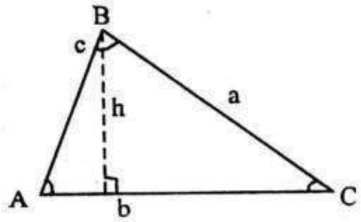
CHAPTER 18

MENSURATION-I
Area and Perimeter
(2-Dimensional Plane Figures)

The area of any figure is the amount of surface enclosed within its boundary lines. It is measured by the number of square metres or square centimetres or square inches (or some other units of square measure) it contains. Hence, its units are accordingly square metre, square centimetre, square inch, square foot, etc. Below we illustrate some figures and write the formulae for calculating their areas :

The Perimeter of a geometrical figure is the total length of the sides enclosing the figure.



Triangle : A triangle is a plane figure bounded by three sides.

It includes three angles. It is denoted by the symbol Δ.

General Convention : (*i*) Nomenclature of vertices or sides are usually done in clock-wise manner.

(*ii*) The side opposite to the vertex A is a, the side opposite to the vertex B is b and so on.

(*iii*) Angle A (or angle BAC) is denoted by $\angle A$ (or $\angle BAC$) and is the angle at vertex A enclosed by sides b and c. It is opposite to side a. Similarly, we can write $\angle B$ and $\angle C$.

$$\angle A + \angle B + \angle C = 180^\circ$$

1. (*a*) Area of a triangle $= \frac{1}{2}$ (base × height) $= \frac{1}{2}\ bh$

(*b*) $b = \frac{2A}{h}$ or $b^2 = 2A\frac{b}{h}$ or $b = \sqrt{2A\left(\frac{b}{h}\right)}$

(c) Similarly, $h = \frac{2A}{b} = \sqrt{\frac{2A}{\left(\frac{b}{h}\right)}}$

Alternatively, we can write its area $= \frac{1}{2}\ ah'$ where h' is the length of the perpendicular dropped from the vertex A on the side a.

Similarly, we can write the formula taking side c as the base and dropping perpendicular from the vertex C.

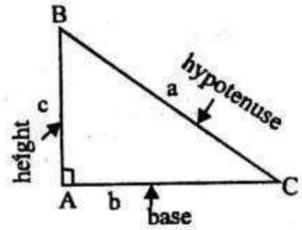
2. $A = \sqrt{s(s-a)(s-b)(s-c)}$

Where A : Area of the ΔABC

$s = \frac{1}{2}\ (a + b + c)$ or semi-perimeter of the triangle.

$P = a + b + c$

Right Triangle : It is a triangle whose one of the angles is a right angle (90°).



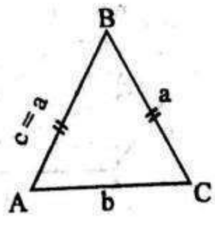
Here, $\angle A = 90^\circ$

$\therefore\ \angle B + \angle C = 90^\circ = \angle A$

3. $a^2 = b^2 + c^2$ (Pythagorus theorem)

4. $A = \frac{1}{2}\ bc.$

Isosceles Triangle : It is a triangle whose two sides are equal. It can be proved that in such triangles, the angles opposite the equal sides are also equal.

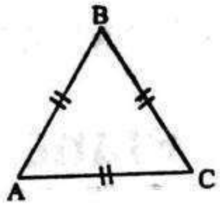


Here, $c = a$

and, $\angle C = \angle A$

5. $A = \frac{1}{4} b\sqrt{(4a^2 - b^2)}$

Equilateral Triangle : It is a triangle with all its three sides equal. It can be proved that its all three angles are also equal.

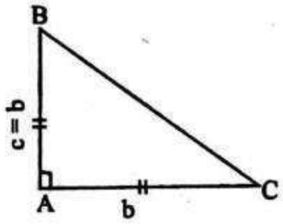


$$a = b = c$$

$$\angle A = \angle B = \angle C = \frac{180^\circ}{3} = 60^\circ$$

6. $A = \frac{\sqrt{3}}{4}a^2 \approx 0.433a^2$.

Right Isosceles Triangle : It is an isosceles triangle with the angle included between its two equal sides being 90°.

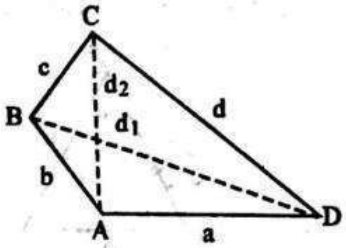


$$\angle A = 90^\circ$$

$$b = c = \frac{BC}{\sqrt{2}}$$

7. $A = \frac{1}{2}b^2 = \frac{1}{4}(\text{hypotenuse})^2$

Quadrilateral : It is a plane figure bounded by four sides. It has four angles included in it. The sum of these four angles is 360°.



Therefore,

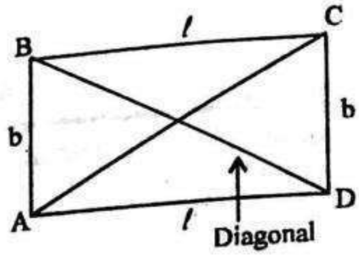
$$\angle A + \angle B + \angle C + \angle D = 360^\circ$$

$$\sqrt{4(d_1 d_2)^2 - (b^2 + d^2 - a^2 - c^2)^2}$$

$$P = a + b + c + d$$

The special cases of quadrilateral are rectangle, square, parallelogram, rhombus, trapezium etc. which are described below separately.

Rectangle : Its all four angles are 90° and opposite sides equal. Its diagonals bisect each other and are equal.



(i) Area = Length × Breadth

(ii) Length $= \frac{\text{Area}}{\text{Breadth}}$

(iii) Breadth $= \frac{\text{Area}}{\text{Length}}$

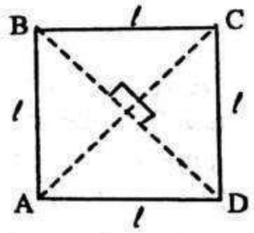
8. (i) $A = l\,b$

(ii) $l = \frac{A}{b}$ (iii) $b = \frac{A}{l}$

9. Diagonal : $AC = BD = \sqrt{l^2 + b^2}$

$$P = 2\,(l + b)$$

Square : Its all four sides are equal and all four angles too are equal, each of 90°.



Its diagonals are equal and bisect each other at 90°.

10. Area = l^2.

11. Diagonal (d) : AC = BD $= \sqrt{2}\,l$

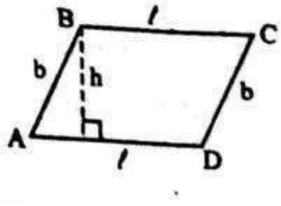
or, $l = \frac{1}{\sqrt{2}} \times (\text{diagonal}) = \frac{d}{\sqrt{2}}$

Therefore, we can also write,

12. $A = l^2 = \frac{d^2}{2}$

$$P = 4\,l$$

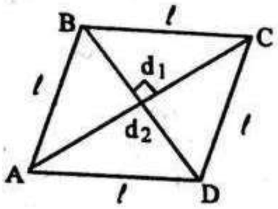
Parallelogram : It is a quadrilateral whose opposite sides are parallel and equal.



13. Area = Base × Height or, $A = l\,h$

$P = 2\,(l + b)$

Rhombus : It is parallelogram whose all four sides are equal.



Its diagonals bisect each other at 90°

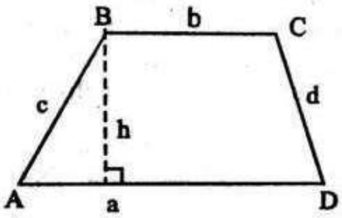
14. Area = $\frac{1}{2}$ (Product of diagonals)

$$A = \frac{1}{2} d_1 d_2$$

15. Side : $l = \frac{1}{2}\sqrt{{d_1}^2 + {d_1}^2}$

$P = 4\,l$

Trapezium : It is a quadrilateral with any one peir of its opposite sides parallel.



Here, BC is parallel to AD.

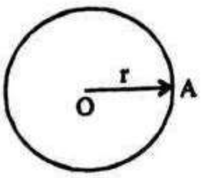
Area of trapezium = $\frac{1}{2}$ (sum of parallel sides × distance between them)

16. $A = \frac{1}{2}\,[(a + b) \times h]$

$P = a + b + c + d.$

Note : Distance between parallel sides of a trapezium is called its *height*.

Circle : A circle is the locus of a point such that its distance from a fixed point is always the same. The fixed point (O) is called the centre of the circle and the distance (r = OA) between the fixed point (O) and the moving point (A) is called the radius of the circle.



17. Area $= \pi r^2 = \frac{\pi}{4} D^2$ where $\pi = \frac{22}{7} \approx 3.14$

and, $D\,(= 2r)$: Diameter of the circle $D = \sqrt{\frac{4A}{\pi}}$

18. Circumference or Perimeter $P = 2\pi r = \pi D$ and

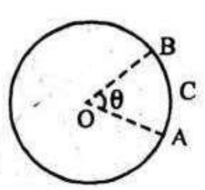
$$D = \frac{P}{\pi}$$

Also, we can write, $A = \frac{P^2}{4\pi}$

and, $P = \sqrt{4\pi A}$

Total angle enclosed by the circle = 360°

Arc : A part of the circumference of the circle is called an arc of the circle.

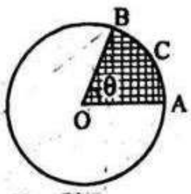


19. Arc ACB or arc $AB = \left(\frac{\theta}{360°}\right) \times 2\pi r \approx r\theta$ (when θ is very small)

Where θ = angle enclosed by the arc ACB.

or, arc $A = \frac{\theta}{360°} \times$ Circumference

Sector : The area enclosed between the arc, the two radii and the centre of the circle is called sector of the circle. Here, the shaded area $AOBCA$ is the sector enclosed by the arc ACB.



20. Area of the sector AOB

$$= \left(\frac{\theta}{360°}\right) \times \pi r^2 = \frac{1}{2} \times \text{arc } ACB \times r$$

Room : A room has length (l) and breadth (b) and height (h) :

21. Area of four walls of the room = $2h\,(l + b)$

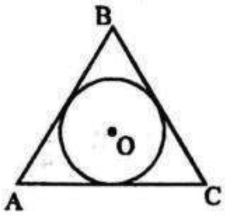
22. Area of the floor and flour walls = $2h\,(l + b) + lb$

23. Area of the floor, roof and four walls $= 2[h\,(l + b) + l\,b]$

Polygon : A polygon is plane figure bounded by multiple number of sides. Normally it is used for figures enclosed by more than four sides: e.g., pentagon, hexagon, octagon etc.

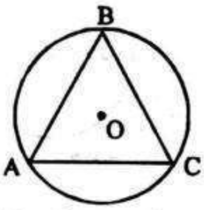
Regular Polygon : It is a polygon whose all sides are equal.

In circle or Inscribed circle : It is the circle inside the polygon whose all the sides are tangent to the circle.



24. For an equilateral triangle of side 'a', radius of inscribed circle $= \frac{a}{2\sqrt{3}}$

Circumcircle : It is the circle whose circumference touches all the vertices of the polygon.



25. For an equilateral triangle, radius of circumcircle $= \frac{a}{\sqrt{3}}$.

26. Area of a regular polygon

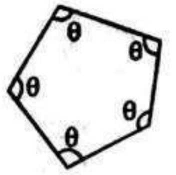
$$= \frac{1}{2}\left(\begin{matrix}\text{Number of} \\ \text{sides}\end{matrix}\right)\left(\begin{matrix}\text{Radius of the} \\ \text{inscribed circle}\end{matrix}\right)$$

27. Area of a regular hexagon $= \frac{3\sqrt{3}}{2}(\text{side})^2 = 2.598$ $(\text{side})^2$

28. Area of a regular octagon $= 2\left(\sqrt{2}+1\right)(\text{side})^2$ $= 4.828\ (\text{side})^2$

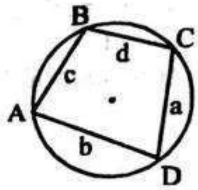
Regular Polygon	*No. of sides*	*Area (S = side of the polygon)*
Triangle (Equilateral)	3	$0.433\ S^2$
Square	4	$1.000\ S^2$
Pentagon	5	$1.720\ S^2$
Hexagon	6	$2.598\ S^2$
Heptagon	7	$3.634\ S^2$
Octagon	8	$4.828\ S^2$
Nonagon	9	$6.182\ S^2$
Decagon	10	$7.694\ S^2$

For a regular polygon of n equal sides, its vertex angle θ is given by



29. $\theta = \left(\frac{n-2}{n}\right)180°$.

Cyclic Quadrilateral : It is a quadrilateral whose vertices lie on the circumference of the circle.

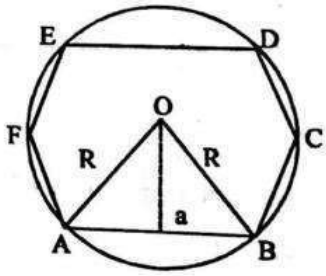


30. $A = \sqrt{S(S-a)(S-b)(S-c)(S-d)}$ where,

$S = \frac{a+b+c+d}{2}$

and, $\angle A + \angle C = \angle B + \angle D = 180°$.

Circum-Circle of Regular Ploygon : A regular polygon can be inscribed in a circle which is called the circum-circle. The centre of this circle is also the centre of the polygon and the radius is known as the circum-radius which is generally denoted by R.



If a is the length of each side of a regular polygon and R is the circum-radius, then we get the following results.

(*a*) $R = \frac{a}{2}\ \text{cosec}\left(\frac{180°}{n}\right)$

(*b*) Area of the polygon

$= \frac{1}{4}na^2 \cot\left(\frac{180°}{n}\right)$

or,

Area of the polygon

$= nR^2 \sin\left(\frac{180°}{n}\right) \cos\left(\frac{180°}{n}\right)$.

(c) Area of the circum-circle of n-sided regular polygon

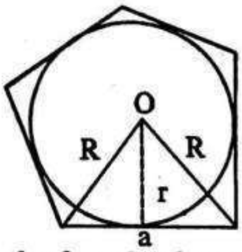
$$=\frac{\pi}{4}a^2\operatorname{cosec}^2\left(\frac{180^\circ}{n}\right)$$

Particular Case : Area of a regular hexagon

$$=\frac{6}{4}a^2\cot 30^\circ = \frac{3\sqrt{3}}{2}a^2$$

Area of circum-circle of a regular hexagon $= \pi a^2$

In-circle of a Regular Polygon : A regular polygon can also circumscribe a circle. A circle having centre at the centre of a regular polygon and touching all sides of it is known as the in-circle.



If a is the length of a side of a regular polygon and r is the radius of the in circle, then we have the following results :

(a) $r = \frac{a}{2}\cot\left(\frac{180^\circ}{n}\right)$

(b) Area of the polygon $= \pi r^2 \cot\left(\frac{180^\circ}{n}\right)$

(c) Area of the in-circle of an n-sided regular polygon $= \frac{\pi}{4}a^2\cot^2\left(\frac{180^\circ}{n}\right)$

Particular Case

Radius of the in-circle of a regular hexagon

$$=\frac{\sqrt{3}}{4}a^2$$

Area of the in-circle $=\frac{3}{4}\pi a^2$

Some Important Points Regarding Circles :

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

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

(c) Distance moved by a rotating wheel in one revolution is equal to the circumference of the wheel.

(d) The number of revolutions completed by a rotating wheel in one minute

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

Measures of Length

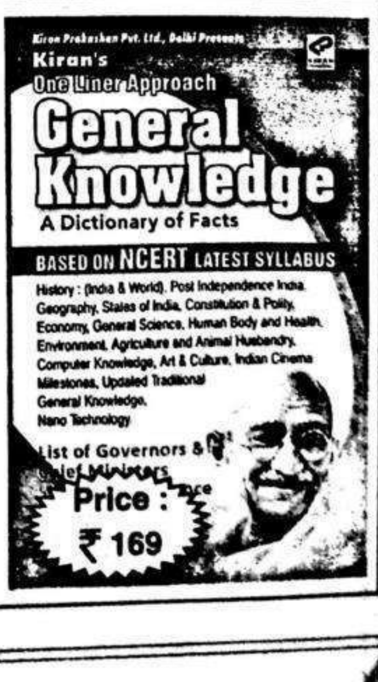
10 milimetres	= 1 centimetre
10 centimetres	= 1 decimetre
10 decimetres	= 1 metre
10 metres	= 1 decametre
10 decametres	= 1 hectometre
10 hectometres	= 1 kilometre
10 kilometres	= 1 myriametre

Measures of Area

100 square milimetres	= 1 square centimetre
100 square centimetres	= 1 square decimetre
100 square decimetres	= 1 square metre
100 square metres	= 1 square decametre
100 square decametres	= 1 square hectometre
100 square hectometres	= 1 square kilometre
100 square kilometres	= 1 square myriametre
1 centiare	= 1 square metre
100 centiare	= 1 are
100 ares	= 1 hectare
100 square metres	= 1 are
10,000 square metres	= 1 hectare

Ramarks : (i) If the dimensions of a plane are given in different units, care should be taken to express them in the same unit before finding the area.

(ii) A square metre is a square whose side is a metre. It should be noted carefully that 3 square metres and 3 metres square are different things. Three square metres denotes an area 3 times as large as a square metre, wheareas three metres square denotes the area of a square whose side is 3 metres. Obviously 3 metres square is equivalent to 9 square metres.



SOLVED OBJECTIVE QUESTIONS

1. Find the area of a triangular piece of land whose sides are 72m, 30m and 78 m respectively.
   (1) 1080 sq. m. (2) 1050 sq. m.
   (3) 1000 sq. m. (4) 1100 sq. m.

2. The perimeter of a right angled triangle is 30 cm. If its hypotenuse is 13 cm, then find the other two sides (in cm).
   (1) 6,11 (2) 5, 12
   (3) 7, 8 (4) 6, 9

3. The perimeter of a triangular field is 450 metres and its sides are in the ratio 13 : 12 : 5. Find the area of the triangle.
   (1) 6780 sq. m. (2) 7000 sq. m.
   (3) 6750 sq. m. (4) 7680 sq. m.

4. Find the area of a right-angled triangle, if the radius of its circum-circle is 5 cm and the altitude drawn to the hypotenuse is 4 cm.
   (1) 20 sq. cm. (2) 25 sq. cm.
   (3) 30 sq. cm. (4) 32 sq. cm.

5. From a point in the interior of an equilateral triangle, perpendiculars drawn to the three sides are 16 cm, 20 cm and 22 cm respectively. Find the area of the triangle.
   (1) 1942.26 sq. cm. (2) 2000 sq. cm.
   (3) 1842 sq. cm. (4) 1842.26 sq. cm.

6. The area of a right angled triangle is 30 sq. cm and the radius of the circle circumscribing the triangle is 6.5cm. Find the ratio of the smallest and the longest sides of the triangle.
   (1) 5 : 13 (2) 5 : 12
   (3) 7 : 13 (4) 6 : 13

7. A lawn is in the shape of a rectangle of length 60 m and width 40 m. Outside the lawn there is a footpath of uniform width 1 m bordering the lawn. Find the area of the path.
   (1) 200 sq. m. (2) 204 sq. m.
   (3) 210 sq. m. (4) 240 sq. m.

8. There is a square field whose side is 44 m. A square flowerbed is prepared in its centre, leaving a gravel path of uniform width all around the flowerbed. The total cost of laying the flowerbed and gravelling the path at Rs. 2 and Re. 1 per square metre respectively is Rs. 3536. Find the width of the gravelled path.
   (1) 1 metre (2) 1.5 metre
   (3) 2 metre (4) 2.5 metre

9. A rectangular lawn is 130 m × 120 m. It has two roads each 2 m wide running in the middle of it, one parallel to the length and the other parallel to the breadth. Find the total cost of planting grass on both the roads at the rate of Rs. 150 per square metre.
   (1) Rs. 74000 (2) Rs. 74400
   (3) Rs. 76400 (4) Rs. 67400

10. The diagonal of a rectangular field is 15 m and its area is 108 sq. m. What will be the total expenditure in fencing the field at the rate of Rs. 5 per metre.
   (1) Rs. 200 (2) Rs. 210
   (3) Rs. 230 (4) Rs. 250

11. Four walls of a room can be covered fully by 70 square paper pieces each of dimensions 2 m × 2 m. The length of room is 18 m and its breadth is twice its height. Find the cost of flooring at the rate of Rs. 20 per sq. metre.
   (1) Rs. 3600 (2) Rs. 3500
   (3) Rs. 3800 (4) Rs. 4000

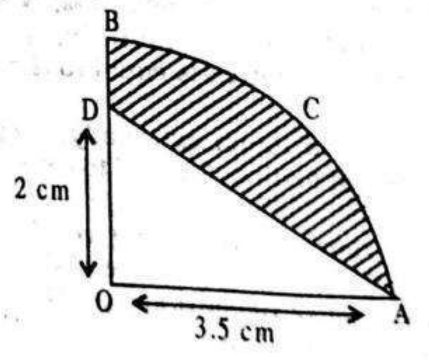
12. *OABC* is a rhombus whose three vertices *A*, *B* and *C* lie on a circle with centre *O*. If the radius of the circle is 10 cm find the area of the rhombus.
   (1) 50 sq. m. (2) $50\sqrt{3}$ sq. m.
   (3) $50\sqrt{2}$ sq. m. (4) $60\sqrt{3}$ sq. m.

13. Find the area of a trapezium whose parallel sides are 77 cm, 60 cm and the other sides are 25 cm and 26 cm.
   (1) 1640 sq. cm. (2) 1644 sq. cm.
   (3) 1740 sq. cm. (4) 1744 sq. cm.

14. Two circles touch externally. The sum of their areas is 130 π sq. cm. and the distance between their centres is 14 cm. Find the radii of the circles.
   (1) 11 cm, 15 cm (2) 11 cm, 4 cm
   (3) 11 cm, 6 cm (4) 11 cm, 3 cm

15. A copper wire when bent in form of a square, encloses an area of 484 cm^2. If the same wire is bent in the form of circle, find the area enclosed by it.
   (1) 600 cm^2 (2) 616 cm^2
   (3) 661 cm^2 (4) 166 cm^2

16. In the given figure *AOBCA* respresents a quadrant of a circle of radius 3.5 cm with centre *O*. Calculate the area of the shaded portion.



   (1) 6.125 cm^2 (2) 6.215 cm^2
   (3) 7.125 cm^2 (4) 7.215 cm^2

17. A bicycle wheel makes 5000 revolutions in moving 11 kms. Find the diameter of the wheel.
(1) 65 cm (2) 70 cm
(3) 75 cm (4) 60 cm

18. *ABCD* is a quadrant of a circle of radius 14 cm. With *AC* as diameter, a semi-circle is drawn. Find the area of shaded portion.
(1) 90 cm^2 (2) 98 cm^2
(3) 980 cm^2 (4) 900 cm^2

19. The minute hand of a clock is 10 cm long. Find the area of the face of the clock described by the minute hand between 9 AM and 9.35 AM.
(1) 180.5 cm^2 (2) 183.3 cm^2
(3) 182.3 cm^2 (4) 187.3 cm^2

20. Find the ratio of areas of inscribed square in a semi-circle and a circle while the radii of circle and semi-circle are equal.
(1) 2 : 5 (2) 3 : 5
(3) 1 : 2 (4) 1 : 3

21. The parallel sides of a field which is in the shape of trapezium are 20m and 41m and the remaining two sides are 10m and 17m. Find the cost of levelling the field at the rate of Rs. 30 per sq. metre.
(1) Rs. 7300 (2) Rs. 7320
(3) Rs. 3720 (4) Rs. 3700

22. The length of the side of a square is 14 cm. Taking vertices of the square as centres, 4 circles are drawn each with a radius of 7 cm. Find the area of the region of the square that remains outside the region of any of the circles.
(1) 40 sq. cm. (2) 42 sq. cm.
(3) 46 sq. cm. (4) 50 sq. cm.

23. A chord AB of a circle of radius 10 cm makes a right angle at the centre of the circle. Find the areas of the minor and major segments of the circle. (Use π = 3.14)
(1) 285.5 cm^2 (2) 385.5 cm^2
(3) 485.5 cm^2 (4) 185.5 cm^2

24. The parallel sides of a field which is in the shape of a trapezium are 40 m and 82 m and the other two sides are 20 m and 34 m. What will be the cost of levelling the field at the rate of Rs. 30 per square metre?
(1) Rs. 29000 (2) Rs. 29280
(3) Rs. 39280 (4) Rs. 19280

25. The lengths of sides AB, BC, and CA of a Δ ABC are 4 cm, 6 cm and 8 cm respectively. Three sectors of circles drawn with centres A, B, C and each with one centimetre of radius, starting and terminating with the sides of the triangle are cut off. Find the area of the remaining portion of the triangle.
(1) 10.1 sq. cm. (2) 11.1 sq. cm.
(3) 12. 1 sq. cm. (4) 12.2 sq. cm.

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

26. The perimeter of an isosceles, right-angled triangle is 2p unit. The area of the same traingle is :
(1) $(3 - 2\sqrt{2})\,p^2$ sq.unit
(2) $(2 + \sqrt{2})\,p^2$ sq.unit
(3) $(2 - \sqrt{2})\,p^2$ sq.unit
(4) $(3 - \sqrt{2})\,p^2$ sq.unit
[SSC Graduate Level Tier-I Exam, 2012]

27. The area of the largest triangle that can be inscribed in a semi circle of radius x in square unit is :
(1) $4x^2$ (2) x^2
(3) $2x^2$ (4) $3x^2$
[SSC Graduate Level Tier-I Exam, 2012]

28. The length of the common chord of two circles of radii 15 cm and 20 cm whose centres are 25 cm apart is (in cm) :
(1) 20 (2) 30
(3) 25 (4) 15
[SSC Graduate Level Tier-I Exam, 2012]

29. Area of the trapezium formed by x-axis; y-axis and the lines $3x + 4y = 12$ and $6x + 8y = 60$ is :
(1) 37.5 sq. unit (2) 31.5 sq. unit
(3) 48 sq. unit (4) 36.5 sq. unit
[SSC Graduate Level Tier-I Exam, 2012]

30. The length of the side of a square is 14cm. Find out the ratio of the radii of the inscribed and circumscribed circle of the square.
(1) $\sqrt{2} : 1$ (2) $1 : \sqrt{2}$
(3) $\sqrt{2} : 3$ (4) 2 : 1
[SSC Graduate Level Tier-I Exam, 2012]

31. The perimeter of a rhombus is 146 cm and one of its diagonals is 55 cm. The other diagonal is
(1) 92 cm (2) 73 cm
(3) 48 cm (4) 72 cm
[SSC Graduate Level Tier-I Exam, 2012]

32. If a circle with radius of 10 cm has two parallel chords 16 cm and 12 cm and they are on the same side of the centre of the circle, then the distance between the two parallel chords is
(1) 2 cm (2) 3 cm
(3) 5 cm (4) 8 cm
[SSC Graduate Level Tier-I Exam, 2012]

33. A square is of area 200 sq. m. A new square is formed in such a way that the length of its diagonal is $\sqrt{2}$ times of the diagonal of the given square. Then the area of the new square formed is

(1) $200\sqrt{2}$ sq.m (2) $400\sqrt{2}$ sq.m
(3) 400 sq.m (4) 800 sq.m .
[SSC Graduate Level Tier-II Exam, 2011]

34. If the length of a chord of a circle at a distance of 12 cm from the centre is 10 cm, then the diameter of the circle is
(1) 13 cm (2) 15 cm
(3) 26 cm (4) 30 cm
[SSC Graduate Level Tier-II Exam, 2011]

35. Area of the incircle of an equilateral triangle with side 6 cm is
(1) $\frac{\pi}{2}$ sq. cm. (2) $\sqrt{3}\pi$ sq. cm.
(3) 6π sq. cm. (4) 3π sq. cm.
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

36. If the circumradius of an equilateral triangle be 10 cm, then the measure of its in-radius is
(1) 5 cm. (2) 10 cm.
(3) 20 cm. (4) 15 cm.
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

37. At the centres of two circles, two arcs of equal length subtend angles of 60° and 75° respectively. The ratio of the radii of the two circles is
(1) 5 : 2 (2) 5: 4
(3) 3 : 2 (4) 2: 1
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

38. A metal wire when bent in the form of a square encloses an area 484 cm². If the same wire is bent in the form of a circle, then (taking $\pi = \frac{22}{7}$) its area is
(1) 308 cm² (2) 506 cm²
(3) 600 cm² (4) 616 cm²
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

39. Sides of a parallelogram are in the ratio 5 : 4. Its area is 1000 sq. units. Altitude on the greater side is 20 units. Altitude on the smaller side is
(1) 30 units (2) 25 units
(3) 10 units (4) 15 units
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

40. The perimeter of a rhombus is 40 cm and the measure of an angle is 60°, then the area of it is :
(1) $100\sqrt{3}$ cm² (2) $50\sqrt{3}$ cm²
(3) $160\sqrt{3}$ cm² (4) 100 cm²
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

41. If the four equal circles of radius 3 cm touch each other externally, then the area of the region bounded by the four circles is
(1) $4(9-\pi)$ sq.cm (2) $9(4-\pi)$ sq.cm
(3) $5(6-\pi)$ sq.cm (4) $6(5-\pi)$ sq.cm
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

42. The adjacent sides of a parallelogram are 36 cm and 27 cm in length. If the distance between the shorter sides is 12 cm, then the distance between the longer sides is
(1) 10 cm (2) 12 cm
(3) 16 cm (4) 9 cm
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

43. The length of a room floor exceeds its breadth by 20 m. The area of the floor remains unaltered when the length is decreased by 10 m but the breadth is increased by 5 m. The area of the floor (in square metres) is :
(1) 280 (2) 325
(3) 300 (4) 420
[SSC 10+2 Levle Data Entry Operator & LDC Exam, 2011]

44. A right angled isosceles triangle is inscribed in a semi-circle of radius 7 cm. The area enclosed by the semi-circle but exterior to the triangle is
(1) 14 cm² (2) 28 cm²
(3) 44 cm² (4) 68 cm²
[SSC Delhi Police S.I. Exam, 19.08.2012]

45. What is the area of a triangle having perimeter 32 cm, one side 11 cm and difference of other two sides 5 cm ?
(1) $8\sqrt{30}$ cm² (2) $5\sqrt{35}$ cm²
(3) $6\sqrt{30}$ cm² (4) $8\sqrt{2}$ cm²
[SSC Delhi Police S.I. Exam, 19.08.2012]

46. The radii of two circles are 5 cm and 3 cm, the distance between their centres is 24 cm. Then the length of the transverse common tangent is
(1) 16 cm (2) $15\sqrt{2}$ cm
(3) $16\sqrt{2}$ cm (4) 15 cm
[SSC Delhi Police S.I. Exam, 19.08.2012]

47. The volume of a right circular cone is 1232 cm³ and its vertical height is 24 cm. Its curved surface area is
(1) 154 cm² (2) 550 cm²
(3) 604 cm² (4) 704 cm²

48. A circle and a rectangle have the same perimeter. The sides of the rectangle are 18 cm and 26 cm. The area of the circle is

$\left[\text{Take } \pi = \frac{22}{7}\right]$

(1) 125 cm^2 (2) 230 cm^2
(3) 550 cm^2 (4) 616 cm^2

49. The volume of a solid hemisphere is 19404 cm^3. Its total surface area is
(1) 4158 cm^2 (2) 2858 cm^2
(3) 1738 cm^2 (4) 2038 cm^2

[SSC Graduate Level Tier-II Exam, 16.09.2012]

50. A solid hemisphere is of radius 11 cm. The curved surface area in sq. cm is
(1) 1140.85 (2) 1386.00
(3) 760.57 (4) 860.57

51. If the length of each median of an equilateral triangle is $6\sqrt{3}$ cm, the perimeter of the triangle is
(1) 24 cm (2) 32 cm
(3) 36 cm (4) 42 cm

52. A cone and a hemisphere stand on equal base and have the same height. The ratio of their whole surfaces is
(1) $\sqrt{2}+1:3$ (2) $\sqrt{2}-1:3$
(3) $\sqrt{2}:3$ (4) $2:3$

53. Two cubes of sides 6 cm each are kept side by side to form a rectangular parallelopiped. The area (in sq. cm) of the whole surface of the rectangular parallelopiped is
(1) 432 (2) 360
(3) 396 (4) 340

[SSC FCI Asstt. Grade-III Exam, 11.11.2012 (Ist Sitting)]

54. A solid sphere of 6 cm diameter is melted and recast into 8 solid spheres of equal volume. The radius (in cm) of each small sphere is
(1) 1.5 (2) 3
(3) 2 (4) 2.5

55. The length of each edge of a regular tetrahedron is 12 cm. The area (in sq. cm) of the total surface of the tetrahedron is
(1) $288\sqrt{3}$ (2) $144\sqrt{2}$
(3) $108\sqrt{3}$ (4) $144\sqrt{3}$

[SSC FCI Asstt. Grade-III Exam, 11.11.2012 (IInd Sitting)]

56. A parallelopiped whose sides are in ratio 2 : 4 : 8 have the same volume as a cube. The ratio of their surface area is :
(1) 7 : 5 (2) 4 : 3
(3) 8 : 5 (4) 7 : 6

57. The radii of two circles are 5cm and 12cm. The area of a third circle is equal to the sum of the areas of the two circles. The radius of the third circle is :
(1) 13 cm (2) 21 cm
(3) 30 cm (4) 17 cm

58. A sphere and a hemisphere have the same volume. The ratio of their curved surface areas is :
(1) $2^{-\frac{3}{2}}:1$ (2) $2^{\frac{2}{3}}:1$
(3) $4^{-\frac{2}{3}}:1$ (4) $2^{\frac{1}{3}}:1$

59. If the slant height of a right pyramid with square base is 4 metre and the total slant surface of the pyramid is 12 square metre, then the ratio of total slant surface and area of the base is :
(1) 16 : 3 (2) 24 : 5
(3) 32 : 9 (4) 12 : 3

[SSC (10+2) Level Data Entry Operator and LDC Exam, 21.10.2012 (IInd Sitting)]

60. What is the area of the triangle whose sides are 9cm, 10cm and 11cm?
(1) 30 cm^2 (2) 60cm^2
(3) $30\sqrt{2}$ cm^2 (4) $60\sqrt{2}$ cm^2

61. If the radius of a sphere be doubled, the area of its surface will become
(1) Double
(2) Three times
(3) Four times
(4) None of the mentioned

62. The area of the curved surface and the area of the base of a right circular cylinder are a square cm and b square cm respectively. The height of the cylinder is
(1) $\frac{2a}{\sqrt{\pi b}}$ cm (2) $\frac{a\sqrt{b}}{2\sqrt{\pi}}$ cm
(3) $\frac{a}{2\sqrt{\pi b}}$ cm (4) $\frac{a\sqrt{\pi}}{2\sqrt{b}}$ cm

63. The radius and height of a cylinder are in the ratio. 5 : 7 and its volume is 550 cm^3. Calculate its curved surface area in sq. cm.
(1) 110 (2) 444
(3) 220 (4) 616

[SSC (10+2) Level Data Entry Operator and LDC Exam, 28.10.2012 (Ist Sitting)]

64. The ratio of the edges of rectangular parallelopiped is 1 : 2 : 3 and its volume is 1296 cubic cm. The area of the whole surface in sq.cm is
(1) 696 (2) 792
(3) 824 (4) 548

65. The perimeter of a semi-circular area is 18cm, then the radius is :

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

(1) $5\frac{1}{3}$ cm (2) $3\frac{1}{2}$ cm

(3) 6 cm (4) 4 cm

[SSC (10+2) Level Data Entry Operator and LDC Exam, 04.11.2012 (Ist Sitting)]

66. If two adjacent sides of a rectangular parallelopiped are 1 cm and 2 cm and the total surface area of the parallelopiped is 22 square cm, then the diagonal of the parallelopiped is

(1) $\sqrt{10}$ cm (2) $2\sqrt{3}$ cm

(3) $\sqrt{14}$ cm (4) 4cm

67. The ratio of sides of a triangle is 3:4:5 and area of the triangle is 72 square unit. Then the area of an equilateral triangle whose perimeter is same as that of the previous triangle is

(1) $32\sqrt{3}$ square unit (2) $48\sqrt{3}$ square unit

(3) 96 square unit (4) $60\sqrt{3}$ square unit

68. The perimeter of a semicircular path is 36 m. Find the area of this semicircular path.

(1) 42sq.m (2) 54 sq. m

(3) 63 sq.m (4) 77 sq. m

[SSC (10+2) Level Data Entry Operator and LDC Exam, 04.11.2012 (IInd Sitting)]

ANSWERS

1. (1)	**2.** (2)	**3.** (3)	**4.** (1)	**5.** (1)
6. (2)	**7.** (2)	**8.** (3)	**9.** (2)	**10.** (2)
11. (1)	**12.** (2)	**13.** (2)	**14.** (4)	**15.** (2)
16. (1)	**17.** (2)	**18.** (2)	**19.** (2)	**20.** (1)
21. (2)	**22.** (2)	**23.** (1)	**24.** (2)	**25.** (1)
26. (1)	**27.** (2)	**28.** (2)	**29.** (2)	**30.** (2)
31. (3)	**32.** (1)	**33.** (3)	**34.** (3)	**35.** (4)
36. (1)	**37.** (2)	**38.** (4)	**39.** (2)	**40.** (2)
41. (2)	**42.** (4)	**43.** (3)	**44.** (2)	**45.** (1)
46. (3)	**47.** (2)	**48.** (4)	**49.** (1)	**50.** (3)
51. (3)	**52.** (1)	**53.** (2)	**54.** (1)	**55.** (4)
56. (4)	**57.** (1)	**58.** (4)	**59.** (1)	**60.** (3)
61. (3)	**62.** (3)	**63.** (3)	**64.** (2)	**65.** (2)
66. (3)	**67.** (2)	**68.** (4)		

EXPLANATIONS

1. (1) Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

where, a, b, c are sides of the triangular field and

$s = \frac{a+b+c}{2}$

Here, $s = \frac{72+30+78}{2} = \frac{180}{2} = 90$ metres

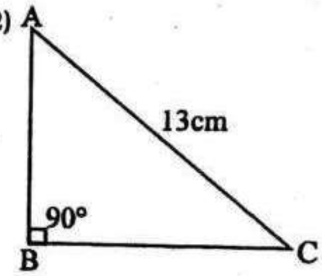
$\therefore$ Area $= \sqrt{90(90-72)(90-30)(90-78)}$

$= \sqrt{90 \times 18 \times 60 \times 12}$

$= \sqrt{5 \times 18 \times 18 \times 5 \times 12 \times 12}$

$= 5 \times 18 \times 12 = 1080$ sq. metres.

2. (2)



Perimeter = $AB + BC + CA = 30$ cm

$AC = 13$ cm

$\therefore AB + BC = 30 - 13 = 17$ cm

Let, $AB = x$, then $BC = 17 - x$

In right triangle, $AB^2 + BC^2 = AC^2$

$\Rightarrow x^2 + (17 - x)^2 = 13^2$

$\Rightarrow x^2 + 289 + x^2 - 34x = 169$

$\Rightarrow 2x^2 - 34x + 120 = 0$

$\Rightarrow x^2 - 17x + 60 = 0$

$\Rightarrow x^2 - 5x - 12x + 60 = 0$

$\Rightarrow x(x-5) - 12(x-5) = 0$

$\Rightarrow x(x-5)(x-12) = 0$

$\Rightarrow x - 5 = 0$ or $x - 12 = 0$

$\Rightarrow x = 5$ or $x = 12$

Hence, $AB = 5$ cm and $BC = 17 - 5 = 12$ cm

3. (3) It is given that the sides a, b, c of triangle are in the ratio 13 : 12 : 5

or, $a : b : c = 13 : 12 : 5$

$\therefore a = 13x$, $b = 12x$, $c = 5x$

Now, Perimeter = 450 metres

$\Rightarrow 13x + 12x + 5x = 450$

$\Rightarrow 30x = 450 \Rightarrow x = 15$

$\therefore a = 13x = 13 \times 15 = 195$ metres

$b = 12x = 12 \times 15 = 180$ metres

and, $c = 5x = 5 \times 15 = 75$ metres

$2S = 450$

$\therefore S = 225$ *[Given]*

Hence, Area $= \sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{225(225-195)(225-180)(225-75)}$

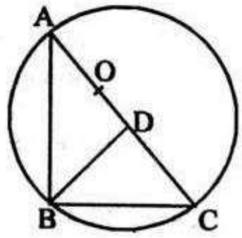
$= \sqrt{225 \times 30 \times 45 \times 150}$

$= \sqrt{5 \times 5 \times 3 \times 3 \times 3 \times 5 \times 2 \times 5 \times 3 \times 3 \times 5 \times 5 \times 3 \times 2}$

$= \sqrt{5^6 \times 3^6 \times 2^2} = 5^3 \times 3^3 \times 2$

$= 6750$ sq. metres.

4. (1) We know that the circum-centre of a right angled triangle is the mid-point of its hypotenuse and the circum-radius is half of the hypotenuse.



Let ABC be the given triangle with right angle at B. Let O be the mid-point of hypotenuse AC. Let BD be the perpendicular from B on AC.

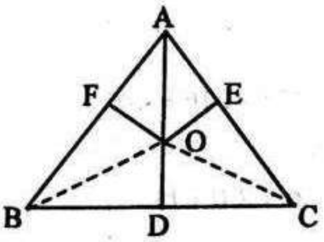
Then, $AC = 2\ OA = 2 \times 5 = 10$ cm

and, $BD = 4$ cm

$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times 10 \times 4 = 20$ sq.cm.

5. (1)



Suppose the length of each side of equilateral triangle ABC be x cm and also suppose, $OF = 20$ cm, $CD = 22$cm, $CE = 16$ cm

$\therefore$ Area of $\Delta BOC = \frac{1}{2} \times x \times 22 = 11x$ sq.cm.

Area of $\Delta COA = \frac{1}{2} \times x \times 16$

$= 8x$ sq. cm.

Area of $\Delta AOB = \frac{1}{2} \times x \times 20 = 10x$ sq.cm.

$\therefore$ Area of $\Delta ABC = \Delta BOC + \Delta COA + \Delta AOB$

$\Rightarrow \frac{\sqrt{3}}{4} x^2 = 11x + 8x + 10x$

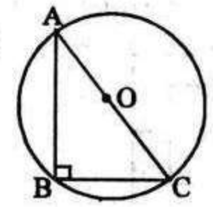
$\Rightarrow \frac{\sqrt{3}}{4} x^2 = 29x$ sq. cm

$\Rightarrow x = \frac{29 \times 4}{\sqrt{3}} = \frac{116}{\sqrt{3}}$ cm

$\therefore$ Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times x^2$

$= \frac{\sqrt{3}}{4} \times \frac{116}{\sqrt{3}} \times \frac{116}{\sqrt{3}} = \frac{29 \times 116}{\sqrt{3}} = 1942.26$ sq. cm.

6. (2)



Let ΔABC be right angled at B and a circle touches all the vertices of ΔABC. As we know, the angle at the circumference of a semi-circle is right angle.

Here, $\angle ABC = 90° \Rightarrow AC$ is the diameter of circle.

$\therefore AC = 2 \times$ radius $= 2 \times 6.5 = 13$ cm

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

$\Rightarrow AB^2 + BC^2 = 13^2 = 169$ ...(*i*)

Area of $\Delta ABC = \frac{1}{2} \times AB \times BC$

$\Rightarrow \frac{1}{2} AB \times BC = 30$

$\Rightarrow AB \times BC = 60$ ...(*ii*)

Now, $(AB + BC)^2 = AB^2 + BC^2 + 2AB \times BC$

$= 169 + 2 \times 60 = 169 + 120 = 289$

$\Rightarrow AB + BC = 17$ ...(*iii*)

Again, $(AB - BC)^2 = AB^2 + BC^2 - 2AB + BC$

$= 169 - 2 \times 60 = 169 - 120 = 40$

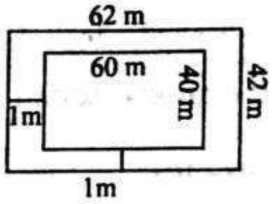
$\Rightarrow AB - BC = 7$ ...(*iv*)

From equation (*iii*) and (*iv*) we have

$AB = 12$ cm and $BC = 5$ cm

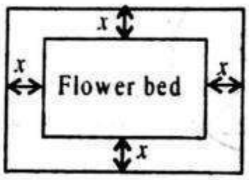
$\therefore$ Required ratio $= \frac{5}{12} = 5 : 12$

7. (2)



Length of the inner rectangle = 60 m
Width of the inner rectangle = 40 m
Area of the inner rectangle = 60 × 40 = 2400 sq. metres
Width of the path = 1m
∴ Length of outer rectangle = 60 + 2 × 1 = 62 m
Width of outer rectangle = 40 + 2 × 1 = 42 m
Area of the outer rectangle = 62 × 42 = 2604 sq. metres
Area of path
= Area of outer rectangle – Area of inner rectangle
= 2604 – 2400 = 204 sq. metres.

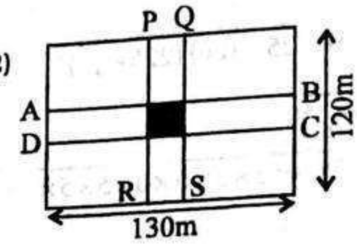
8. (3) Let the width of the gravel path be x metres



Then, each side of the square flowerbed
$= (44 - 2x)$ m
∴ Its area $= (44 - 2x)^2$ sq. metres
Now, Area of square field
= 44 × 44 sq. metres
∴ Area of the gravel path
= Area of the field – Area of the flower bed
$= [(44)^2 - (44 - 2x)^2]$ sq. metres
$= (44 + 44 - 2x)(44 - 44 + 2x)$ sq. metres
$= (88 - 2x)(2x)$ sq. metres
$= (176x - 4x^2)$ sq. metres
Cost of laying the flower bed
= Rs. $(44 - 2x)^2 \times 2$
Cost of gravelling the path
= Rs. $(176x - 4x^2) \times 1$
$\therefore 2 \times (44 - 2x)^2 + (176x - 4x^2) \times 1 = 3536$
$\Rightarrow 3872 - 352x + 8x^2 + 176x - 4x^2 = 3536$
$\Rightarrow 4x^2 - 176x + 336 = 0$
$\Rightarrow x^2 - 44x + 84 = 0$
$\Rightarrow x^2 - 42x - 2x + 84 = 0$
$\Rightarrow x(x - 42) - 2(x - 42) = 0$
$\Rightarrow (x - 42)(x - 2) = 0$
$\Rightarrow x = 42$ or 2

But $x \neq 42$ because the side of the square = 44 metres
Hence, the width of the gravelled path = 2 metres.

9. (2)



Length of road $ABCD$ = 130 m and its
Breadth = 2 m
∴ Area = 130 × 2 = 260 sq. metres
Length of road $PQRS$ = 120 m and its
Breadth = 2 m
∴ Area = 120 × 2 = 240 sq. metres
Obviously, the shaded portion is included in both roads
Area of the shaded portion = 2 × 2
= 4 sq. metres
∴ Area of the roads = 260 + 240 – 4
= 496 sq. metres
Cost = Rs. 150 per square metre
∴ Total cost = 496 × 150
= Rs. 74400

10. (2) Let the length of the rectangular field be l m and breadth be b m.

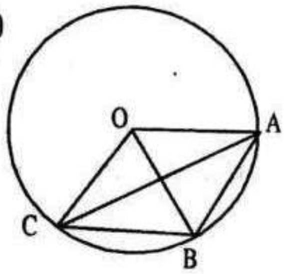
$\therefore$ Diagonal $= \sqrt{(\text{Length})^2 + (\text{Breadth})^2}$

$\Rightarrow 15 = \sqrt{l^2 + b^2}$
$\Rightarrow 225 = l^2 + b^2$ ...(i)
And its area $= lb = 108$ sq. metres
$\therefore (l + b)^2 = l^2 + b^2 + 2lb$
$= 225 + 2 \times 108 = 225 + 216 = 441$
$\therefore l + b = \sqrt{441} = 21$
∴ Perimeter of field $= 2(l + b)$
= 2 × 21 = 42 m
Rate of fencing = Rs. 5 per metre
∴ Total cost of fencing = 5 × 42 = Rs. 210

11. (1) Let the height of the room be x m.
∴ Breadth $= 2x$ m
∴ Area of four walls = 2 × height (length + breadth)
$= 2 \times x(18 + 2x)$
$= (36x + 4x^2)$ sq. metres
Area of a paper piece = 2 × 2
= 4 sq. metres

Area of 70 equal paper pieces
$= 70 \times 4 = 280$ sq. metres
$\therefore 36x + 4x^2 = 280$
$\Rightarrow x^2 + 9x - 70 = 0$
$\Rightarrow x^2 - 14x - 5x - 70 = 0$
$\Rightarrow x(x + 14) - 5(x + 14) = 0$
$\Rightarrow (x + 14)(x - 5) = 0$
$\Rightarrow x = 5, -14$
But height can't be negative.
$\therefore x = 5$m i.e. height = 5m
$\therefore$ Breadth $= 2 \times 5 = 10$ m
$\therefore$ Area of floor $= 18 \times 10 = 180$ sq. metres
Rate of flooring = Rs. 20 per sq. metres
$\therefore$ Total cost $= 180 \times 20 =$ Rs. 3600

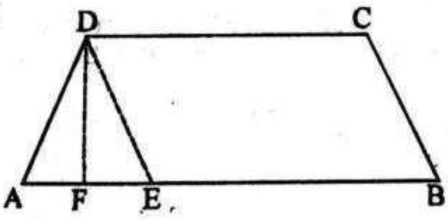
12. (2)



Since $OABC$ is a rhombus
Therefore, $AB = BC = OA = OC = 10$ cm
In triangle OBC,
$OC = OB$ (radii of circle)
$\therefore OC = OB = BC = 10$ cm
$\therefore \Delta OBC$ is an equilateral triangle
$\therefore$ Area of rhombus $OABC$
$= 2 \times$ Area of ΔOBC

$$= 2 \times \frac{\sqrt{3}}{4} \times 10 \times 10 = 50\sqrt{3} \text{ sq. metres.}$$

13. (2)



Let $ABCD$ be the given trapezium in which
$AB = 77$ cm, $CD = 60$ cm
$BC = 25$ cm and $AD = 26$ cm
Draw $DE \parallel BC$ and $DF \perp AB$
Now, $DE = BC = 25$ cm
$AE = AB - EB = AB - CD = 77 - 60 = 17$ cm

Thus in ΔDAE, we have

$$S = \frac{17 + 25 + 26}{2} = 34$$

$\therefore$ Area of ΔDAE

$$= \sqrt{34(34-17)(34-25)(34-26)}$$

$$= \sqrt{34 \times 17 \times 9 \times 8} = 204 \text{ sq. cm}$$

Again area of $\Delta DAE = \frac{1}{2} \times AE \times DF$

$$204 = \frac{1}{2} \times 17 \times DF$$

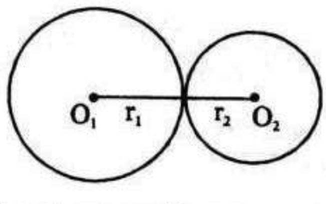
$$\Rightarrow DF = \frac{204 \times 12}{17} = 24 \text{cm}$$

$\therefore$ Area of trapezium $ABCD$

$$= \frac{1}{2}(AB + CD) \times DF$$

$$= \frac{1}{2}(77 + 60) \times 24 = 1644 \text{ sq. cm}$$

14. (4) Let the radii of the two circles be r_1 and r_2 cm respectively.



$\therefore$ They touch externally $r_1 + r_2 = 14$ ...(i)
According to the question,

$$\pi r_1^2 + \pi r_2^2 = 130\pi$$

$\Rightarrow r_1^2 + r_2^2 = 130$ ...(ii)

Now, $(r_1 + r_2)^2 = r_1^2 + r_2^2 + 2r_1r_2$
$14^2 = 130 + 2r_1r_2$ *[By equations (i) and (ii)]*
$\Rightarrow 2r_1r_2 = 196 - 130 = 66 \Rightarrow r_1r_2 = 33$ ...(iii)
$\therefore (r_1 - r_2)^2 = r_1^2 + r_2^2 - 2r_1r_2 = 130 - 66 = 64$

$\Rightarrow r_1 - r_2 = \sqrt{64} = 8$ ..(iv)
Solving equations (i) and (iv) we have
$r_1 = 11$ cm and $r_2 = 3$ cm

15. (2) Area of the square $= 484$ cm^2
$\therefore$ Side $= \sqrt{484} = 22$ cm
Length of wire = Perimeter of square
$= 4 \times$ Side $= 4 \times 22 = 88$ cm
Let r be the radius of the circle

Then, circumference of circle = Perimeter of the square

$\therefore 2\pi r = 88$

$\Rightarrow r = \frac{88}{2\pi} = \frac{88 \times 7}{22 \times 2} = 14$ cm

$\therefore$ Area of circle = πr^2

$= \frac{22}{7} \times 14 \times 14 = 616\text{ cm}^2$

16. (1) Area of quadrant $AOBCA = \frac{1}{4}\pi r^2$

$= \frac{1}{4} \times \frac{22}{7} \times (3.5)^2 = 9.625\text{ cm}^2$

Area of $\Delta AOD = \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 3.5 \times 2 = 3.5\text{ cm}^2$

$\therefore$ Area of the shaded portion

= Area of quadrant – Area of ΔAOD

$= 9.625 - 3.5 = 6.125\text{ cm}^2$

17. (2) Distance covered by the wheel in one revolution

$= \frac{\text{Distance covered}}{\text{Number of revolutions}} = \frac{11}{5000}$ km

$= \frac{11 \times 1000 \times 100}{5000}$ cm = 220 cm

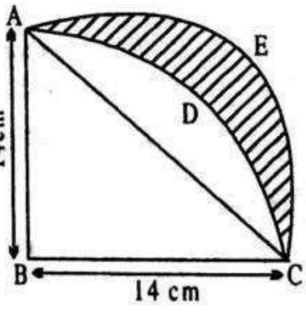
$\therefore$ Circumference of the wheel = 220 cm

or, Let diameter = d cm

$\therefore \pi d = 220$ cm

$\therefore d = \frac{220}{\pi} = \frac{220 \times 7}{22} = 70$ cm

18. (2)



In the right angled triangle ABC

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

$\Rightarrow AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{14^2 + 14^2} = \sqrt{2 \times 14^2}$

$= 14\sqrt{2}$ cm

$\therefore$ Radius of semi-circle

$= \frac{AC}{2} = \frac{14\sqrt{2}}{2} = 7\sqrt{2}$ cm

$\therefore$ Required area (shaded portion)

= Area of $ADCEA$

= Area of $ACEA$ – Area of $ACDA$

= Area $ACEA$ – (Area of $ABCDA$ – Area of ΔABC)

$= \frac{1}{2} \times \frac{22}{7} \times (7\sqrt{2})^2 - \left[\frac{1}{4} \times \frac{22}{7} \times 14^2 - \frac{1}{2} \times 14 \times 14\right]$.

$= \frac{1}{2} \times \frac{22}{7} \times 49 \times 2 - \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 + \frac{1}{2} \times 14 \times 14$

$= 154 - 154 + 98 = 98\text{ cm}^2$.

19. (2) Angle described by minute hand in 60 minutes

$= 360°$

Angle described by minute hand in 35 minutes

$= \frac{360}{60} \times 35 = 210°$

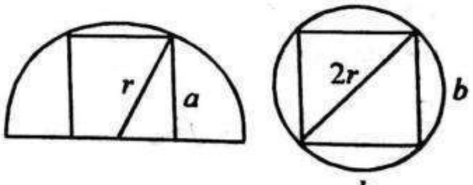
$\therefore$ The required area swept by the minute hand = Area of sector $r = 10$ cm

and, $\theta = 210°$

$= \frac{22}{7} \times 10 \times 10 \times \frac{210}{360}$

$= 183.3\text{ cm}^2$.

20. (1)



Let the side of square formed in semi-circle be a units and radius of semi circle be r units

$\therefore r^2 = a^2 + \frac{a^2}{4} = \frac{5a^2}{4}$

$\therefore a^2 = \frac{4r^2}{5}$

For square inscribed in circle,

$(2r)^2 = b^2 + b^2 = 2b^2$

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

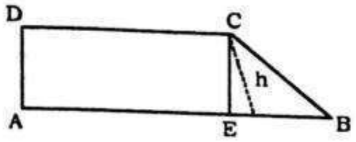
$\Rightarrow b^2 = 2r^2$

$\therefore$ Area $= b^2 = 2r^2$

$\therefore$ Required ratio $= \dfrac{\frac{4r^2}{5}}{2r^2} = \dfrac{4r^2}{5} \times \dfrac{1}{2r^2}$

$= \dfrac{2}{5} = 2 : 5$

21. (2)



Let ABCD be the given trapezium in which AB = 41m, CD = 20m. BC = 17m and AD = 10m.
Draw CE || AD.
Now ADCE is a parallelogram in which
AD || CE and AE || CD
$\therefore$ AE = DC = 20m. and BE
= AB – AE = 41 – 20 = 21m.

In ΔBCE, $S = \dfrac{10+17+21}{2} = 24$

Area of Δ BCE $= \sqrt{24(24-10)(24-17)(24-21)}$

$= \sqrt{24 \times 14 \times 7 \times 3} = 84\text{m}^2$ ... (i)

Let h be the height of Δ BCE, then Area of ΔBCE

$= \dfrac{1}{2}$(Base × Height)

$= \dfrac{1}{2} \times 21 \times h$ ... (ii)

From (i) and (ii) we have,

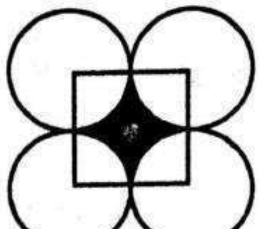
$\dfrac{1}{2} \times 21 \times h = 84 \Rightarrow h = \dfrac{84 \times 2}{21} = 8\text{m}.$

Clearly, the height of trapezium ABCD is same as that of ΔBCE.
$\therefore$ Area of trapezium

$= \dfrac{1}{2}(AB + CD) \times h = \dfrac{1}{2}(41 + 20) \times 8$

$= 61 \times 4 = 244\text{m}^2$
Now, rate of levelling the field = Rs. 30/m^2
$\therefore$ Total cost = 244 × 30 = Rs. 7320.

22. (2)

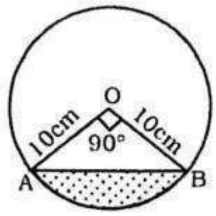


Four equal quadrants of circles are included in side the square.
$\therefore$ Area of the shaded portion
= Area of square — 4 × Area of a quadrant of circle

$= (14)^2 - 4 \times \dfrac{\pi}{4} \times 7^2 = 196 - \dfrac{22}{7} \times 7 \times 7$

= 196 – 154 = 42 sq. cm.

23. (1)



We know that the area of a minor segment of angle θ° in a circle of radius r is given by

$A = r^2 \left[\dfrac{\pi\theta}{360°} - \dfrac{1}{2}\sin\theta\right]$

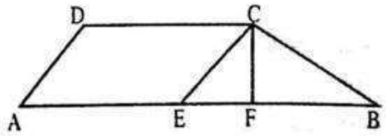
Here, $r = 10$, $\theta = 90°$

$\therefore A = (10)^2 \left[\dfrac{3.14 \times 90°}{360°} - \dfrac{1}{2}\sin 90°\right]\text{cm}^2$

$= 100\left[\dfrac{3.14}{4} - \dfrac{1}{2}\right]\text{cm}^2 = [3.14 \times 25 - 50]\ \text{cm}^2$

= (78.5 – 50) cm² = 28.5 cm²
Area of the major segment
= Area of the circle – Area of the minor segment
= [3.14 × 10² – 28.5] cm²
= [314 – 28.5] cm² = 285.5 cm²

24. (2)



Let ABCD be the field in the shape of a trapezium, where AB = 82 m, CD = 40 m, BC = 34 m and AD = 20 m
Draw CE || AD.
Now, ADCE is a parallelogram in which AD || CE
and AE || CD.
$\therefore$ AE = DC = 40 m and
BE = AB – AE = 82 – 40 = 42 m
In Δ BCE,

Semi-perimeter, $s = \dfrac{20 + 34 + 42}{2} = \dfrac{96}{2} = 48$

$\therefore$ Area of Δ BCE

$= \sqrt{48(48-20)(48-34)(48-42)}$

$= \sqrt{48 \times 28 \times 14 \times 6} = 336\ m^2$ ..... (i)

Let the height of Δ BCE = h metre

∴ Area of Δ BCE = $\frac{1}{2}$ × base × height

$= \frac{1}{2} \times 42 \times h$ ..... (ii)

From equations (i) and (ii),

$\frac{1}{2} \times 42 \times h = 336$

$\Rightarrow h = \frac{336 \times 2}{42} = 16$ m

∴ Height of the trapezium ABCD = 16 m

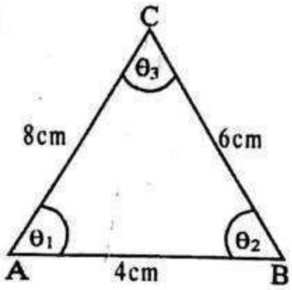
∴ Its area = $\frac{1}{2}(AB + CD) \times h$

$= \frac{1}{2}(82 + 40) \times 16 = 122 \times 8 = 976\ m^2$

Cost of levelling = Rs. 30 /m^2

∴ Total cost = Rs. (976 × 30) = Rs. 29280

25. (1)



Let $a = 6$ cm, $b = 8$ cm,
and $c = 4$ cm

Semi-perimeter (s)

$= \frac{a+b+c}{2} = \frac{6+8+4}{2} = 9$cm

Area of the triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{9(9-6)(9-8)(9-4)}$

$= \sqrt{9 \times 3 \times 1 \times 5} = 3\sqrt{15}$ sq.cm

Area of sectors $= \frac{\pi r^2}{360}(\theta_1 + \theta_2 + \theta_3)$

$= \frac{\pi \times 1^2}{360} \times 180 = \frac{22}{7 \times 2} = \frac{11}{7}$ sq.cm.

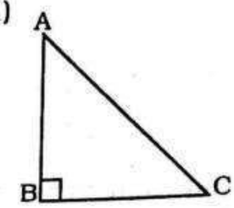
∴ Area of the remaining portion of the triangle

$= \left(3\sqrt{15} - \frac{11}{7}\right)$sq.cm

= (3 × 3.9 − 1.6) sq. sm

= (11.7 − 1.6) sq. cm = 10.1 sq. cm

26. (1)



AB = BC = x

$\therefore\ AC = \sqrt{AB^2 + BC^2} = \sqrt{x^2 + x^2}$

$= \sqrt{2}x$ units

$\therefore\ 2x + \sqrt{2}x = 2p$

$\Rightarrow x(2 + \sqrt{2}) = 2p$

$\Rightarrow x = \frac{2p}{2+\sqrt{2}} = \frac{2p(2-\sqrt{2})}{(2+\sqrt{2})(2-\sqrt{2})}$

$= \frac{2(2-\sqrt{2})p}{4-2} = (2-\sqrt{2})p$

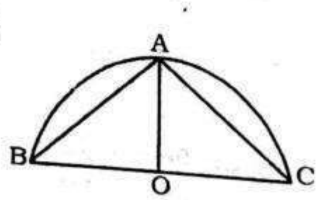
∴ Area of triangle = $\frac{1}{2}x^2$

$= \frac{1}{2} \times (2-\sqrt{2})^2 p^2$

$= \frac{4+2-4\sqrt{2}}{2}p^2$

$= (3-2\sqrt{2})p^2$ sq. units

27. (2)



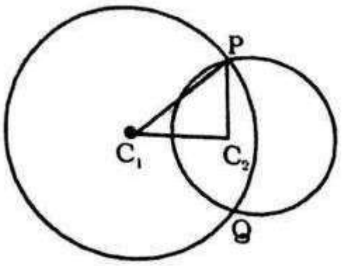
OA = $\frac{1}{2}$ BC = radius

Area of the largest triangle

$= \frac{1}{2} \times BC \times OA = \frac{1}{2} \times 2x \times x$

$= x^2$

28. (2)



PQ = common chord

$C_1P = 20$, $C_2P = 15$

$C_1C_2 = 25$

$25^2 = 20^2 + 15^2$

$\therefore \angle C_1PC_2 = 90°$

$\therefore PQ = 2C_2P = 30$

29. (2) For $3x + 4y = 12$,

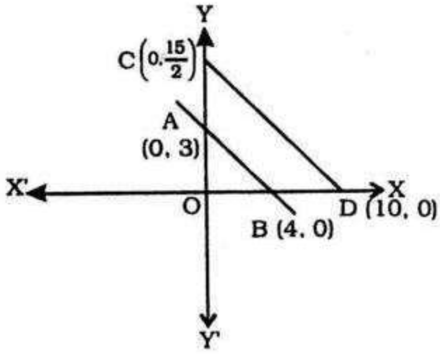
By putting $x = 0$, $y = 3$

By putting, $y = 0$, $x = 4$

For $6x + 8y = 60$,

By putting $x = 0$, $y = \frac{15}{2}$

By putting $y = 0$, $x = 10$



$\therefore$ Area of Δ OCD = $\frac{1}{2} \times OD \times OC$

$= \frac{1}{2} \times 10 \times \frac{15}{2} = \frac{75}{2}$

$\therefore$ Area of Δ OAB

$= \frac{1}{2} \times OB \times OA$

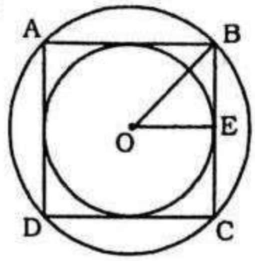
$= \frac{1}{2} \times 4 \times 3 = 6$

$\therefore$ Area of trapezium = $\frac{75}{2} - 6$

$= \frac{75 - 12}{2} = \frac{63}{2}$

= 31.5 sq. units

30. (2)



Radius of incircle = OE = $\frac{AB}{2}$

= 7 cm

Radius of circum-circle = OB

$= \frac{\text{Diagonal BD}}{2}$

$= \frac{\sqrt{2} \times 14}{2} = 7\sqrt{2}$ cm

$\therefore$ Required ratio = $7 : 7\sqrt{2}$

$= 1 : \sqrt{2}$

31. (3) Perimeter = 4 × Side

$= 4 \times \frac{1}{2} . \sqrt{d_1^2 + d_2^2}$

$= 2\sqrt{d_1^2 + d_2^2}$

$\Rightarrow 146 = 2\sqrt{55^2 + d_2^2}$

$\Rightarrow 73 = \sqrt{55^2 + d_2^2}$

$\Rightarrow 73^2 = 55^2 + d_2^2$

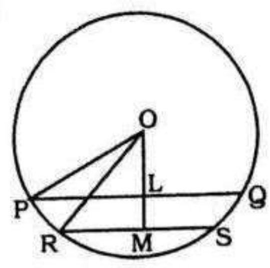
$\Rightarrow 73^2 - 55^2 = d_2^2$

$\Rightarrow d_2^2 = (73 + 55)(73 - 55)$

$= 128 \times 18$

$\Rightarrow d_2 = 48$ cm

32. (1)



OP = OR = 10 cm

PL = 8 cm, RM = 6 cm

$\therefore OP^2 = OL^2 + PL^2$ and $OR^2 = OM^2 + RM^2$

$\Rightarrow 100 = OL^2 + 64$ and $100 = OM^2 + 36$

$\Rightarrow OL^2 = 6$ and $OM^2 = 64$

$\Rightarrow OL = 6$ and $OM = 8$

$\therefore LM = OM - OL = 8 - 6$

$= 2$ cm

33. (3) Side of the first square $= \sqrt{\text{Area}}$

$= \sqrt{200} = 10\sqrt{2}$ metre

Its diagonal $= \sqrt{2} \times$ side

$= 10\sqrt{2} \times \sqrt{2}$

$= 20$ metre

$\therefore$ Diagonal of new square

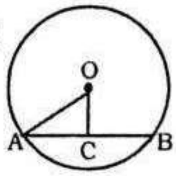
$= \sqrt{2} \times 20 = 20\sqrt{2}$ metre

$\therefore$ Its area $= \frac{1}{2} \times (\text{diagonal})^2$

$= \frac{1}{2} \times 20\sqrt{2} \times 20\sqrt{2}$

$= 400$ sq. metre

34. (3)



OC = 12 cm AC = CB = 5 cm

$\therefore$ Radius 'OA' $= \sqrt{OC^2 + AC^2}$

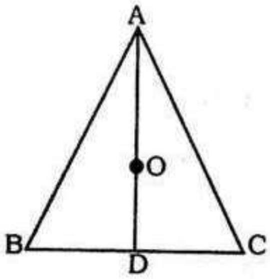
$= \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$

$= \sqrt{169} = 13$ cm

$\therefore$ Diameter of circle

$= 2 \times 13 = 26$ cm

35. (4)



DB= DC = 3cm.

$AD = \sqrt{AB^2 - BD^2} = \sqrt{6^2 - 3^2}$

$= \sqrt{36 - 9} = \sqrt{27} = 3\sqrt{3}$ cm.

$\therefore$ OD = In-radius

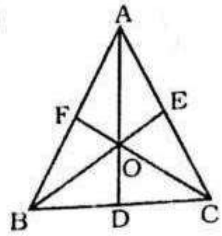
$= \frac{1}{3} \times 3\sqrt{3} = \sqrt{3}$ cm.

$\therefore$ Area of the in-circle

$= \pi r^2$

$= \pi \times \sqrt{3} \times \sqrt{3} = 3\pi$ sq.cm.

36. (1)



Let AB = x cm.

$\therefore BD = \frac{x}{2}$

$AD = \sqrt{x^2 - \frac{x^2}{4}} = \frac{\sqrt{3}}{2} x$ cm.

$\therefore OD = \frac{1}{3} \times \frac{\sqrt{3}}{2} x = \frac{x}{2\sqrt{3}}$ cm.

$OB = \sqrt{BD^2 + OD^2}$

$= \sqrt{\frac{x^2}{4} + \frac{x^2}{12}} = \sqrt{\frac{4x^2}{12}} = \frac{x}{\sqrt{3}}$ cm.

$\therefore \frac{x}{\sqrt{3}} = 10 \Rightarrow x = 10\sqrt{3}$ cm.

$\therefore OD = \frac{x}{2\sqrt{3}} = \frac{10\sqrt{3}}{2\sqrt{3}} = 5$ cm.

37. (2) $\theta_1 = 60° = \frac{60 \times \pi}{180}$

$= \frac{\pi}{3}$ radian

$\theta_2 = 75° = \frac{75 \times \pi}{180}$

$= \frac{5\pi}{12}$ radian

$\theta = \frac{l}{r} \Rightarrow \theta \propto \frac{1}{r}$

$\therefore \frac{r_1}{r_2} = \frac{\theta_2}{\theta_1} = \frac{5\pi}{12} \times \frac{3}{\pi} = 5:4$

38. (4) Side of square

$= \sqrt{484} = 22$ cm

$\therefore$ length of wire $= 22 \times 4$

$= 88$ cm

$\therefore\ 2\pi r = 88$

$\Rightarrow 2 \times \frac{22}{7} \times r = 88$

$\Rightarrow r = \frac{88 \times 7}{2 \times 22} = 14$ cm

$\therefore$ Area of circle $= \pi r^2$

$= \frac{22}{7} \times 14 \times 14 = 616$ sq.cm.

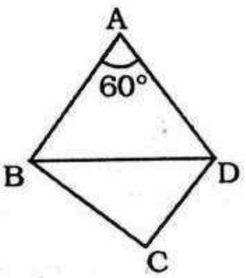
39. (2) Let the sides of parallelogram be $5x$ and $4x$.
Base × Height
= Area of parallelogram
$\therefore 5x \times 20 = 1000$

$\Rightarrow x = \frac{1000}{5 \times 20} = 10$

$\therefore$ Sides = 50 and 40 units
$\therefore 40 \times h = 1000$

$\Rightarrow h = \frac{1000}{40} = 25$ units

40. (2)



Side $= \frac{40}{4} = 10$ cm

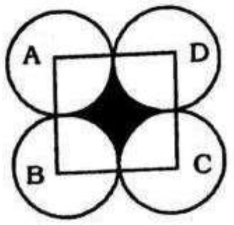
AB = AD = 10 cm
$\angle ABD = \angle ADB = 60°$
$\therefore$ Area of the rhombus

$= 2 \times \frac{\sqrt{3}}{4} \times (AB)^2$

$= 2 \times \frac{\sqrt{3}}{4} \times 10 \times 10$

$= 50\sqrt{3}$ cm²

41. (2)



Area of the shaded region
= Area of square of side 6cm – 4 × a right angled sector

$= 36 - 4 \times \frac{\pi \times 3^2}{4}$

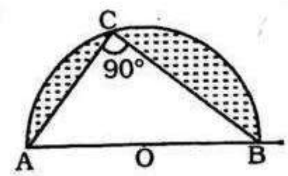
$= 36 - 9\pi = 9(4 - \pi)$ sq. cm.

42. (4) Area of parallelogram
= base × height
$= 27 \times 12 = 324$ sq. cm.
Again,
$324 = 36 \times h$

$\Rightarrow h = \frac{324}{36} = 9$cm

43. (3) Let the breadth of floor be x metre.
$\therefore$ Length $= (x + 20)$ metre
$\therefore$ Area of the floor
$= (x + 20)\, x$ sq. metre
In case II,
$(x + 10)(x + 5) = x(x + 20)$
$\Rightarrow x^2 + 15x + 50 = x^2 + 20x$
$\Rightarrow 20x = 15x + 50$
$\Rightarrow 5x = 50$
$\Rightarrow x = 10$ metre
$\Rightarrow$ Length $= x + 20 = 10 + 20$
= 30 metre
$\therefore$ Area of the floor $= 30 \times 10$
= 300 sq.metre

44. (2)



$\angle ACB = 90°$
AC = CB = x cm
AB = 14 cm
From Δ ABC
$AC^2 + BC^2 = AB^2$
$\Rightarrow x^2 + x^2 = 14^2$
$\Rightarrow 2x^2 = 14 \times 14$
$\Rightarrow x^2 = 14 \times 7$
$\Rightarrow x = \sqrt{14 \times 7} = 7\sqrt{2}$ cm
$\therefore$ Area of Δ ABC

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

$= \frac{1}{2} \times 7\sqrt{2} \times 7\sqrt{2} = 49$ sq. cm

Area of semi-circle

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

= 77 sq. cm

∴ Area of the shaded region

= 77 − 49 = 28 sq. cm

45. (1) Let the sides of triangle be a, b and c respectively.

$\therefore 2s = a + b + c = 32$

$\Rightarrow 11 + b + c = 32$

$\Rightarrow b + c = 32 - 11 = 21$ .....(i)

and $b - c = 5$ ....(ii)

By equations (i) and (ii)

$2b = 26 \Rightarrow b = 13$

$\therefore c = 13 - 5 = 8$

$\therefore 2s = 32 \Rightarrow s = 16$

$a = 11, b = 13, c = 8$

∴ Area of triangle

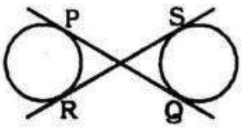
$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{16(16-11)(16-13)(16-8)}$

$= \sqrt{16 \times 5 \times 3 \times 8}$

$= 8\sqrt{30}$ sq. cm

46. (3) Transverse common tangent



$= \sqrt{d^2 - (r_1 + r_2)^2}$

$= \sqrt{(24)^2 - (5+3)^2}$

$= \sqrt{576 - 64} = \sqrt{512}$

$= 16\sqrt{2}$ cm.

47. (2) $\frac{1}{3}\pi r^2 h = 1232$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 1232$

$\Rightarrow r^2 = \frac{1232 \times 3 \times 7}{22 \times 24} = 49$

$\therefore r = \sqrt{49} = 7$ cm.

∴ Slant height $(l) = \sqrt{h^2 + r^2}$

$= \sqrt{24^2 + 7^2} = \sqrt{625} = 25$ cm.

∴ Curved surface of cone = πrl

$= \frac{22}{7} \times 7 \times 25 = 550$ cm^2

48. (4) $2\pi r = 2(18 + 26)$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44 \times 2$

$\Rightarrow r = 14$ cm

∴ Area of circle = πr^2

$= \frac{22}{7} \times 14 \times 14 = 616$ sq. cm.

49. (1) $\frac{2}{3}\pi r^3 = 19404$

$\Rightarrow \frac{2}{3} \times \frac{22}{7} \times r^3 = 19404$

$\Rightarrow r^3 = \frac{19404 \times 3 \times 7}{2 \times 22} = 9261$

$\therefore r = \sqrt[3]{21 \times 21 \times 21} = 21$ cm.

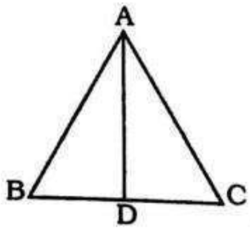
∴ Total surface area = $3\pi r^2$

$= 3 \times \frac{22}{7} \times 21 \times 21 = 4158$ sq. cm.

50. (3) Curved surface area of hemisphere

$= 2\pi r^2 = 2 \times \frac{22}{7} \times 11 \times 11 = 760.57$ sq.cm.

51. (3)



If AB = x cm, then

BD = $\frac{x}{2}$ cm

∴ From Δ ABD

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

$\Rightarrow x^2 = \frac{x^2}{4} + (6\sqrt{3})^2$

$\Rightarrow x^2 - \frac{x^2}{4} = 36 \times 3$

$\Rightarrow \frac{3x^2}{4} = 36 \times 3$

$\Rightarrow x^2 = 36 \times 4$

$\Rightarrow x = 6 \times 2 = 12$ cm

$\therefore$ Perimeter of equilateral triangle = 3×12

= 36 cm

52. (1) Slant height of cone (l)

$= \sqrt{r^2 + h^2} = \sqrt{r^2 + r^2} = \sqrt{2}r$

$$\frac{\text{Total surface area of cone}}{\text{Total surface area of hemi - sphere}}$$

$$= \frac{\pi rl + \pi r^2}{3\pi r^2} = \frac{l + r}{3r} = \frac{\sqrt{2}r + r}{3r} = \sqrt{2} + 1 : 3$$

53. (2) Length of parallelopiped

= 12 cm.

breadth = 6 cm.

height = 6 cm.

$\therefore$ Total surface area

= 2 (12 × 6 + 6 × 6 + 12 × 6) sq.cm.

= 2 (72 + 36 + 72) sq.cm.

= 360 sq.cm.

54. (1) Volume of original sphere

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

$= 36\pi$ cu. cm.

$\therefore \; 8 \times \frac{4}{3}\pi r_1^3 = 36\pi$

$\Rightarrow \; r_1^3 = \frac{36 \times 3}{8 \times 4} = \frac{27}{8}$

$\therefore \; r_1 = \sqrt[3]{\frac{27}{8}} = \frac{3}{2} = 1.5$ cm

55. (4) Total surface of the tetrahedron

$= 4 \times \frac{\sqrt{3}}{4} \times 12^2 = 144\sqrt{3}$ sq.cm.

56. (4) Let the sides of the parallelopiped be $2x$, $4x$ and $8x$ units respectively and the edge of cube be y units.

$\therefore 2x \times 4x \times 8x = y^3$

$\Rightarrow 8 \times 8\, x^3 = y^3$

Taking cube roots,

$\Rightarrow 4x = y$ .....(i)

Surface area of parallelopiped

$= 2\,(2x \times 4x + 4x \times 8x + 8x \times 2x)$

$= 2\,(8x^2 + 32x^2 + 16x^2)$

$= 112x^2$ sq. units.

Surface area of cube = $6y^2$ sq. units.

$\therefore$ Required ratio

$= \frac{112x^2}{6y^2} = \frac{112x^2}{6 \times 16x^2} = \frac{7}{6} = 7 : 6$

57. (1) $\pi r^2 = \pi \times 5^2 + \pi \times 12^2$

$\Rightarrow r^2 = 25 + 144 = 169$

$\Rightarrow r = \sqrt{169} = 13$ cm

58. (4) $\frac{4}{3}\pi r^3 = \frac{2}{3}\pi r_1^3$

$\Rightarrow 2r^3 = r_1^3 \Rightarrow \frac{r}{r_1} = \frac{1}{2^{\frac{1}{3}}}$

$\therefore$ Required ratio $= \frac{4\pi r^2}{2\pi r_1^2} = 2\left(\frac{r}{r_1}\right)^2 = 2\left(\frac{1}{2^{\frac{1}{3}}}\right)^2$

$= 2 \times 2^{-\frac{2}{3}} : 1 = 2^{\frac{1}{3}} : 1$

59. (1) If the length of each side of base be x metres, then

$\frac{1}{2} \times$ perimeter of base × slant height = 12

$\Rightarrow \frac{1}{2} \times 4x \times 4 = 12$

$\Rightarrow x = \frac{12}{8} = \frac{3}{2}$ metre

$\therefore$ Area of the base $= \frac{9}{4}$ sq. metre

$\therefore$ Required ratio $= 12 : \frac{9}{4} = 16 : 3$

60. (3) Semi-perimeter(s)

$= \frac{9 + 10 + 11}{2} = 15$ cm

Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{15(15-9)(15-10)(15-11)}$

$= \sqrt{15 \times 6 \times 5 \times 4} = 30\sqrt{2}$ square cm.

61. (3) Original surface area of sphere = $4\pi r^2$

Case II,

Surface area of sphere

$= 4\pi(2r)^2 = 16\pi r^2 = 4 \times 4\pi r^2$

62. (3) Curved surface of cylinder = $2\pi rh = a$

Area of base = $\pi r^2 = b$

$\therefore 2\pi rh = a$

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

$\Rightarrow 4\pi bh^2 = a^2$

$\Rightarrow h^2 = \frac{a^2}{4\pi b}$

$\Rightarrow h = \frac{a}{2\sqrt{\pi b}}$ cm.

63. (3) $V = \pi r^2 h$

$\Rightarrow 550 = \pi \times 5x \times 5x \times 7x$

$\Rightarrow 550 = \frac{22}{7} \times 25 \times 7x^3$

$\Rightarrow x^3 = \frac{550}{22 \times 25} = 1$

$\Rightarrow x = 1$

$\therefore$ Area of curved surface

$= 2 \times \frac{22}{7} \times 5 \times 7 = 220$ sq.cm.

64. (2) Let the edges of rectangular parallelopiped be x, $2x$ and $3x$ cm respectively.

$\therefore x \times 2x \times 3x = 1296$

$\Rightarrow x^3 = 1296 \div 6 = 216$

$\therefore x = \sqrt[3]{216} = 6$

$\therefore$ Total surface area

$= 2\,(x \times 2x + 2x \times 3x + 3x \times x)$

$= 2\,(2x^2 + 6x^2 + 3x^2)$

$= 22x^2$

$= 22 \times 6 \times 6 = 792$ sq.cm.

65. (2) Perimeter of semi-circular region = 18 cm

$\therefore \pi r + 2r = 18$

$\Rightarrow r(\pi + 2) = 18$

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 18$

$\Rightarrow r\left(\frac{36}{7}\right) = 18$

$\Rightarrow r = \frac{18 \times 7}{36} = \frac{7}{2} = 3\frac{1}{2}$ cm

66. (3) If the third side of the rectangular parallelopiped be x cm, then

$2\,(x \times 1 + 1 \times 2 + 2 \times x) = 22$

$\Rightarrow 3x + 2 = 11$

$\Rightarrow 3x = 11 - 2 = 9$

$\Rightarrow x = \frac{9}{3} = 3$ cm

Diagonal = $\sqrt{l^2 + b^2 + h^2}$

$= \sqrt{3^2 + 2^2 + 1^2} = \sqrt{9 + 4 + 1}$

$= \sqrt{14}$ cm

67. (2) Sides of triangle

$= 3x$, $4x$ and $5x$ units (let)

Here, $(3x)^2 + (4x)^2 = (5x)^2$

$\therefore$ It is a right angled triangle.

$\therefore$ Area of triangle $= \frac{1}{2} \times 3x \times 4x = 6x^2$

$\therefore 6x^2 = 72$

$\Rightarrow x^2 = \frac{72}{6}$

$\Rightarrow x = \sqrt{12} = 2\sqrt{3}$

Perimeter of right angled triangle

$= 3x + 4x + 5x$

$= 12x = 12 \times 2\sqrt{3} = 24\sqrt{3}$ units

Perimeter of equilateral triangle = $24\sqrt{3}$ units

Its side $= \frac{24\sqrt{3}}{3} = 8\sqrt{3}$ units

Its area $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 8\sqrt{3} \times 8\sqrt{3}$

$= 48\sqrt{3}$ sq units.

68. (4) $\pi r + 2r = 36$

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

$\Rightarrow r\left(\frac{22 + 14}{7}\right) = 36$

$\Rightarrow r = \frac{36 \times 7}{36} = 7$ metre

Area $= \frac{\pi r^2}{2} = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$

= 77 sq. metre