure	Nomenclature	Area	Perimeter
1.	Rectangle		$l \rightarrow$ length $b \rightarrow$ breadth	$l \times b = lb$	$2l+2b=2(l+b)$
2.	Square		$l \rightarrow$ side $d \rightarrow$ diagonal $d = a\sqrt{2}$	(i) $a \times a = a^2$ (ii) $\frac{d^2}{2}$	$a+a+a+a = 4a$
3.	Triangle (Scalene)		a, b and c are three sides of triangle and s the semiperimeter, where $s = \left(\frac{a+b+c}{2}\right)$ b is the base and h is the altitude of triangle	(i) $\frac{1}{2} \times b \times h$ (ii) $\sqrt{s(s-a)(s-b)(s-c)}$ (Heron's formula)	$a+b+c=2s$

S. No.	Name	Figure	Nomenclature	Area	Perimeter
4.	Equilateral triangle		$a \rightarrow$ side $h \rightarrow$ height or altitude $h=\frac{\sqrt{3}}{2}a$	(i) $\frac{1}{2}\times a \times h$ (ii) $\frac{\sqrt{3}}{4}a^2$	3a
5.	Isosceles triangle		$a \rightarrow$ equal sides $b \rightarrow$ base $h \rightarrow$ height or altitude $h=\sqrt{\frac{4a^2-b^2}{2}}$	(i) $\frac{1}{2}\times b \times h$ (ii) $\frac{1}{4}\times b\times\sqrt{4a^2-b^2}$	2a+b
6.	Right angled triangle		$b \rightarrow$ base $h \rightarrow$ altitude/height $d \rightarrow$ diagonal $d=\sqrt{b^2+h^2}$	(i) $\frac{1}{2}\times b \times h$	b+h+d
7.	Isosceles right angled triangle		$b \rightarrow$ equal sides $h \rightarrow$ equal diagonal $d=b\sqrt{2}$	$\frac{1}{2}b^2$	2b+d
8.	Quadrilateral		AC is the diagonal and h_1, h_2 are the altitude on AC from the vertices D and B respectively	$\frac{1}{2}\times AC \times(h_1+h_2)$	AB+BC+CD+AD
9.	Parallelogram		a and b are sides adjacent to each other. $h \rightarrow$ distance between the parallel sides	$a \times h$	2(a+b)
10.	Rhombus		$a \rightarrow$ each equal side of rhombus d_1 and d_2 are the diagonals $d_1 \rightarrow BD$ $d_2 \rightarrow AC$	$\frac{1}{2}\times d_1\times d_2$	4a
11.	Trapezium		a and b are parallel sides to each other and h is the perpendicular distance betweeen parallel sides	$\left(\frac{a+b}{2}\right)\times h$	AB+BC+CD+AD

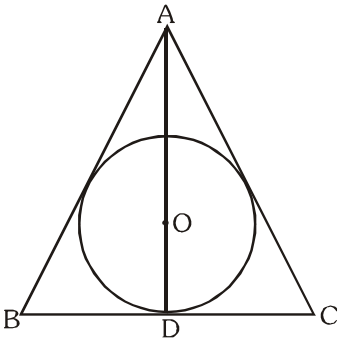
S. No.	Name	Figure	Nomenclature	Area	Perimeter
12.	Regular hexagon		a→each of the equal side	$\frac{3\sqrt{3}}{2}a^2$	6a
13.	Regular octagon		a→ each of equal side	$2a^2(1+\sqrt{2})$	8a
14.	Circle		a→ radius of the circle $\pi=\frac{22}{7}=3.1416$(approx)	πr^2	$2\pi r$ (called circumference)
15.	Semicircle		r→ radius	$\frac{1}{2}\pi r^2$	$\pi r+2r$
16.	Quadrant		r→ radius	$\frac{1}{4}\pi r^2$	$\frac{1}{2}\pi r+2r$
17.	Ring or circular path (shaded region)		R→ outer radius r→ inner radius	$\pi(R^2-r^2)$	(outer) → $2\pi R$ (inner) → $2\pi r$
18.	Sector of a circle		O→ centre of the circle r→ radius l→ length of the arc θ→ angle of the sector $\ell=2\pi r\left(\frac{\theta}{360^\circ}\right)$	(i) $\pi r^2\left(\frac{\theta}{360^\circ}\right)$ (ii) $\frac{1}{2}r\times\ell$	$\ell+2r$
19.	Segment of a circle		θ→ angle of the sector r→ radius AB→ chord ACB→ arc of the circle	Area of Segment ACB minor segment $=r^2\left(\frac{\pi\theta}{360^\circ}-\frac{\sin\theta}{2}\right)$ major segment ADB $=\pi r^2-$minor segment	$\left[\frac{\pi\theta}{360^\circ}+\sin\left(\frac{\theta}{2}\right)\right]$
20.	Pathways running across the middle of a rectangle		l→ length b→ breadth w→ width of the path (road)	(l+b–w) w	2(l+b)–4w = 2[l+b–2w]

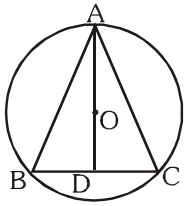
S. No.	Name	Figure	Nomenclature	Area	Perimeter
21.	Outer pathways		l→length b→breadth w→width of the path	(l+b+2w) 2w	(linner) → 2 (l+b) (outer) → 2 (l+b+4w)
22.	Inner path		l→length b→breadth w→width of the path	(l+b–2w)2w	(outer) → 2 (l+b) (inner) → 2 (l+b–4w)

■ Important Concepts

- **Inradius**

$\frac{1}{3} \times \text{height} = \frac{\text{side}}{2\sqrt{3}}$, OD → Inradius





- **Cirumradius :**

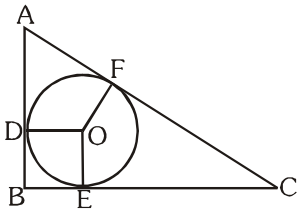
$= \frac{2}{3} \times \text{height} = \frac{\text{side}}{\sqrt{3}}$

OA → Circumradius

- In equilateral triangle: orthocentre, centroid, incentre and circumcentre coincide at the same point.
- Circumradius = 2 × inradius
- For the given perimeter of a triangle, the area of equilateral triangle is maximum.
- For the given area of a triangle, the perimeter of equilateral triangle is minimum.

- **In a right angled triangle**

- Inradius $(r) = \frac{AB + BC - AC}{2}$

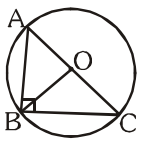


- Inradius $(r) = \frac{\text{Area}}{\text{Semiperimeter}}$

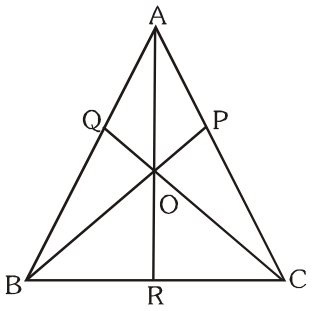
DO = EO = FO (r)

- Circumradius (R) = $\frac{AC}{2} = \left(\frac{\text{hypotenuse}}{2}\right)$

AO=CO=BO=(R)
AC is the diameter



- In an equilateral triangle perpendiculars drawn from all the three vertices intersect each other in the ratio of 2 :1 from the vertex to the base.

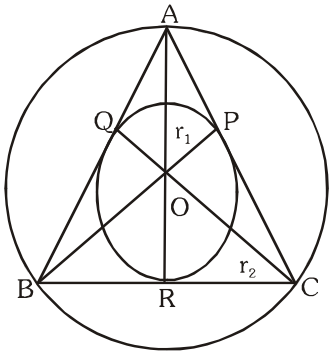


$\therefore \quad \frac{AO}{OR} = \frac{BO}{OP} = \frac{CO}{OQ} = \frac{2}{1} = \frac{r_2}{r_1}$

OP=OQ = OR, all are the inradii

OA = OB = OC, all are the circumradii

Note: Radii means more than one radius.



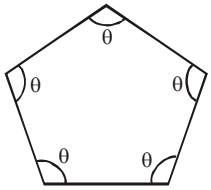
O is the centre of two circles. Circle PQR is called an incirle (touching the sides) and circle ABC is called as circumcircle (touching the vertices)

$\therefore$ Inradius = $\frac{side}{2\sqrt{3}}$

and Circumradius = $\frac{side}{\sqrt{3}}$

- **Polygon :** A polygon is a plane figure enclosed by four or more straight lines.

Regular Polygon - If all the sides of a polygon are equal, it is called a regular polygon



All the interior angles of a regular polygon are equal.

- For a regular polygon :

(a) Sum of exterior angles = 2π

(b) Sum of interior angles = $(n - 2)\pi$

(c) No. of diagonals in a polygon = $\frac{n(n-3)}{2}$

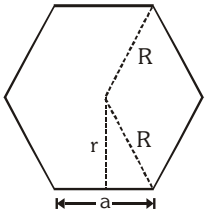
(d) Perimeter (P) = $n \times a$,
where n = number of sides
and a = length of each side

(e) Each interior angle = $\frac{n-2}{n} \times \pi$

(f) Each exterior angle = $\frac{2\pi}{n}$

(g) Area = $\frac{1}{2} \times P \times r = \frac{1}{2} \times n \times a \times r$,

where r is radius of the circle drawn inside the polygon touching its sides.



$= \frac{1}{2} \times n \times a \times \sqrt{R^2 - \left(\frac{a}{2}\right)^2}$,

where R is radius of the circle drawn outside the polygon touching its sides.

$= \frac{na^2}{4}\cot\left(\frac{\pi}{n}\right)$.

Area of a regular hexagon = $\frac{3\sqrt{3}}{2}$ (side)^2

Area of regular octagon = $2(\sqrt{2}+1)$ (side)^2

- **Carpeting the floor of a Room**

  If the length and breadth of a room are I and b, respecitvely, and a carpet of width w is used to cover the floor, then the required length of the carpet = $\frac{\ell \times b}{w}$.

- **Number of Square Tiles Required for Flooring**
  - If the length and breadth of a room are ℓ and b, respecively, then the least number of square tiles required to cover the floor = $\frac{\ell \times b}{\text{H.C.F.}(\ell, b)}$
  - Also, the size of the largest tile so that the tiles exactly fit = H.C.F. (ℓ, b).

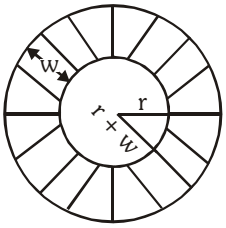
- A circular ground of radius r has a pathway of width w around it on its outside. The area of circular pathway is given by = $\pi w(2r + w)$

  Explanation

  Area of circular ground = πr^2

  Area of circular ground + pathway

  = $\pi(r + w)^2 = \pi r^2 + 2\pi rw + \pi w^2$.

  $\therefore$ Area of circular path way

  = $(\pi r^2 + 2\pi rw + \pi w^2) - \pi r^2$

  = $\pi\omega (2r + w)$.

- A circular ground of radius r has a pathway of width w around it on its inside. The area of the circular pathway is given by = $\pi w (2r - w)$.

  Explanation

  Area of circular ground = πr^2

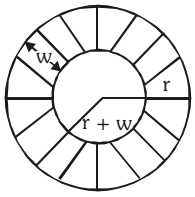
  Area of circular ground–pathway = $\pi (r - w)^2$

  = $\pi r^2 - 2\pi rw + \pi w^2$.

  $\therefore$ Area of circular pathway

  = $\pi r^2 - (\pi r^2 - 2\pi rw + \pi w^2)$

  = $\pi w (2r - w)$.

- If the area of a square is 'a sq cm', then the area of the circle formed by the same perimeter is $\left(\frac{4a}{\pi}\right)$ sq cm.

Explanation

Area of the square = a.

$\therefore$ Side of the square = $\sqrt{\text{Area}} = \sqrt{a}$.

$\therefore$ Perimeter of the square = $4\sqrt{a}$.

Given : Circumference of the circle = Perimeter of the square

$\Rightarrow 2\pi r = 4\sqrt{a}$

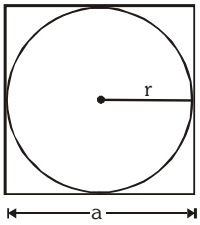
$\therefore$ Radius of circle (r) = $\frac{4\sqrt{a}}{2\pi} = \frac{2\sqrt{a}}{\pi}$.

$\therefore$ Area of circle = $\pi r^2 = \pi\left(\frac{2\sqrt{a}}{\pi}\right)^2 = \frac{4a}{\pi}$ sq cm.

- The area of the largest circle that can be inscribed in a square of side a is $\frac{\pi a^2}{4}$.

Explanation

Clearly, from the figure, the diameter of the inscribed circle equals the side of the square i.e., D = a.



Area of the circle = $\frac{\pi D^2}{4}$

$\therefore$ Area of the inscribed circle = $\frac{\pi a^2}{4}$.

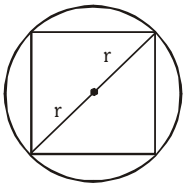
- Area of a square inscribed in a circle of radius r is $2r^2$ and the side of the square is $\sqrt{2}r$.

Explanation

Clearly, from the figure, diagonal of the inscribed square is equal to the diameter of the circle, i.e., 2r.

$\therefore$ Area of square = $\frac{1}{2}(\text{diagonal})^2$

= $\frac{1}{2}(2r)^2 = 2r^2$.



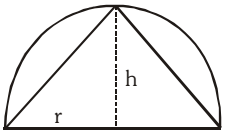
Also, side of the square

= $\sqrt{\text{Area}} = \sqrt{2r^2} = \sqrt{2}r$.

The area of largest triangle inscribed in a semi-circle of radius r is r^2.

Explanation

Clearly, from the figure, the largest triangle inscribed in a semi-circle is an isosceles triangle with diameter as its base and radius as its height.



Area of the triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

The number of revolutions made by a circular wheel of radius r in travelling distance d is given by = $\left(\frac{d}{2\pi r}\right)$

Explanation

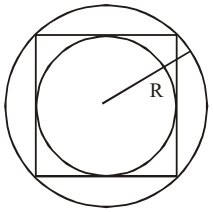
Circumference of the wheel = 2π r

In travelling a distance 2π r, the wheel makes 1 revolution.

$\therefore$ In travelling a distance d, the wheel makes $\left(\frac{d}{2\pi r}\right)$ revolutions.

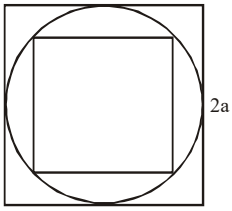
- Ratio of the areas of the two circles is

$$= \frac{\text{Area of circle circumscribing the square}}{\text{Area of circle inscribed in the square}} = \frac{2}{1}$$



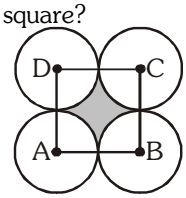
- Ratio of the area of the two squares is

$$= \frac{\text{Area of square circumscribing the circle}}{\text{Area of square inscribed in the circle}} = \frac{2}{1}$$



- If the length and the breadth of a rectangle are increased by x% and y%, respectively, then the area of rectangle will increase by $\left(x + y + \frac{xy}{100}\right)\%$
- If the length of a rectangle is increased by x%, then its breadth will have to be decreased by $\left(\frac{100x}{100 + x}\right)\%$ in order to maintain the same area of rectangle.
- If each of the defining dimensions or sides of any two dimensional figure (triangle, rectangle, square, circle, quadrilateral, pentagon, hexagon, etc.) is changed by x%, its area changes by $x\left(2 + \frac{x}{100}\right)\%$.
- If all the sides of a quadrilateral are increased (or decreased) by x%, its diagonals also increase (or decrease) by x%.
- If each of the defining dimensions or sides of any two-dimensional figures are increased (or decreased) by x%, its perimeter also increases (or decreases) by x%.
- If the ratio of the areas of two square be a:b, then the ratio of their sides, ratio of their perimeters and the ratio of their diagonals, each will be in the ratio $\sqrt{a} : \sqrt{b}$.
- If the diagonal of a square increases by x times, then the area of the square becomes x^2 times.

1. ABCD is a square, 4 equal circles are just touching each other whose centres are the vertices A, B, C, D of the square. What is the ratio of the shaded to the unshaded area within square?



(1) $\frac{8}{11}$ (2) $\frac{3}{11}$

(3) $\frac{5}{11}$ (4) $\frac{6}{11}$

2. If the radius of a circle is increased by 100%, then the area of the circle increases by:

(1) 100% (2) 200% (3) 300% (4) 400%

3. If the perimeter of an isosceles right triangle is $(6 + 3\sqrt{2})$m then the area of the triangle is:

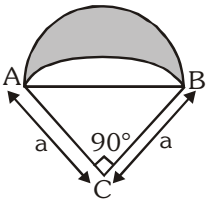
(1) 4.5 m^2 (2) 5.4 m^2 (3) 9 m^2 (4) 81 m^2

4. In the adjoining figure ACB is a quadrant with radius 'a'. A semicircle is drawn outside the quadrant taking AB as a diameter. Find the area of shaded region :

(1) $\frac{1}{4}(\pi - 2a^2)$

(2) $\left(\frac{1}{4}\right)(\pi a^2 - a^2)$

(3) $\frac{a^2}{2}$



(4) Can't be determined

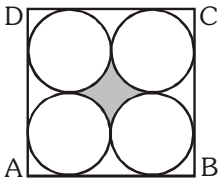
5. ABCD is a square, inside which 4 circles with radius 1 cm, each are touching each other. What is the area of the shaded region?

(1) $(2\pi - 3)$ cm^2

(2) $(4 - \pi)$ cm^2

(3) $(16 - 4\pi)$ cm^2

(4) None of these



6. The opposite pairs of sides of a square are increased by 40% and 30% respectively. The area of the resulting rectangle exceeds the area of the square by:

(1) 42% (2) 62% (3) 82% (4) 72%

7. If the length and width of a rectangular garden plot were each increased by 20 percent, then what would be the percent increase in the area of the plot?

(1) 20% (2) 24% (3) 36% (4) 44%

8. The sides of a triangle are in the ratio of $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$. If the perimeter is 52 cm, then the length of the smallest side is:

(1) 9 cm (2) 10 cm (3) 11 cm (4) 12 cm

9. The length of a rope by which cow must be tethered in order that it may be able to graze an area of 9856 sq. meters is:

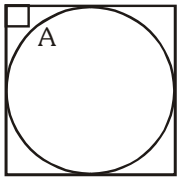
(1) 56 m (2) 64 m (3) 88 m (4) 168 m

10. A horse is placed for grazing inside a rectangular field of 70 m by 52 m and is tethered to one corner by a rope 21 m long. On how much area can it graze?

(1) 386.5 m^2 (2) 325.5 m^2

(3) 346.5 m^2 (4) 246.5 m^2

11. In the figure below, the rectangle at the corner measures 10 cm × 20 cm. The corner A of the rectangle is also a point on the circumference of the circle. What is the radius of the circle in cm?



(1) 10 cm (2) 40 cm (3) 50 cm (4) None

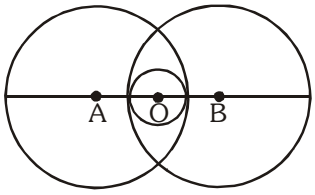
12. There are two circles intersecting each other. Another smaller circle with centre O, is lying between the common region of two larger circles. Centre of the circle (i.e., A, O and B) are lying on a straight line. AB = 16 cm and the radii of the larger circles are 10 cm each. What is the area of the smaller circle?

(1) 4π cm^2

(2) 2π cm^2

(3) $\frac{4}{\pi}$ cm^2

(4) $\frac{\pi}{4}$ cm^2



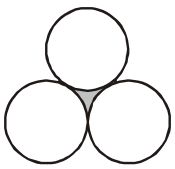
13. Three circles of equal radii touch each other as shown in figure. The radius of each circle is 1 cm. What is the area of shaded region?

(1) $\left(\frac{2\sqrt{3} - \pi}{2}\right)$ cm^2

(2) $\left(\frac{3\sqrt{2} - \pi}{3}\right)$ cm^2

(3) $\frac{2\sqrt{3}}{\pi}$ cm^2

(4) None of these



14. A triangle and a parallelogram are constructed on the same base such their areas are equal. If the altitude of the parallelogram is 100 m, then the altitude of the triangle is:

(1) 100 m (2) 200 m

(3) $100\sqrt{2}$ m (4) $10\sqrt{2}$ m

15. There are two concentric circles whose areas are in the ratio of 9 : 16 and the difference between their diameters is 4 cm. What is the area of the outer circle?
(1) 32 cm^2 (2) 64π cm^2
(3) 36 cm^2 (4) 48 cm^2

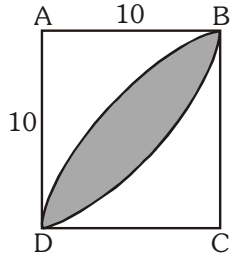
16. The length of each side of a square is $\frac{3x}{4}+1$. What is the perimeter of the square?
(1) x + 1 (2) 3x + 1
(3) 3x + 4 (4) $\frac{9}{16}x^2+\frac{3}{2}x+1$

17. The area of a square increases by ..... if its side increases by 30%.
(1) 71% (2) 60% (3) 69% (4) 30%

18. A track is in the form of a ring whose inner circumference is 352 m and the outer circumference is 396 m. The width of the track is:
(1) 44 m (2) 14 m (3) 22 m (4) 7 m

19. A person wishes to make a 100 sq. m rectangular garden. Since he has only 30 m barbed wire for fencing, he fences only three sides letting the house wall act as the fourth side. The width of the garden is:
(1) 10 m (2) 5 m (3) 50 m (4) 100 m

20. In the figure, ABCD is a square with side 10. BFD is an arc of circle with center C. BGD is an arc of a circle with center A. What is the area of the shaded region?



(1) 100 – 50 π (2) 100 – 257 π
(3) 50 π – 100 (4) 25 π – 100

21. A steel wire bent in the form of a square of area 121 cm^2. If the same wire is bent in the form of a circle, then the area of the circle is:
(1) 130 cm^2 (2) 136 cm^2
(3) 154 cm^2 (4) None

22. A pond 100 m in diameter is surrounded by a circular grasss walk 2 m wide. How many square meters of grass is there on the walk?
(1) 98 π (2) 100 π (3) 204 π (4) 202 π

23. The length of a rectangle is increased by 60%. By what percent would the width be decreased so as to maintain the same area?
(1) $37\frac{1}{2}\%$ (2) 60% (3) 75% (4) 120%

24. A circular grassy plot of land, 42 m in diameter, has a path 3.5 m wide running round it on the outside. Find the cost of gravelling the path at Rs. 4 per square meter.
(1) Rs. 2002 (2) Rs. 2003
(3) Rs. 2004 (4) Rs. 2000

25. If the circumference and the area of a circle are numerically equal, then what is the numerical value of the diameter?
(1) 1 (2) 2 (3) 4 (4) π

26. A rhombus OABC is drawn inside a circle whose center is at O in such a way that the vertices A, B and C of the rhombus are on the circle. If the area of the rhombus, is $32\sqrt{3}$ m^2, then the radius of the circle is:
(1) 64 m (2) 8 m (3) 32 m (4) 46 m

27. Four equal circles are described about the four corners of a square so that each touches two of the others. If each side of the square is 14 cm, then the area enclosed between the circumferences of the circle is:
(1) 24 sq cm (2) 42 sq cm
(3) 154 sq cm (4) 196 sq cm

28. A wire is in the form of a circle of radius 35 cm. If it is bent into the shape of a rhombus, what is the side of the rhombus?
(1) 32 cm (2) 70 cm (3) 55 cm (4) 17 cm

29. To make marriage tent, poles are planted along the perimeter of a square field at a distance of 5 meters from each other and the total number of poles used is 20. What is the area (in sq. meters) of the square field?
(1) 500 (2) 400
(3) 900 (4) None of these

30. A rectangular carpet has an area of 60 m^2. Its diagonal and longer side together equal 5 times the shorter side. The length of the carpet is:
(1) 5 m (2) 12 m (3) 13 m (4) 14.5 m

31. How many squares are there in a 5 inch by 5 inch square grid, if the grid is made up of one inch by one inch squares?
(1) 50 (2) 150 (3) 55 (4) 25

32. The area of a rhombus is 2016 sq cm and its side is 65 cm. The lengths of the diagonals (in cm) respectively are:
(1) 125,35 (2) 126,32
(3) 132,26 (4) 135,25

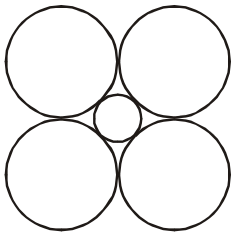
33. The number of revolution made by a wheel of diameter 56 cm in covering a distance of 1.1 km is $\left(\text{Use } \pi=\frac{22}{7}\right)$:
(1) 31.25 (2) 56.25 (3) 625 (4) 62.5

34. Semi-circular lawns are attached to the edges of a rectangular field measuring 42 m ×35m. The area of the total field is:
(1) 3818.5 m^2 (2) 8318 m^2
(3) 5813 m^2 (4) 1358 m^2

35. A wire is looped in the form of a circle of radius 28 cm. It is re-bent into a square form. Determine the length of the side of the square.
(1) 44 cm (2) 45 cm (3) 46 cm (4) 48 cm

36. The circumference of a circular ground is 88 meters. A strip of land, 3 meters wide, inside and along circumference of the ground is to be levelled. What is the budgeted expenditure if the levelling costs Rs. 7 per square meter?
(1) Rs. 1050 (2) Rs. 1125
(3) Rs. 1325 (4) Rs. 1650

37. In the figure, when the outer circles all have radii 'r', then the radius of the inner circle will be:



(1) $\sqrt{2}$ r (2) $(\sqrt{2}-1)$r
(3) $\frac{1}{\sqrt{2}r}$ (4) $\frac{2}{(\sqrt{2}+1)r}$

38. A square and an equilateral triangle have the same perimeter. If the diagonal of the square is $12\sqrt{2}$ cm, then the area of the triangle is:
(1) $24\sqrt{3}$ cm^2 (2) $24\sqrt{2}$ cm^2
(3) $64\sqrt{3}$ cm^2 (4) $32\sqrt{3}$ cm^2

39. A horse is tethered to one corner of a rectangular grassy field 40 m by 24 m with a rope 14 m long. Over how much area of the field can it graze?
(1) 154 m^2 (2) 308 m^2
(3) 150 m^2 (4) None of these

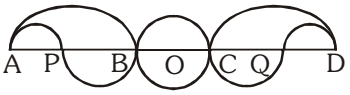
40. Four horses are tied on the four corners of a square field of 14 m length so that each horse can touch the other two horses. They were able to graze in the area accessible to them for 11 days. For how many days is the ungrazed area sufficient for them?
(1) 3 days (2) 4 days (3) 5 days (4) 2 days

41. If the diagonal of a square is decreased by 15%, then the area of the square is decreased by:
(1) 22.5% (2) 72.25%
(3) 27.75% (4) None of these

42. The ratio of the circumference of two circles is 2 : 3. What is the ratio of their areas?
(1) 4 : 9 (2) 2 : 3
(3) 9 : 4 (4) None of these

43. The ratio of the area of a square inscribed in a semi-circle to that of the area of a square inscribed in the circle of the same radius is:
(1) 2 : 1 (2) 2 : 3
(3) 2 : 5 (4) None

44. In the adjoining figure AB = CD = 2BC = 2BP = 2 CQ. In the middle, a circle with radius 1 cm is drawn. In the rest figure all are the semicircular arcs. What is the perimeter of the whole figure?
(1) 4 π
(2) 8π
(3) 10 π
(4) None of these



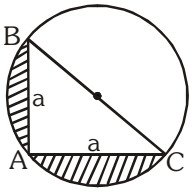
45. If BC passes through centre of the circle, then the area of the shaded region in the given figure is :

(1) $\frac{a^2}{2}(3-\pi)$

(2) $a^2\left(\frac{\pi}{2}-1\right)$

(3) $2a^2(\pi-1)$

(4) $\frac{a^2}{2}\left(\frac{\pi}{2}-1\right)$



46. Two circles of unit radii, are so drawn that the centre of each lies on the circumference of the other. The area of the region common to both the circles, is :
(1) $\frac{(4\pi-3\sqrt{3})}{12}$ (2) $\frac{(4\pi-6\sqrt{3})}{12}$
(3) $\frac{(4\pi-3\sqrt{3})}{6}$ (4) $\frac{(4\pi-6\sqrt{3})}{6}$

47. The area of the largest possible square inscribed in a circle of unit radius (in square unit) is :
(1) 3 (2) 4
(3) $2\sqrt{3}\pi$ (4) 2

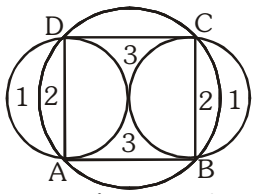
48. The area of the largest triangle that can be inscribed in a semicircle of radius r is :
(1) r^2 cm^2 (2) $\left(\frac{r}{3}\right)^2$ cm^2
(3) $r\sqrt{2}$ cm^2 (4) $3\sqrt{3r}$ cm^2

49. If a regular hexagon is inscribed in a circle of radius r, then its perimeter is :
(1) $6\sqrt{3}r$ (2) 6r (3) 3r (4) 12r

50. If a regular hexagon circumscribes a circle of radius r, then its perimeter is :

(1) $4\sqrt{3}r$ (2) $6\sqrt{3}r$ (3) 6r (4) $12\sqrt{3}r$

Direction (Q.51-53) : In the adjoining figure ABCD is a square. A circle ABCD is passing through all the four vertices of the square. There are two more circles on the sides AD and BC touching each other inside the square, AD and BC are the respective diameters of the two smaller circles. Area of the square is 16 cm^2.



51. What is the area of region 1 ?

(1) 2.4 cm^2 (2) $\left(2-\frac{\pi}{4}\right)cm^2$

(3) 8 cm^2 (4) $(4\pi - 2)$ cm^2

52. What is the area of region 2?

(1) $3(\pi - 2)$ cm^2 (2) $(\pi - 3)$ cm^2

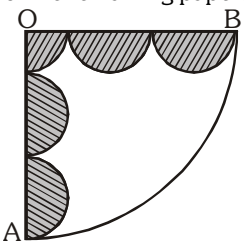
(3) $(2\pi - 3)$ cm^2 (4) $4(\pi - 2)$ cm^2

53. What is the area of region 3?

(1) $(4 - 4\pi)$ cm^2 (2) $4(4 - \pi)$ cm^2

(3) $(4\pi - 2)$ cm^2 (4) $(3\pi + 2)$ cm^2

54. A circular paper is folded along its diameter, then again it is folded to form a quadrant. Then it is cut as shown in the figure, after it the paper was reopened in the original circular shape. Find the ratio of the original paper to that of the remaining paper? (The shaded portion is cut off from the quadrant. The radius of quadrant OAB is 5 cm and radius of each semicircle is 1 cm) :

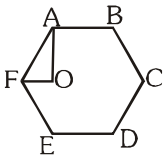


(1) 25 : 16

(2) 25 : 9

(3) 20 : 9 (4) None

55. In the figure below, ABCDEF is a regular hexagon and $\angle AOF = 90°$. FO is parallel to ED. What is the ratio of the area of the triangle AOF to that of the hexagon ABCDEF?



(1) $\frac{1}{12}$ (2) $\frac{1}{6}$ (3) $\frac{1}{24}$ (4) $\frac{1}{18}$

56. The wheel of a cycle covers 660 metres by making 500 revolutions. What is the diameter of the wheel (in cm) ?

(1) 42 (2) 21 (3) 30 (4) 60

57. Twenty nine times the area of a square is one square metre less than six times the area of the second square and nine times the side of it exceeds the perimeter of other square by one metre. The difference in sides of these squares is

(1) 5 m (2) 54/11 m (3) 11 m (4) 6 m

58. A roller 150 cm long has diameter 70 cm. To level a playground, it takes 750 complete revolution. The cost of levelling the playground at the rate of Rs. 2 per m^2 is

(1) Rs. 5000 (2) Rs. 2950

(3) Rs. 4500 (4) Rs. 4950

59. The ratio of the areas of the incircle and the circumcircle of a square is

(1) $1:\sqrt{2}$ (2) $1:\sqrt{3}$

(3) 1 : 4 (4) 1 : 2

60. The area of largest circle that can be drawn inside a retangle with side 18 cm by 14 cm is

(1) 49 cm^2 (2) 154 cm^2

(3) 378 cm^2 (4) 1078 cm^2

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	3	1	3	2	3	4	4	1	3	3	1	1	2	2	3	3	4	2	
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	3	1	1	3	2	2	3	4	2	4	2	3	1	1	4	2	3	1	
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	1	3	3	4	3	4	1	2	1	3	4	2	1	1	1	4	4	4	