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Mensuration

Plane Figure

Any plane figure which is made up of some line or curve is called a plane figure or a two-dimensional figure.

Area

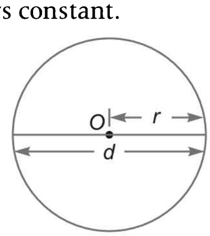
The magnitude of a plane region enclosed by a simple closed figure is called its area. It is denoted by letter 'A'.

Perimeter

The perimeter is the length of the boundary. It is denoted by letter 'P'.

Circle

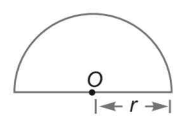
Circle is the path traced by a point which moves in such a way that its distance from a fixed point (say centre) is always constant.



- Circumference (perimeter) of a circle = $2\pi r = \pi d$
- Area of a circle = πr^2

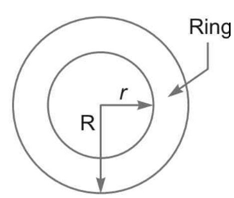
1. Semicircle

- Perimeter of semicircle = $\pi r + 2r$
- Area of semicircle = $\frac{1}{2}\pi r^2$



2. Ring

- Perimeter of ring = $2\pi R + 2\pi r$



Area of the ring

$$= \text{Area of outer circle} - \text{Area of inner circle}$$

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

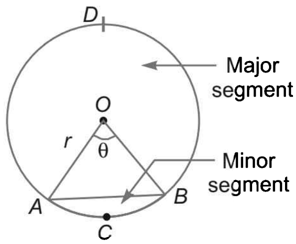
$$= \pi (R + r)(R - r)$$

3. Segment and Sector of a circle

- Perimeter of sector OACBO = Length of arc

$= AB + 2r$

$= \dfrac{\pi r \theta}{180°} + 2r$



- Length of arc $AB = 2\pi r \times \dfrac{\theta}{360°}$
- Area of sector OACBO $= \pi r^2 \times \dfrac{\theta}{360°}$
- Area of minor segment $= \dfrac{\pi r^2 \theta}{360°} - \dfrac{1}{2} r^2 \sin\theta$
- Area of major segment BDAB

= Area of the circle – Area of minor segment ACBA

$= \pi r^2$ – Area of minor segment ACBA

Example 1 If the circumference of a circular sheet is 154 m, find its radius. Also, find the area of the sheet. $\left(\text{take } \pi = \dfrac{22}{7}\right)$

(a) $\dfrac{49}{2}$, 1886.5 m^2 (b) 49 m, 1876.5 m^2

(c) $\dfrac{49}{2}$ m, 1886.5 m^2 (d) None of these

Sol. Given, circumference of a circular sheet $= 154\,\text{m}$

$\Rightarrow 2\pi r = 154 \Rightarrow 2 \times \dfrac{22}{7} \times r = 154$

$\Rightarrow r = \dfrac{154 \times 7}{2 \times 22} = \dfrac{49}{2}\,\text{m}$

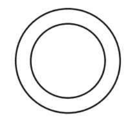
Now, area of the circular sheet $= \pi r^2$

$= \dfrac{22}{7} \times \dfrac{49}{2} \times \dfrac{49}{2} = \dfrac{154 \times 49}{4} = \dfrac{7546}{4}$

$= 1886.5\ \text{m}^2$

Hence, the radius and area of the circular sheet are 49/2 m and 1886.5 m^2, respectively.

Example 2 From a circular sheet of radius 4 cm, a circle of radius 3 cm is removed. Find the area of the remaining sheet. (take $\pi = 3.14$)



(a) 21.98 cm^2 (b) 22.54 cm^2

(c) 21.50 cm^2 (d) 22.10 cm^2

Sol. (*a*) Given, radius of a circular sheet (outer circle), $R = 4\,\text{cm}$

and radius of removed circular sheet (inner circle), $r = 3\,\text{cm}$

We know that, area of a circle $= \pi \times (\text{Radius})^2$

$\therefore$ Area of circular sheet of radius 4 cm $= \pi \times (4)^2$

$= 3.14 \times 16 = 50.24\ \text{cm}^2$

and area of circular sheet of radius 3 cm $= \pi \times (3)^2$

$= 3.14 \times 9 = 28.26\ \text{cm}^2$

$\therefore$ Area of remaining sheet = Area of circular sheet of radius 4 cm

– Area of circular sheet of radius 3 cm

$= 50.24 - 28.26 = 21.98\ \text{cm}^2$

Hence, the area of the remaining sheet is 21.98 cm^2.

Example 3 In a circle of radius 35 cm, an arc subtends an angle of 72° at the centre. Find the length of the arc and the area of the sector.

(a) 44 cm, 770 cm^2

(b) 45 cm, 770 cm^2

(c) 44 cm, 772 cm^2

(d) None of the above

Sol. (*a*) Length of the arc $= \dfrac{2\pi r \theta}{360°}$

$= 2 \times \dfrac{22}{7} \times 35 \times \dfrac{72°}{360°} = 44\ \text{cm}$

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

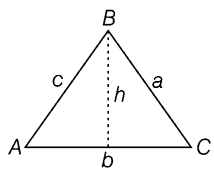
$= \dfrac{22}{7} \times 35 \times 35 \times \dfrac{72°}{360°}$

$= 770\ \text{cm}^2$

Perimeter and Area of Triangle

Triangle is a closed bounded figure joining by three line segments.

In a ΔABC, let a, b and c are the length of the sides of a triangle.



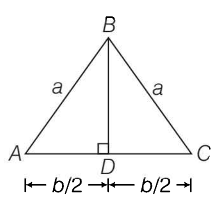
- Perimeter of triangle, $P = a + b + c = 2s$
- Area of triangle, $A = \frac{1}{2} \times \text{Base} \times \text{height}$

$$= \frac{1}{2} \times b \times h$$

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

which is called Heron's formula.

1. **Isosceles Triangle** In a triangle ABC, let a is length of two equal sides and b is length of non equal side.

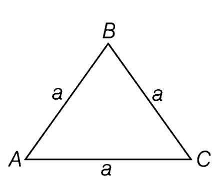


Perimeter of an isosceles triangle, $P = 2a + b$

Area of an isosceles triangle,

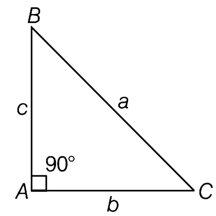
$$A = \frac{b}{4}\sqrt{4a^2 - b^2}$$

2. **Equilateral triangle** In a equilateral triangle ΔABC, let length of each side of a triangle be 'a' unit.



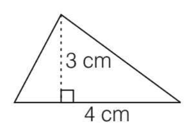
- Perimeter of an equilateral triangle, $P = 3a$
- Area of an equilateral triangle, $A = \frac{\sqrt{3}}{4}a^2$

3. **Right angled Triangle** In a right angled ΔBAC, let length of hypotenuse be a unit and length of base and perpendicular be b unit and c unit respectively.



- Perimeter of Right angled triangle, $P = a + b + c = 2s$
- Area of Right angled triangle, $A = \frac{1}{2}bc$

Example 4 Find the area of the following triangle



(a) 6 cm^2 (b) 5 cm^2
(c) 4 cm^2 (d) None of these

Sol. (*a*) Given, base of a triangle = 4 cm

and height of a triangle = 3 cm

$\therefore$ Area of a triangle $= \frac{1}{2} \times \text{Base} \times \text{Height}$

$$= \frac{1}{2} \times 4 \times 3 = \frac{1}{2} \times 12 = 6 \text{ cm}^2$$

Example 5 Find the area and perimeter of a triangle, whose base is 6 cm and each equal sides are 5 cm and height 4 cm.

(a) 12 cm^2, 16 cm (b) 13 cm^2, 16 cm
(c) 12 cm^2, 15 cm (d) None of these

Sol. (*a*) Given, base $(b) = 6$ cm and height $(h) = 4$ cm

Area of a triangle $= \frac{1}{2} \times b \times h = \frac{1}{2} \times 6 \times 4 = 12 \text{ cm}^2$

and perimeter of a triangle = Sum of the length of all three sides

$= \text{Base} + 2 \times \text{Equal sides}$

$= 6 + 2 \times 5$ [$\because$ two sides are equal]

$= 6 + 10 = 16$ cm

Example 6 Find the area of a rectangle, whose length and breadth are 45 cm and 16 cm, respectively. Also, find the perimeter of the rectangle.

(a) 720 cm^2, 123 cm
(b) 720 cm^2, 122 cm
(c) 730 cm^2, 123 cm
(d) None of the above

Sol. (*b*) Given, length of the rectangle = 45 cm and breadth of the rectangle = 16 cm

∴ Area of the rectangle

= Length × Breadth

= 45 × 16 = 720 cm^2 and perimeter of the rectangle

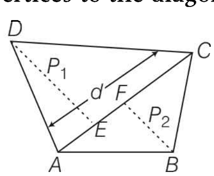
= 2 × (Length + Breadth)

= 2 × (45 + 16) = 2(61) = 122 cm

Perimeter and Area of Quadrilateral

Quadrilateral is a closed bounded figure joining by four line segments.

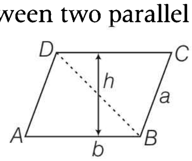
In a quadrilateral ABCD, let d be the length of diagonal and p_1 and p_2 be the length of perpendicular from opposite vertices to the diagonal.



- Perimeter of a quadrilateral ABCD = sum of all sides of a quadrilateral = AB + BC + CD + DA.
- Area of a quadrilateral

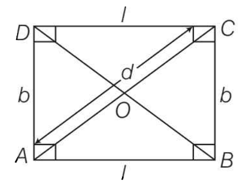
$$ABCD = A \times \frac{1}{2} \times d \times (p_1 \times p_2)$$

1. **Parallelogram** In a parallelogram ABCD, let the length of base be b unit and perpendicular distance between two parallel lines be h unit.



Perimeter of a parallelogram ABCD,
P = 2(a + b)
Area of a parallelogram ABCD, A = b × h = 2 (Area of ΔABD)

2. **Rectangle** In a rectangle ABCD, let length and breadth be l and b units and length of diagonal be d unit.



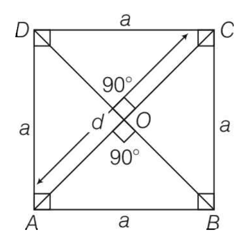
Perimeter of a rectangle,ABCD, P = 2(l + b)

$= 2(l + \sqrt{d^2 - l^2}) = 2(b + \sqrt{d^2 - b^2})$

Area of a rectangle ABCD, A = l × b

$= l \times \sqrt{d^2 - l^2} = b \times \sqrt{d^2 - b^2}$

3. **Square** In a square ABCD, let length of each side of a square be *a* unit and length of diagonal be d unit.

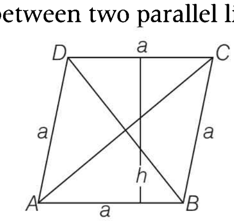


Perimeter of a square, $P = 4a = 2d\sqrt{2}$ unit

Area of a square, $A = a^2$ sq unit

$= \frac{d^2}{2}$ sq unit $= \frac{p^2}{16}$ sq unit

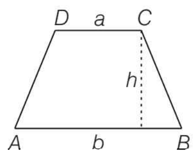
4. **Rhombus** In a rhombus ABCD, let length of each side of a rhombus be *a* unit and length of diagonals be d_1 and d_2 unit. Let h be the distance between two parallel lines.



- Perimeter of a rhombus, $P = 4a = 2\sqrt{d_1^2 + d_2^2}$
- Area of a rhombus, $A = a \times h = \frac{1}{2} \times d_1 \times d_2$

$$= \frac{d_1}{2}\sqrt{a^2 - \left(\frac{d_1}{2}\right)^2} = \frac{d_2}{2}\sqrt{a^2 - \left(\frac{d_2}{2}\right)^2}$$

5. Trapezium In a trapezium ABCD, let length of opposite sides of a parallel lines be a and b units.

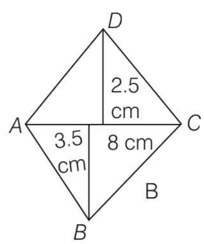


- Perimeter of a trapezium, P = sum of all sides of a trapezium

  = AB + BC + CD + DA

- Area of a trapezium, $A = \frac{1}{2}(a + b) \times h$

Example 7 Find the area of following quadrilateral *ABCD*.



(a) 24 cm^2 (b) 23 cm^2
(c) 25 cm^2 (d) None of these

Sol. (*a*) In the given figure, diagonal (d)=8 cm, $h_1 = 2.5$ cm, $h_2 = 3.5$ cm

Area of quadrilateral $ABCD = \frac{1}{2} d(h_1 + h_2)$

$$= \frac{1}{2} \times 8(2.5 + 3.5) = \frac{1}{2} \times 8 \times 6 = 24 \text{ cm}^2$$

Hence, the area of quadrilateral is 24 cm^2.

Example 8 The area of trapezium is 450m^2 , the distance between two parallel sides is 10 m and one of the parallel side 15 m. Find the other parallel side.

(a) 75 cm (b) 74 cm
(c) 76 cm (d) 77 cm

Sol. (*a*) Given, one of the parallel sides of the trapezium, $a = 15$ m

Its height (h) = 10 m

Let another side be b m and then, area of trapezium = 450 m^2

Area of trapezium $= \frac{1}{2} h(a + b)$

$$\Rightarrow 450 = \frac{1}{2} \times 10 \times (15 + b)$$

$$\Rightarrow \frac{450 \times 2}{10} = 15 + b \Rightarrow 90 = 15 + b$$

$$\therefore b = 90 - 15 = 75$$

Hence, the other parallel side of trapezium is 75 m.

Solid Figure

A solid figures are three dimensional figures that have length, width and height.

Volume

The space occupied by an object/solid body is called the volume of that particular object/solid body. It is always measured in cubic unit.

Surface Area

Surface area of a solid figure is a measure of the total area that the surface of the object occupies. It is always measured in sq. unit.

Polyhedron

A solid shape bounded by polygonal regions is called a polyhedron.

Various terms of polyhedron, are as follows:

Faces Each flat part of a polyhedron is known as its face.

Edges Line segments common to intersecting faces of a polyhedron are known as its edges.

Vertices Points of intersection of edges of a polyhedron are known as its vertices.

Euler's Formula for Polyhedron

For polyhedron, $F + V = E + 2$ or $F + V - E = 2$

where, F stands for number of faces, V stands for number of vertices and E stands for number of edges.

This relationship is called Euler's formula.

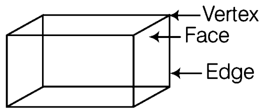
Euler's formula for some polyhedrons are given below

(i) **Cuboid**

F = Number of faces = 6

E = Number of edges = 12

V = Number of vertices = 8

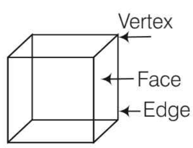


(ii) **Cube**

F = Number of faces = 6

E = Number of edges = 12

V = Number of vertices = 8

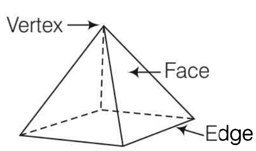


(iii) **Pyramid with square base**

F = Number of faces = 5

E = Number of edges = 8

V = Number of vertices = 5

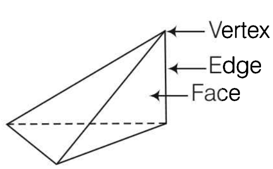


(iv) **Triangular pyramid or tetrahedron**

F = Number of faces = 4

E = Number of edges = 6

V = Number of vertices = 4

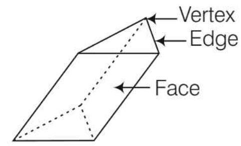


(v) **Triangular prism**

F = Number of faces = 5

E = Number of edges = 9

V = Number of vertices = 6

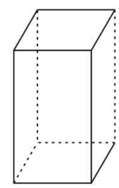


(vi) **Rectangular Prism**

F = Number of faces = 4

E = Number of edges = 12

V = Number of vertices = 8



Example 9 Suppose vertices and edges of a polyhedron are 6 and 12. By using Euler's formula, find the number of faces in polyhedron.

(a) 6 (b) 8 (c) 9 (d) 10

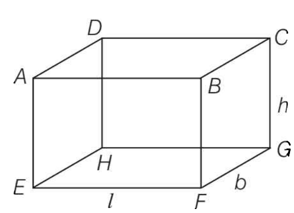
Sol. (*b*) Give $V = 6$ and $E = 12$

Using Euler's Formula, $F + V = E + 2$

$\therefore \quad F + 6 = 12 + 2 \Rightarrow F = 14 - 6 = 8$

Volume and Surface Area of Different Solid Figures

1. **Cuboid** Cuboid is a solid bounded by six rectangular plane regions. Then,

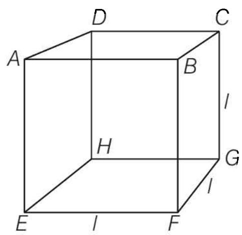


Curved surface area (Lateral surface area) of a cuboid = 2 × Height × (Length + Breadth)
= 2 × h × (l + b) sq unit

Total surface area of cuboid = 2(lb + bh + hl) sq unit

Volume of cuboid = lbh cu unit

2. **Cube** Cube is a special type of a cuboid whose length, breadth and height are all equal. Then,

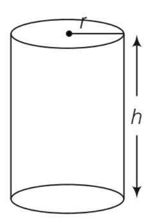


Lateral surface area of a cube = $4 \times (\text{Side})^2$
$= 4 \times l^2$ sq. unit

Total surface area of a cube = $6 \times (\text{Side})^2 = 6 \times l^2$ sq. unit

Volume of cube = l^3 cu unit

3. **Right Circular Cylinder** A right circular cylinder (or simply ray cylinder) has two plane ends. Each plane end is circular in shape and these two plane ends are parallel. Then,

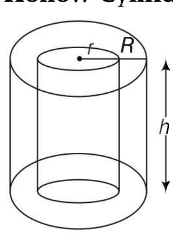


Curved surface area (Lateral surface area) of a cylinder = $2\pi rh$ sq unit

Total surface area of a cylinder = $2\pi r(r + h)$ sq unit

Volume of cylinder = $\pi r^2 h$ cu unit

4. **Right Circular Hollow Cylinder**

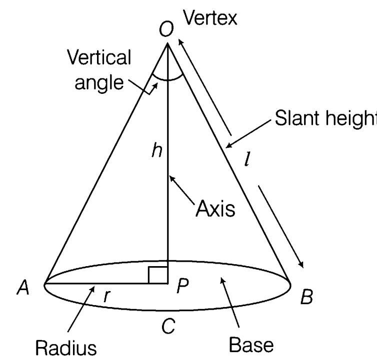


Curved surface area of a hollow cylinder
$= 2\pi h(R + r)$ sq units

Total surface area of hollow cylinder
$= 2\pi h(R + r) + 2\pi(R^2 - r^2)$ sq units

Volume of hollow cylinder = $\pi(R^2 - r^2)h$ cu unit

5. **Right Circular Cone** If a right angled triangle is revolved about one of the two sides forming a right angle, keeping the other side fixed in position, then the solid so obtained by segments is called a *right circular cone*.



Relation between l, r and h

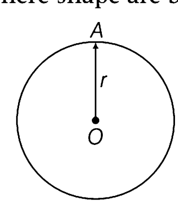
Let l be the slant height, r be the radius and h be the height of the cone. Then, relation between l, r and h is

$$l^2 = r^2 + h^2$$

- Curved surface area of cone = πrl sq unit
- Total surface area of cone $\pi rl + \pi r^2$ or $\pi r(l + r)$
- Volume of cone = $\frac{1}{3}\pi r^2 h$ cu unit

6. **Sphere** A sphere is a completely round geometrical figure in three dimensional space.

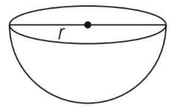
e.g. The sphere shape are ball,



Surface area (or total surface area) of sphere = $4\pi r^2$ sq unit

Volume of sphere = $\frac{4}{3}\pi r^3$ cu unit

7. **Hemisphere** If a sphere is divided into two equal part, then each part is called hemisphere.



Curved surface area of hemisphere = $2\pi r^2$ sq unit

Total surface area of hemisphere = $2\pi r^2 + \pi r^2$

$= 3\pi r^2$ sq unit

Volume of Hemisphere = $\frac{2}{3}\pi r^3$ cu unit

Example 10 How many bricks each measuring 25 cm × 11.5 cm × 6 cm will be need to construct a wall 8 m long, 6 m high and 22.5 cm thick?

(a) 6265 (b) 6260
(c) 6270 (d) 6280

Sol. (*b*) Number of bricks required

$$= \frac{\text{Volume of wall (in cm}^3)}{\text{Volume of 1 brick (in cm}^3)}$$

$$= \frac{800 \times 600 \times 22.5}{25 \times 11.5 \times 6} = 6260$$

Example 11 Find the volume and curved surface area of a cylinder of length 60 cm with diameter of the base 7 cm.

(a) 2310 cm^3, 1320 cm^2
(b) 2340 cm^3, 1340 cm^2
(c) 2320 cm^3, 1320 cm^2
(d) None of the above

Sol. (*a*) Volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times 3.5 \times 3.5 \times 60 = 2310 \text{ cm}^3$$

Curved surface area of cylinder = $2\pi rh$

$$= 2 \times \frac{22}{7} \times 3.5 \times 60 = 1320 \text{ cm}^2$$

Example 12 The height and the slant height of a cone are 21 cm and 28 cm, respectively. Find the volume of the cone.

(a) 7540 cm^3 (b) 7546 cm^3
(c) 7550 cm^3 (d) None of these

Sol. (*b*) Given, height (h) = 21 cm and slant height (l) = 28 cm

We know that, $l^2 = h^2 + r^2$

$\Rightarrow r^2 = l^2 - h^2$

$\Rightarrow r = \sqrt{l^2 - h^2}$ [on taking positive square root]

$= \sqrt{(28)^2 - (21)^2} = 7\sqrt{16 - 9} = 7\sqrt{7}$ cm

Hence, volume of the cone = $\frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \frac{22}{7} \times 7\sqrt{7} \times 7\sqrt{7} \times 21 = 7546 \text{ cm}^3$$

Example 13 Find the surface area and volume of a sphere having diameter 30 cm.

(a) 2828.57 cm^2, 14142.85 cm^3
(b) 2830.50 cm^2, 14142.85 cm^3
(c) 2830.58 cm^2, 14152.80 cm^3
(d) None of the above

Sol. (*a*) Given, diameter of the sphere = 30 cm

$\therefore$ Radius of the sphere = $\frac{30}{2} = 15$ cm

Now, surface area of the sphere = $4\pi r^2$

$$= 4 \times \frac{22}{7} \times (15)^2 = 4 \times \frac{22}{7} \times 15 \times 15 = 2828.57 \text{ cm}^2$$

Volume of sphere = $\frac{4}{3}\pi r^3$

$$= \frac{4}{3} \times \frac{22}{7} \times (15)^3 = 14142.85 \text{ cm}^3$$

Example 14 A hemispherical bowl is made from a metal sheet having thickness 0.3 cm. The inner radius of the bowl is 24.7 cm. Find the cost of polishing its outer surface at the rate of ₹ 4 per 100 cm^2. (take, $\pi = 3.14$)

(a) ₹ 157 (b) ₹ 200 (c) ₹ 160 (d) ₹ 170

Sol. (*a*) Given, inner radius of the hemispherical bowl = 24.7 cm

Thickness of metal sheet = 0.3 cm

Now, outer radius of the hemispherical bowl

= 24.7 + 0.3 = 25 cm

$\therefore$ Outer surface area of the hemispherical bowl

$= 2\pi r^2 = 2 \times 3.14 \times (25)^2$

$= 157 \times 25 = 3925$ cm^2

Now, cost of polishing 100 cm^2 = ₹ 4

$\therefore$ Cost of polishing 3925 cm^2 = $\frac{4 \times 3925}{100}$ = ₹157

Practice Exercise

1. Find the area of circle having radius 3.5 cm.

(a) 38.3 cm^2 (b) 38.5 cm^2
(c) 37.5 cm^2 (d) None of these

2. Find the perimeter of the adjoining figure, which is a semi-circle including its diameter.

(a) 25.8 cm (b) 25.7 cm
(c) 26 cm (d) 27 cm

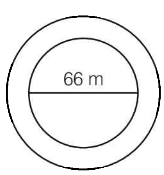
3. The inner circumference of a circular park is 440 m. The track is 14 m wide. The diameter of the outer circle of the track is

(a) 168 m (b) 169 m
(c) 144 m (d) 108 m

4. The diameter of the wheels of a bus is 140 cm. How many revolutions per minute must a wheel make in order to move at a speed of 66 km/h?

(a) 200 (b) 250
(c) 300 (d) 350

5. A circular flower bed is surrounded by a path 4 m wide. The diameter of the flower bed is 66 m. What is the area of this path? (take $\pi = 3.14$)



(a) 879.2 m^2
(b) 880.5 m^2
(c) 860 m^2
(d) None of the above

6. In a circle of radius 42 cm, an arc subtends an angle of 72° at the centre. The length of the arc is

(a) 52.8 cm (b) 53.8 cm
(c) 72.8 cm (d) 79.8 cm

7. Find the area of sector of a circle having radius 4 cm and angle 40°.

(a) 5.59 cm^2 (b) 6.2 cm^2
(c) 5.5 cm^2 (d) None of these

8. The area of an equilateral triangle with side 10 cm is

(a) $15\sqrt{3}$ cm^2 (b) $25\sqrt{3}$ cm^2
(c) $5\sqrt{3}$ cm^2 (d) $35\sqrt{3}$ cm^2

9. The diagonal of a square field measures 50 m. The area of square field is

(a) 1250 cm^2 (b) 1200 cm^2
(c) 1205 cm^2 (d) 1025 cm^2

10. A rectangular grassy plot is 110 m by 65 m. It has a uniform path 2.5 m wide all around it on the inside. The area of the path is

(a) 750 cm^2 (b) 850 cm^2
(c) 950 cm^2 (d) 1050 cm^2

11. The length of a rectangle is 2 cm more than its breadth and the perimeter is 48 cm. The area of the rectangle (in cm^2) is

(a) 96 (b) 28
(c) 143 (d) 144

12. The area of a rhombus whose one side and one diagonal measure 20 cm and 24 cm respectively, is

(a) 364 cm^2 (b) 374 cm^2
(c) 384 cm^2 (d) 394 cm^2

13. The sum of the length of two diagonals of a square is 144 cm, then the perimeter of square is

(a) 144 cm (b) $72\sqrt{2}$ cm
(c) $144\sqrt{2}$ cm (d) None of these

14. An isosceles right angled triangle has area 200 cm^2. The length of its hypotenuse is

(a) $15\sqrt{2}$ cm (b) $\frac{10}{\sqrt{2}}$ cm
(c) $10\sqrt{2}$ cm (d) $20\sqrt{2}$ cm

15. If the ratio of the areas of two square is $4:1$, then the ratio of their perimeter is

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

16. If the area of a square with side 'b' is equal to the area of a triangle with base 'b', then the altitude of the triangle is

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

17. If the side of a square be increased by 50%, then the per cent increase in area is

(a) 50 (b) 100
(c) 125 (d) 150

18. The length of the sides of a triangle are in the ratio 3 : 4 : 5 and its perimeter is 144 cm. The area of the triangle is

(a) 684 cm^2 (b) 664 cm^2
(c) 764 cm^2 (d) 864 cm^2

19. The difference between the sides at right angles in a right angled triangle is 14 cm. The area of the triangle is 120 cm^2. The perimeter of the triangle is

(a) 68 cm (b) 64 cm
(c) 60 cm (d) 58 cm

20. The area of the quadrilateral whose sides measures 9 cm, 40 cm, 28 cm and 15 cm and in which the angle between the first two sides is a right angle, is

(a) 206 cm^2 (b) 306 cm^2
(c) 356 cm^2 (d) 380 cm^2

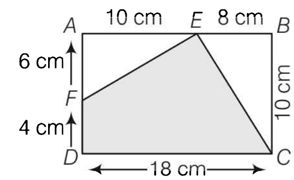
21. The area of the largest circle that can be drawn inside a square of side 14 cm in length, is

(a) 84 cm^2 (b) 96 cm^2
(c) 104 cm^2 (d) 154 cm^2

22. A wire is in the form of a circle of radius 42 cm. It is bent into a square. The side of the square is

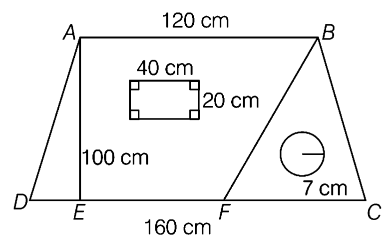
(a) 33 cm (b) 66 cm
(c) 78 cm (d) 112 cm

23. In the following figure, find the area of the shaded portion.



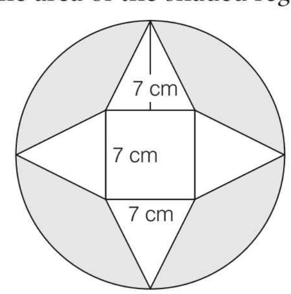
(a) 110 cm^2 (b) 125 cm^2
(c) 120 cm^2 (d) 130 cm^2

24. Find the area of the shaded region



(a) 13050 cm^2 (b) 13046 cm^2
(c) 13040 cm^2 (d) None of these

25. Find the area of the shaded region



(a) 199.5 cm^2 (b) 200.5 cm^2
(c) 198.5 cm^2 (d) None of these

26. Find the number of edges and vertices of rectangular prism.

(a) 12, 8 (b) 10, 12
(c) 12, 12 (d) None of these

27. If vertices and faces of a polyhedron are 8 and 4. Find the number of edges are

(a) 8 (b) 10
(c) 9 (d) 11

28. The surface area of a cube is 486 sq m, then its volume is
(a) 729 m^3 (b) 781 m^3
(c) 625 m^3 (d) 879 m^3

29. A rectangular sand box is 5 m wide and 2 m long. How many cubic metres of sand are needed to fill the box upto a depth of 10 cm?
(a) 1 (b) 10
(c) 100 (d) 1000

30. The volume of a cuboid is 440 cm^3, the area of its base is 88 cm^2, then its height is
(a) 5 cm (b) 10 cm (c) 11 cm (d) 6 cm

31. The maximum length of a pencil that can be kept in a rectangular box of dimensions 8 cm × 6 cm × 2 cm is
(a) $2\sqrt{54}$ cm (b) $2\sqrt{26}$ cm
(c) $2\sqrt{14}$ cm (d) $2\sqrt{13}$ cm

32. The sum of the length, breadth and depth of a cuboid is 20 cm and its diagonal is $4\sqrt{5}$ cm, then its surface area is
(a) 400 cm^2 (b) 420 cm^2
(c) 300 cm^2 (d) 320 cm^2

33. How many 6 m cubes can be cut from a cuboid measuring 18 m × 15 m × 8 m?
(a) 8 (b) 9
(c) 10 (d) 7

34. Three cubes each of side 10 cm are joined end to end. Find the surface area of the resultant figure.
(a) 1350 cm^2 (b) 1400 cm^2
(c) 1420 cm^2 (d) None of these

35. If the volumes of two cubes are in the ratio 8 :1, then ratio of their edges is
(a) 2 :1 (b) 4 :1
(c) $2\sqrt{2}:1$ (d) 8 :1

36. The outer dimensions of a closed wooden box are 10 cm × 8 cm × 7 cm. Thickness of the wood is 1 cm. The total cost of wood required to make box, if 1 cm^3 of wood cost ₹ 2.00 is
(a) ₹ 540 (b) ₹ 640
(c) ₹ 740 (d) ₹ 780

37. The total surface area of a right circular cylinder whose height is 15 cm and the radius of the base is 7 cm, is
(a) 968 cm^2
(b) 2310 cm^2
(c) 488 cm^2
(d) 1860 cm^2

38. The sum of the radius of the base and the height of a cylinder is 37 m. If the total surface area of the solid cylinder is 1628 m^2. The circumference of base of cylinder is
(a) 11 m (b) 22 m
(c) 33 m (d) 44 m

39. The volume of a metallic cylindrical pipe is 770 cm^3. Its length is 14 cm and its external radius is 9 cm. Then, its thickness is
(a) 1 cm (b) 1.5 cm
(c) 2 cm (d) 2.5 cm

40. A 20 m deep well with diameter 14 m is dug up and the earth from digging is spread evenly to form a platform 22 m × 14 m. The height of platform is
(a) 10 m (b) 15 m
(c) 20 m (d) 25 m

41. The circumference of the base of a 9 m high wooden solid cone is 44 m. The slant height of the cone is
(a) $\sqrt{120}$ m (b) $\sqrt{130}$ m
(c) $\sqrt{150}$ m (d) $7\sqrt{5}$ m

42. The diameter of a right circular cone is 12 m and the slant height is 10 m. The total surface area of cone is
(a) $\frac{2412}{7}$ m^2 (b) $\frac{2312}{7}$ m^2
(c) $\frac{2112}{7}$ m^2 (d) $\frac{2012}{7}$ m^2

43. How many metres of cloth 50 m wide will be required to make a conical tent, the radius of whose base is 7 m and whose height is 24 m?
(a) 9 (b) 11
(c) 12 (d) 13

44. A rectangular sheet of dimensions $25\text{ cm} \times 7\text{ cm}$ is rotated about its longer side. Find the volume and the whole surface area of the solid thus generated.

(a) 348.011 cm^3, 178 cm^2

(b) 348.011 cm^3, 175 cm^2

(c) 350 cm^3, 178 cm^2

(d) None of the above

45. The internal and external diameters of a hollow hemispherical vessel are 24 cm and 25 cm, respectively. The total area to be painted is

(a) $\frac{13211}{7}\text{ cm}^2$ (b) $\frac{26961}{14}\text{ cm}^2$

(c) $\frac{6961}{14}\text{cm}^2$ (d) $\frac{16951}{14}\text{ cm}^2$

46. The volume of the largest sphere which is curved out of a cube of side 7 cm, is

(a) $\frac{539}{3}\text{ cm}^3$

(b) 905 cm^3

(c) $805\ .\ 5\text{ cm}^3$

(d) None of the above

47. Height of a solid cylinder is 10 cm and diameter 8 cm. Two equal conical holes have been made from its both ends. If the diameter of the hole is 6 cm and height 4 cm. The volume of remaining portion is

(a) $24\pi\text{ cm}^3$ (b) $36\pi\text{ cm}^3$

(c) $72\pi\text{ cm}^3$ (d) $136\pi\text{ cm}^3$

Answers

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

Hints & Solutions

1. (b) Area of circle $= \pi r^2$

$$= \frac{22}{7} \times (3.5)^2$$

$$= 38.5\text{ cm}^2$$

2. (b) Given, diameter of a semi-circle $= 10\text{ cm}$

$\therefore$ Radius of a semi-circle $= \frac{10}{2} = 5\text{ cm}$

Now, circumference of semi-circle

$= \pi r = 3.14 \times 5$

$= 15.7\text{ cm}$

$\therefore$ Perimeter of the given figure

= Circumference of a semi-circle

+ Diameter of a semi-circle

$= 15.7 + 10 = 25.7\text{ cm}$

Hence, perimeter of given figure is 25.7 cm.

3. (a) Inner circumference of a park

$= 2\pi r = 440\text{ m}$

$\Rightarrow r = \frac{440}{2 \times 22} \times 7 = 70\text{ m}$

Width of track $= 14$ m

$\Rightarrow$ Radius of outer circle $= (70 + 14) = 84$ m

$\therefore$ Diameter of outer circle $= 2 \times 84 = 168$ m

4. (b) Distance covered by wheel in 1 min

$= \left(\frac{66 \times 1000 \times 100}{60}\right) = 110000\text{ cm}$

Circumference of wheel $= \left(2 \times \frac{22}{7} \times 70\right) = 440\text{ cm}$

$\therefore$ Number of revolutions in 1 min

$= \left(\frac{110000}{440}\right) = 250$

5. (a) Given, diameter of the flower bed = 66 m Let r be the radius of circular flower bed.

Then, radius of the flower bed

$$= \frac{\text{Diameter}}{2} = \frac{66}{2} = 33 \text{ m}$$

$\therefore$ Area of the flower bed $= \pi r^2$

$= 3.14 \times 33 \times 33 = 3419.46 \text{ m}^2$

Since, the path is 4 m wide.

$\therefore$ Radius of circular flower bed with path $= 33 + 4 = 37 \text{ m}$

$\therefore$ Area of circular flower bed with path

$= 3.14 \times 37 \times 37 = 4298.66 \text{ cm}^2$

Now, area of path = Area of circular flower bed with path

− Area of circular flower bed

$= 4298.66 - 3419.46 = 879.2 \text{ m}^2$

Hence, the area of the path is 879.2 m^2.

6. (a) Length of an arc $= 2\pi r \times \frac{\theta}{360°}$

$$= \frac{2 \times 22 \times 42 \times 72°}{7 \times 360°} = \frac{264}{5} = 52.8 \text{ cm}$$

7. (a) $\because$ Area of sector of a circle $= \pi r^2 \times \frac{\theta}{360°}$

$$= \frac{22}{7} \times (4)^2 \times \frac{40°}{360°} = \frac{22}{7} \times 16 \times \frac{1}{9} = 5.59 \text{ cm}^2$$

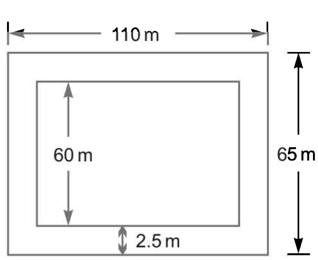
8. (b) Area of equilateral triangle $= \frac{\sqrt{3}}{4} (\text{Side})^2$

$$= \frac{\sqrt{3}}{4} \times 10 \times 10 = 25\sqrt{3} \text{ cm}^2$$

9. (a) Area of square $= \frac{1}{2} \times (\text{Diagonal})^2$

$$= \frac{1}{2} \times 50 \times 50 = 1250 \text{ m}^2$$

10. (b) Area of plot $= 110 \times 65 = 7150 \text{ m}^2$



Area of the plot excluding the path

$= (110 - 5) \times (65 - 5)$

$= 105 \times 60 = 6300 \text{ m}^2$

$\therefore$ Area of path $= 7150 - 6300 = 850 \text{ m}^2$

11. (c) Let length = x cm and breadth = (x − 2) cm

$\therefore 2[x + (x - 2)] = 48$

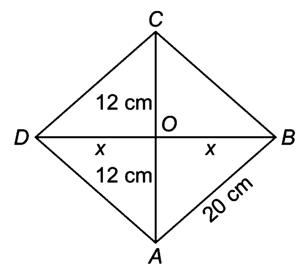
$\Rightarrow 4x - 4 = 48 \Rightarrow x = \frac{52}{4} = 13 \text{ cm}$

$\therefore$ Length = 13 cm and breadth = 11 cm

Hence, area $= l \times b = 13 \times 11 = 143 \text{ cm}^2$

12. (c) Let the other diagonal be 2x.

In ΔAOB,



$(20)^2 = (12)^2 + x^2$

$\Rightarrow x^2 = 256 \Rightarrow x = 16 \text{ cm}$

$\because$ Other diagonal $= 2x = 32$ cm

$\therefore$ Area $= \frac{1}{2} \times d_1 d_2$

$= \frac{1}{2} \times 24 \times 32 = 384 \text{ cm}^2$

13. (c) Length of a diagonal of square

$= \frac{144}{2} = 72 \text{ cm}$

Side of square $= \frac{\text{Length of diagonal}}{\sqrt{2}} = \frac{72}{\sqrt{2}}$ cm

$\therefore$ The perimeter of square $= 4a = 4 \times \frac{72}{\sqrt{2}}$

$= 144\sqrt{2}$ cm

14. (d) Area of an isosceles right angled triangle

$= \frac{1}{2} (\text{Side})^2 = 200 \text{ cm}^2$

$\therefore$ Side = 20 cm

$\therefore$ Hypotenuse $= \sqrt{a^2 + a^2} = \sqrt{2}\, a = 20\sqrt{2}$ cm

15. (a) Let the sides of the two square be a and b.

$\therefore$ Ratio of their areas

$$= \frac{a^2}{b^2} = \frac{4}{1} \Rightarrow \left(\frac{a}{b}\right)^2 = \left(\frac{2}{1}\right)^2$$

$\Rightarrow \quad \frac{a}{b} = \frac{2}{1}$

$\therefore \quad a : b = 2 : 1$

16. (b) Given, area of triangle = Area of square

$\frac{1}{2} \times b \times \text{Altitude} = b^2$

$\therefore$ Altitude $= \frac{b^2 \times 2}{b} = 2b$

17. (c) Let the original side of a square be 'a'.

$\therefore$ Area of square $= a^2$

Now, new side $= a + \frac{a}{2} = \frac{3a}{2}$

$\Rightarrow$ New area $= \frac{9a^2}{4}$

$\because$ Increase in area $= \frac{9a^2}{4} - a^2 = \frac{5a^2}{4}$

$\therefore$ Per cent increase in area

$$= \frac{5a^2}{4a^2} \times 100 = 125\%$$

18. (d) Given, perimeter of triangle = 144 cm

$\therefore$ Sides of triangle are

$a = \frac{3}{3+4+5} \times 144 = 36$ cm,

$b = 48$ cm and $c = 60$ cm

Now, $s = \frac{a+b+c}{2} = \frac{36+48+60}{2}$

$= 72$ cm

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

$= \sqrt{72 \times 36 \times 24 \times 12} = 72 \times 12$

$= 864 \text{ cm}^2$

19. (c) Let the sides containing right angled be x cm and $(x - 14)$ cm.

$\therefore$ Area $= \left[\frac{1}{2} x \times (x - 14)\right] \text{cm}^2$

$\Rightarrow \frac{1}{2} x(x - 14) = 120$ [$\because$ Area $= 120 \text{ cm}^2$]

$\Rightarrow x^2 - 14x - 240 = 0$

$\Rightarrow (x - 24)(x + 10) = 0$

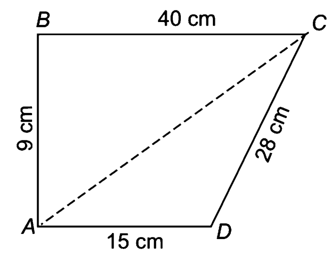
$\Rightarrow x = 24$ and $x \neq -10$

Other side $= 24 - 14 = 10$ cm

$\Rightarrow$ Hypotenuse $= \sqrt{24^2 + 10^2} = \sqrt{676} = 26$ cm

$\therefore$ Perimeter $= (24 + 10 + 26) = 60$ cm

20. (b) Applying Pythagorus theorem in ΔABC we get,



$9^2 + 40^2 = AC^2$

$\Rightarrow \quad AC = \sqrt{1681} = 41$ cm

$\therefore$ Area of quadrilateral

$= \text{Area of } \Delta ABC + \text{Area of } \Delta ADC$

$= \frac{1}{2}(9 \times 40) + \sqrt{42 \times 1 \times 14 \times 27}$

$\left[\because s = \frac{15 + 28 + 41}{2} = 42 \text{ cm}\right]$

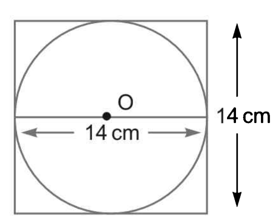
and area $= \sqrt{s(s-a)(s-b)(s-c)}$

$= 180 + 14 \times 3 \times 3$

$= 180 + 126 = 306 \text{ cm}^2$

21. (d) Diameter of circle = Side of Square = 14 cm

$\Rightarrow r = 7$ cm



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

22. (b) Circumference of circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 42 = 264$ cm

$\therefore$ Length of wire = 264 cm

Now, wire is bent into a square.

$\therefore$ Perimeter of square = Length of wire

$= 264$ cm

$\Rightarrow 4 \times \text{side of square} = 264$

$\therefore$ Side of square $= \frac{264}{4} = 66$ cm

23. (a) From the given figure,

Length of the rectangle ABCD (l) = 18 cm

and breadth of the rectangle ABCD (b) = 10 cm

$\therefore$ Area of rectangle ABCD

$= l \times b = 18 \times 10 = 180 \text{ cm}^2$

Now, area of $\Delta EAF = \frac{1}{2} \times \text{Base} \times \text{Height}$

$= \frac{1}{2} \times AF \times AE = \frac{1}{2} \times 6 \times 10 = \frac{60}{2} = 30 \text{ cm}^2$

and area of $\Delta EBC = \frac{1}{2} \times \text{Base} \times \text{Height}$

$= \frac{1}{2} \times EB \times BC = \frac{1}{2} \times 8 \times 10$

$= \frac{80}{2} = 40 \text{ cm}^2$

Area of shaded portion = Area of rectangle ABCD

$-$ (Area of ΔEAF + Area of ΔEBC)

$= 180 - (40 + 30) = 180 - 70 = 110 \text{ cm}^2$

Hence, the area of the shaded portion is 110 cm^2.

24. (b) Area of shaded portion = Area of trapezium $-$ Area of rectangle $-$ Area of circle

Area of trapezium $= \frac{1}{2} \times$ [Sum of parallel sides] $\times$ Height

$= \frac{1}{2} \times (120 + 160) \times 100 = \frac{1}{2} \times 280 \times 100$

$= \frac{28000}{2} = 14000 \text{ cm}^2$

Area of rectangle = Length $\times$ Breadth

$= 40 \times 20 = 800 \text{ cm}^2$

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

$\therefore$ Area of shaded portion $= 14000 - 800 - 154$

$= 13046 \text{ cm}^2$

25. (a) Area of shaded region = Area of the circle $-$ Area of four triangles $-$ Area of a square

Area of four triangles $= 4 \times \frac{1}{2} \times \text{Base} \times \text{Height}$

$= 4 \times \frac{1}{2} \times 7 \times 7 = \frac{4 \times 49}{2} = 2 \times 49 = 98 \text{ cm}^2$

Area of a square $= (\text{Side})^2 = (7)^2 = 49 \text{ cm}^2$

Area of the circle $= \pi r^2 = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$

$= \frac{11 \times 3 \times 21}{2} = \frac{693}{2} = 346.5 \text{ cm}^2$

Area of shaded region $= (346.5 - 98 - 49)$

$= 199.5 \text{ cm}^2$

26. (a) The number of edges and vertices of rectangular prism are 12 and 8 respectively.

27. (b) Given V = 8 and F = 4

By Euler's Formula,

$F + V = E + 2$

$4 + 8 = E + 2$

$E = 10$

28. (a) Let edge of cube be a.

Surface area of the cube $= 6a^2$

$\therefore 6a^2 = 486 \Rightarrow a^2 = 81 \Rightarrow a = 9$

$\therefore$ Volume of the cube $= (\text{Edge})^3$

$= (9)^3 \text{ m}^3 = 729 \text{ m}^3$

29. (a) Sand needed to fill the tank

$= \left(5 \times 2 \times \frac{10}{100}\right) \text{m}^3 = 1 \text{ m}^3$

30. (a) Height $= \frac{\text{Volume of the cuboid}}{\text{Area of its base}}$

$= \frac{440}{88} = 5$ cm

31. (b) Length of longest pencil

= Diagonal of the box

$= \sqrt{8^2 + 6^2 + 2^2} = \sqrt{104} = 2\sqrt{26}$ cm

32. (d) Given, $l + b + h = 20$ cm

and $\sqrt{l^2 + b^2 + h^2} = 4\sqrt{5}$

$\therefore$ Surface area $= 2(lb + bh + hl)$

$= (l + b + h)^2 - (l^2 + b^2 + h^2)$

$= (20)^2 - (4\sqrt{5})^2 = 400 - 80 = 320 \text{ cm}^2$

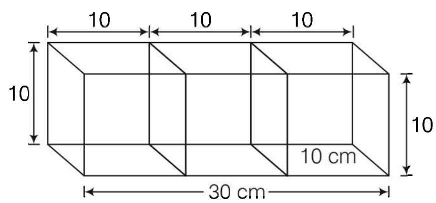
33. (c) Volume of cube $= 6 \times 6 \times 6 \text{ m}^3$

Volume of cuboid $= 18 \times 15 \times 8 \text{ m}^3$

$\therefore$ Required number of cube

$$= \frac{\text{Volume of cuboid}}{\text{Volume of cube}} = \frac{18 \times 15 \times 8}{6 \times 6 \times 6} = 10$$

34. (b) If three cubes each of side 10 cm are joined, then a cuboid will be formed of dimensions $30 \text{ cm} \times 10 \text{ cm} \times 10 \text{ cm}$.



$\therefore$ Surface area of the cuboid $= 2[lb + bh + hl]$

$= 2[30 \times 10 + 10 \times 10 + 30 \times 10]$

$= 2[300 + 100 + 300] = 2[700] = 1400 \text{ cm}^2$

35. (a) Let the edges of cubes be x and y, then volumes are x^3 and y^3, respectively.

$$\therefore \frac{x^3}{y^3} = \frac{8}{1} \Rightarrow \frac{x}{y} = \frac{2}{1}$$

36. (b) External volume of the box

$= 10 \times 8 \times 7 = 560 \text{ cm}^3$

Internal dimensions as thickness of wood $= 1$ cm

Internal length $= 10 - 2 = 8$ cm

Breadth $= 8 - 2 = 6$ cm, Height $= 7 - 2 = 5$ cm

$\therefore$ Internal volume $= 8 \times 6 \times 5 = 240 \text{ cm}^2$

Volume of wood

= External volume – Internal volume

$= 560 - 240 = 320 \text{ cm}^3$

$\therefore$ Total cost of wood required to make the box

$= 320 \times 2 = ₹\, 640$

37. (a) Total surface area of right circular cylinder

$$= 2\pi r(h + r) = 2 \times \frac{22}{7} \times 7(15 + 7)$$

$= 2 \times 22 \times 22 = 968 \text{ cm}^2$

38. (d) Given, $r + h = 37$ m

and total surface area

$= 2\pi r(h + r) = 1628 \text{ m}^2$

$\Rightarrow \quad 2\pi r(37) = 1628$

$$\Rightarrow \quad r = \frac{1628 \times 7}{2 \times 22 \times 37} = 7$$

$\therefore$ Circumference of its base $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 7 = 44 \text{ m}$$

39. (a) External radius, R = 9 cm

Internal radius, = r cm

Length of pipe = 14 cm

Since, volume of pipe $= 770 \text{ cm}^3$

$\therefore \quad r(R^2 - r^2)h = 770$

$$\Rightarrow \quad 81 - r^2 = \frac{770 \times 7}{22 \times 14} = 17$$

$\therefore \quad r^2 = 64 \Rightarrow r = 8$ cm

$\therefore$ Thickness $= R - r = 9 - 8 = 1$ cm

40. (a) Volume of earth dug out from the well

$$\pi r^2 h = \frac{22}{7} \times \left(\frac{14}{2}\right)^2 \times 20$$

$= 22 \times 7 \times 20 \text{ m}^3$

Let height of platform be h m.

Volume of platform $= 22 \times 14 \times h$

$\therefore \quad 22 \times 14 \times h = 22 \times 7 \times 20$

$$\Rightarrow \quad h = \frac{22 \times 7 \times 20}{22 \times 14} = 10 \text{ m}$$

41. (b) Since, circumference of cone = 44 m

$\therefore \quad 2\pi r = 44$

$$\Rightarrow \quad r = \frac{44}{2\pi} = 7 \text{ m}$$

Slant height $= \sqrt{r^2 + h^2} = \sqrt{49 + 81}$

$= \sqrt{130}$ m

42. (c) Total surface area $= \pi r(l + r)$

$$= \frac{22}{7} \times 6 \times (10 + 6) = \frac{2112}{7} \text{ m}^2$$

43. (b) Slant height $= \sqrt{r^2 + h^2} = \sqrt{24^2 + 7^2}$

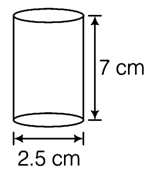
$= \sqrt{576 + 49} = \sqrt{625} = 25$

$$\text{Curved surface area} = \pi r l = \frac{22}{7} \times 7 \times 25 = 550 \text{ m}^2$$

Since, width of cloth = 50 m

$$\therefore \text{Length of required cloth} = \frac{550}{50} = 11 \text{ m}$$

44. (b) A rectangular sheet of dimensions $25\text{ cm} \times 7\text{ cm}$ is rotated about its longer side which makes a cylinder with base 25 cm /and height 7 cm.



Surface area of a base = $2\pi r$

$\therefore \quad 2\pi r = 25\text{ cm}$

$\Rightarrow \quad r = \dfrac{25 \times 7}{2 \times 22}$

$= \dfrac{175}{44}\text{ cm}$

Volume of a cylinder = $\pi r^2 h$

$= \dfrac{22}{7} \times \dfrac{175}{44} \times \dfrac{175}{44} \times 7$

$= \dfrac{175 \times 175}{2 \times 44} = \dfrac{30625}{88}$

$= 348.011\text{ cm}^3$

Surface area = $2\pi rh = 2 \times \dfrac{22}{7} \times \dfrac{175}{44} \times 7$

$= \dfrac{44}{44} \times 175$

$= 175\text{ cm}^2$

45. (b) Internal radius (r) = 12 cm,

External radius = $\dfrac{25}{2}$ cm

$\therefore$ Area to be painted

= Internal area + External area + Area of edge

$= 2 \times \dfrac{22}{7} \times 12 \times 12 + 2 \times \dfrac{22}{7} \times \dfrac{25}{2} \times \dfrac{25}{2}$

$+ \dfrac{22}{7}\left(\dfrac{25}{2} \times \dfrac{25}{2} - 12 \times 12\right)$

$= \dfrac{6336}{7} + \dfrac{6875}{7} + \dfrac{539}{14}$

$= \dfrac{26422}{14} + \dfrac{539}{14} = \dfrac{26961}{14}\text{ cm}^2$

46. (a) Diameter of the largest sphere = Side of cube from which it is curved out.

$\therefore$ Radius (r) = $\dfrac{7}{2}$ cm

$\therefore$ Volume of sphere = $\dfrac{4}{3} \times \dfrac{22}{7} \times \dfrac{7}{2} \times \dfrac{7}{2} \times \dfrac{7}{2}$

$= \dfrac{11 \times 7 \times 7}{3} = \dfrac{539}{3}\text{ cm}^3$

47. (d) Volume of cylinder = $\pi(4)^2 \times 10 = 160\pi\text{ cm}^3$

Volume of one cone = $\dfrac{1}{3} \times \pi \times 3^2 \times 4 = 12\pi\text{ cm}^3$

$\therefore$ Volume of both cones = $24\pi\text{ cm}^3$

$\therefore$ Volume of remaining portion

$= 160\pi - 24\pi = 136\pi\text{ cm}^3$