CHAPTER 7

Mensuration-II Volume and Surface Area (3-Dimensional Volume)

Solides : A solid is a figure bounded by one more surfaces.

It has three dimensions - (i) length (ii) breadth or width (iii) height or thickness.

Faces : The plane surfaces that bind a solid are called its faces.

Volume : The amount of space occupied by the object is called its volume. Its units of measurement is m^3, cm^3 etc. i.e. cubic units.

(i) (a) $V = l \times b \times h$ cubic units

(b) $V = \sqrt{A_1 \times A_2 \times A_3}$ *cubic* units

Where,

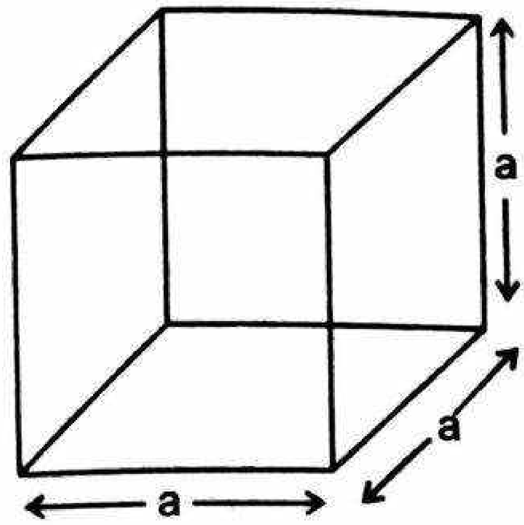
A_1 = ara of base or top = lb sq. units

A_2 = area of one side face =bh sq. units

A_3 = area of other side face = hl.sq. units

(ii) Lateral surface Area / Curved surface area / Area of four walls

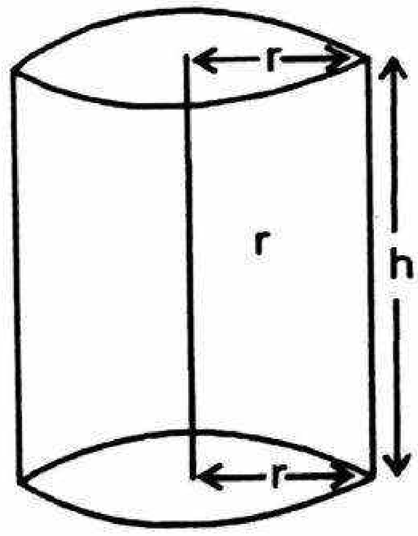
= Perimeter of Base × height



(vi) Volume of cube =

$$V = \left(\sqrt{\frac{\text{surface area}}{6}}\right)^3 \text{ cubic units}$$

3. **Right Circular Cylinder :** It is formed by rotating one side of a rectangle about its opposite side (keeping fixed)
If r = radius of base and h = height of the cylinder, then,

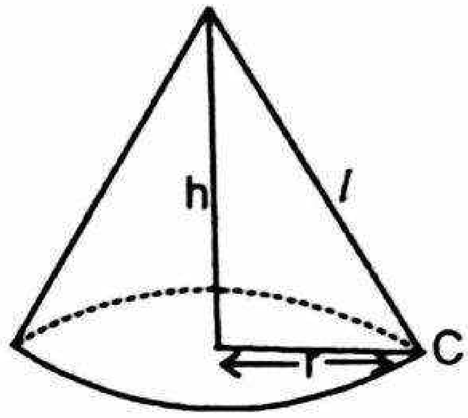


(i) V = Area of base × height
= p r²h cubic units

(ii) Area of the curved surface
= Circumference of the base × height
= 2prh square units

(iii) Area of the total surface = Area of the curved surface + Area of the two circular ends
= 2prh + 2pr²
= 2pr (h + r) square units

4. **Right Circular Cone :** It is a solid obtained by rotating a right-angled triangle around its height.
If r = radius of base, h = height,



l = slant height = $\sqrt{h^2 + r^2}$, *then*:

(i) $V = \frac{1}{3}$ area of the base × height

$= \frac{1}{3}\pi r^2 h$ cubic

(ii) curved surface area = $\frac{1}{2}$ × (circumference of base)× slant height

$= \frac{1}{2}(2\pi r) \times l$

= $\pi r l$ square units

(iii) Total surface area = curved surface area + area of base
= $\pi r l + \pi r^2$
= $\pi r (l + r)$ sq.units

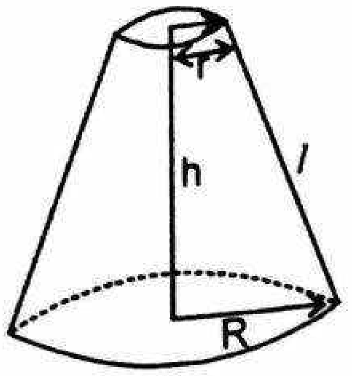
Note : volume of cone $= \frac{1}{3}(\pi r^2 h)$

$= \frac{1}{3}$(volume of cylinder)

volume of cylinder = 3(volume of cone)
when r cylinder = r (cone) and h (cylinder) = h (cone)

5. **Frustum of a right circular cone :** If a cone is cut by a plane parallel to the base of the cone, the lower part

is called the frustum of the cone.



If R = Radius of the base of frustum
r = Radius of the top of the frustum
h = height of the frustum
l = slant height of the frustum, then

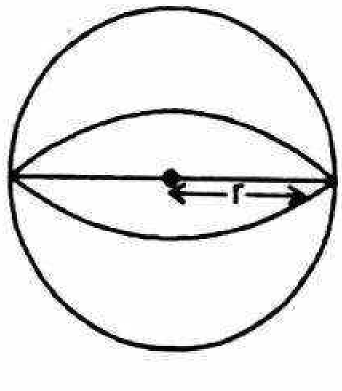
(i) $l = \sqrt{h^2 + (R-r)^2}$ *units*

(ii) $V = \frac{1}{3}\pi(R^2 + r^2 + Rr)h$ cubic units

(iii) curved surface area = π (R+r)l sq.units

(iv) Total surface area = π (R+r)l + π (R^2 +r^2) sq.units
= π [(R + r)l + (R^2 + r^2)] sq. units

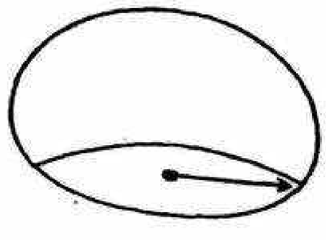
6. **Sphere :** It is the solid figure formed by revolving a semicircle on its diameter.
Radius (r) of the semicircle is called the radius of the sphere ;



(i) V = $\frac{4}{3}\pi r^3$ cubic units

(ii) Surface Area = 4 πr^2 sq.units

7. **Hemisphere :**



(i) V = $\frac{2}{3}\pi r^3$ cubic units

(ii) curved surface area = $2\pi r^2$ *sq.units*

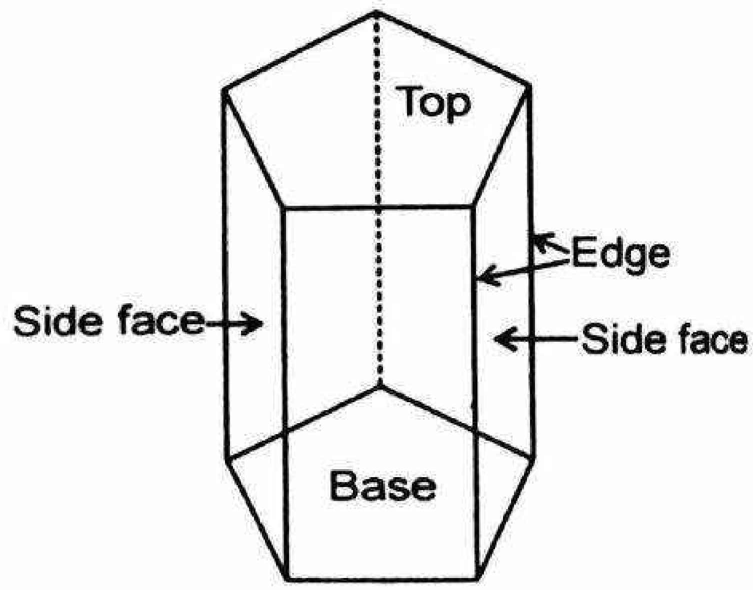
(iii) Total surface area = $3\pi r^2$ sq. units

8. **Spherical shell :**
If r = inner radius of spherical shell and R = outer radius of spherical shell, then

(i) V=$\frac{4}{3}\pi(R^3 - r^3)$

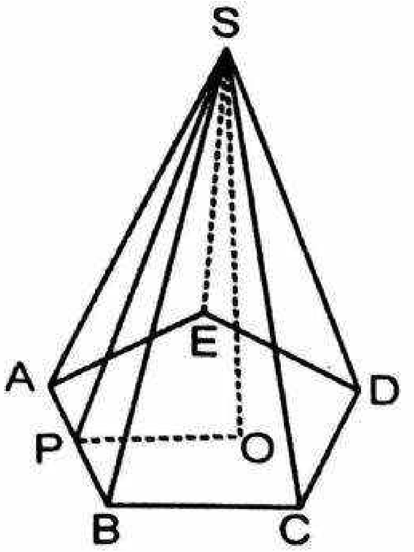
(ii) Total surface area = $4\pi(R^2 + r^2)$

9. **Right Prism :** A solid having top and bottom faces identical and side faces rectangular is a prism.



In a prism with a base of n sides,
(i) Number of vertices = 2n , and
(ii) Number of faces = n + 2
(iii) Volume of the prism = area of base × height
(iv) Lateral surface area of the prism = perimeter of base × height
(v) Total surface Area = Lateral surface area + 2 × Base area.

10. Pyramid:



(i) volume of pyramid $= \frac{1}{3} \times (\textit{area} \text{ of base}) \times \textit{height}$

(ii) curved surface area

$= \frac{1}{2} \times (\textit{perimeter} \text{ of base}) \times \textit{slant height}$

(iii) Total surface area = curved surface area + area of the base.

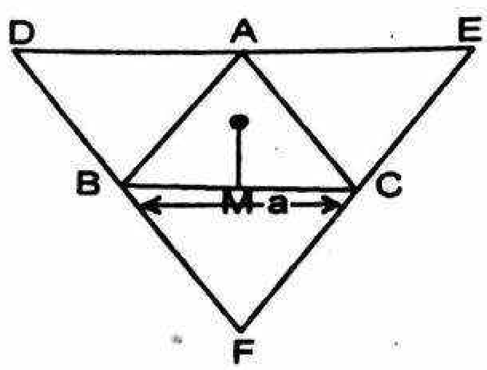
11. Tetrahedron: Area of all four triangles are equal and triangle are same.

in-radius of D ABC = $\frac{a}{2\sqrt{3}}$

slant height = MC = $\frac{\sqrt{3}}{2}$a

$\therefore \text{height(h)} = \sqrt{\left(\frac{\sqrt{3}}{2}a\right)^2 - \left(\frac{a}{2\sqrt{3}}\right)^2}$

$\Rightarrow h = \frac{\sqrt{2}}{\sqrt{3}}a$



(i) volume (v) $= \frac{1}{3} \times (\text{Area of the base}) \times h$

$\Rightarrow \text{Volume (V)} = \frac{1}{3} \times \frac{\sqrt{3}}{4}a^2 \times \frac{\sqrt{2}}{\sqrt{3}}a$

$\Rightarrow V = \frac{\sqrt{2}}{12}a^3$

(ii) Surface area = $\frac{1}{2}$ × perimeter of the base × slant height

$= \frac{1}{2} \times 3a \times \frac{\sqrt{3}}{2}a$

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

(iii) Total surface area = surface area + base area

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

$TSA = \sqrt{3}a^2$

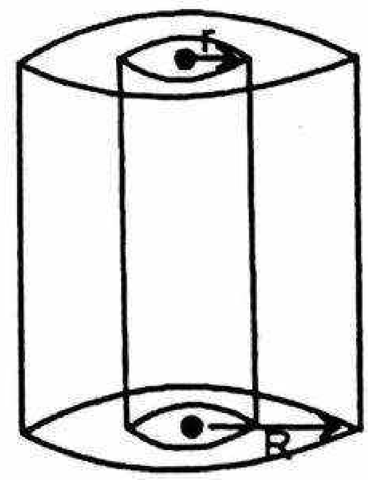
12. Hollow Cylinder :

(i) Volume (V) = $\pi(R^2 - r^2)h$

(ii) Curved surface area = 2p(R+r)h

(iii) Total surface area = $2\pi(R+r)[h+(R-r)]$

(iv) Thickness (t) = (R-r)



Note: This trick for finding out answers of Mensuration is totally based on your Intellectual thinking. It is used for getting answers taking a few seconds only. If you don't understand this trick completely, you are advised to solve the questions in details because our first preference is to get good marks. But if you become able to understand how to use this trick in an appropriate way, you may find it very helpful. We have given types of questions in which this trick can be applied.

How to use this Trick

Step -1: Check whether '$\pi = \frac{22}{7}$' has been used in the formula for finding out the particular Area, Curved Surface Area, Total Area, Volume, etc.

If it is so, the option divisible by 11 is your answer.

E.g. Find the surface area of a sphere whose volume is 4851 cubic metres:

(a) 1380 m^2 (b) 1360 m^2
(c) 1368 m^2 (d) 1386 m^2

Using the Trick :

We know that surface area of a sphere = $4\pi r^2$

It means 'π' has been used in finding out the surface area of the sphere.

We can easily see that only **'1386'** from the given options is divisible by '11'

Hence, surface area of the sphere = 1386 m^2

If more than one options are divisible by 11, we proceed to **Step 2.**

Step-2 : In this step, we check divisible by '7'.

Your are advised to use Step 2. very carefully because you have to keep in mind whether the **Radius, Height, Slant Height, length, etc.** of a particlular **circle, cone, Cylinder, Sphere, etc.** are multiple of 7 or not.

In this step, 2 Cases are possible :

Case- 1: If more than unit of length (**e.g. height, radius, etc**) in the used formula are multiple of '7', the option divisible by '7' is your answer.

E.g. The radius and height of a right circular cylinder are 14 cm & 21 cm respectively. Find its volum :

(a) 12836 cm^3 (b) 12736 cm^3
(c) 12936 cm^3 (d) 1837 cm^3

Using the Trick :

You know that volume of Cylinder = $\pi r^2 h$

It means that we must check divisibility by '11'. Here, both '12936' and '12837' are divisible by 11.

But you also notice that Radius (14 cm) & height (21 cm) are multiple of 7. So the option divisible by '7' is your is your answer. Hence, volume of a Right circular cylinder = 12936 cm^3

$\because$ Volume of the given cylinder

$$= \frac{22}{7} \times 14 \times 14 \times 14 \times 21 cm^3$$

or $22 \times 14 \times 14 \times 3$ cm^3

$\Rightarrow$ Volume must be divisible by '7'

E.g.2: The radius and height of a right circular cone are 7 cm & 18 cm respectively. Find its volume:

(a) 824 cm^3 (b) 624 cm^3
(c) 825 cm^3 (d) 924 cm^3

Using the Trick :

You know that volume of a right circular cone $= \frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 18 \text{ cm}^3$$

or $22 \times 7 \times 6$.

⇒ The option divisible by both '11' & '7' is your answer because 'π' has been used in finding its volume and its radius is also a multiple of 7

Hence, Volume of the given cone = 924 cm^3

Case-2 : If only one unit of length (**e.g. height, radius, etc.**) is multiple of '7' in the used formula but it is in the form of higher powers of '7' like 49, 343, etc. the option divisible by '7' is your answer in the same way as in Case 1.

E.g. Find the circumference of a circle whose radius is 49 cm.

(a) 208 cm (b) 288 cm
(c) 308 cm (d) 407 cm

Using the trick :

Circumference of circle = $2\pi r$ cm

$= 2 \times \frac{22}{7} \times 7 \times 49$ cm

$= 2 \times 22 \times 7$ cm

⇒ The option divisible by both 11 & 7 is your answer.

Hence, Circumference of circle = 308 cm

Remember : If there is only one unit of length equals to '7' or multiple of '7' the answer will not be divisible by '7'

E.g. Find the curved surface area of a right circular cylinder whose radius & height are 14 cm & 50 cm respectively.

(a) 3300 cm^3 (b) 3420 cm^3
(c) 4440 cm^3 (d) 4400 cm^3

Solution : Curved surface area of a right circular cylinder = $2\pi r^2 h$

$= 2 \times \frac{22}{7} \times 14 \times 50$

$= 2 \times 22 \times 2 \times 50$

$= 4400$ cm^3

In this case, you can check divisiblity by '11' but not by '7' because '7' form Numerator & Denominator has been cancelled out.

Conclusion of the Trick : The whole trick is based on the multiplication & divisiblity by 11 & 7. So you are advised to use this trick very carefully using your intellectual thinking.

Exercise
LEVEL - 1

1. Each edge of an equilateral triangle is 'a' cm. A cone is formed by joining any two sides of the triangle. What is the radius and slant height of the cone ?
(a) $a, \frac{a}{2\pi}$ (b) $\frac{a}{\pi}, \frac{a}{2}$
(c) $\frac{a}{2\pi}, a$ (d) $2a, \frac{a}{\pi}$

2. If the ratio of diagonals of two cubes is 4 : 3, then the ratio of the surface areas of the two cubes respectively is :
(a) 7 : 9 (b) 16 : 9
(c) 64 : 27 (d) $2:\sqrt{3}$

3. If a hemispherical dome has an inner radius 14m, then its volume (in m^3) is :
(a) $5749.33m^3$ (b) $5749m^3$
(c) $5740m^3$
(d) None of these

4. The volume of a spherical shell whose external and internal diameters are 12cm, and 8cm repectively:
(a) $\frac{304}{3}\pi\ cm^3$ (b) $115\pi\ cm^3$
(c) $608\pi\ cm^3$ (d) $\frac{608}{3}\pi\ cm^3$

5. A solid metal ball of diameter 8cm is melted and cast into smaller balls, each of radius 1cm. The number of such balls is :
(a) 512 (b) 128
(c) 64
(d) None of these

6. The volume of a pyramid of base area $20cm^2$ and height 15cm is :
(a) $300cm^3$ (b) $100cm^3$
(c) $200cm^3$
(d) None of these

7. If the base of right rectangular prism remains constant and the measures of the lateral edges are halved, then its volume will be reduced by :
(a) 50% (b) 33.33%
(c) 25% (d) 66.66%

8. The ratio of the volume of right circular cylinder and a right circular cone of the same base and height will be :
(a) 1 : 3 (b) 2 : 3
(c) 3 : 2 (d) 3 : 1

9. If the diameter of the base of right circular cone is 16cm and its slant height is 10cm, then the area of its axial section is :
(a) $24cm^2$ (b) $36cm^2$
(c) $48cm^2$ (d) $32cm^2$

10. The radius and height of a right circular cone are in the ratio of 5 : 12. If its volume is $314\frac{2}{7}m^3$, its slant height is :
(a) 26m (b) 19.5m
(c) 13m (d) 20m

11. A conical tent has 60° angle at the vertex. The ratio of its radius and slant height is :
(a) 1 : 2 (b) 2 : 1
(c) 3 : 2 (d) 1 : 3

12. The height and radius of a cone is doubled the volume of the cone becomes :
(a) 8 times (b) 4 times
(c) 3 times (d) 2 times

13. If the volume of a cube is $512cm^3$, then its total surface area will be :
(a) $348cm^2$ (b) $256cm^2$
(c) $192cm^2$ (d) $384cm^2$

14. A curved surface of a cylindrical pillar is $264m^2$ and its volume is $924m^3$. The diameter of the pillar is

:
(a) 12m (b) 10m
(c) right pyramid is a square, length of diagonal of the base is $24\sqrt{2}m$. If the volume of the pyramid is 1728 cu.m, its height is :
(a) 12 metre (b) 8 metre
(c) 9 metre (d) 11 metre

16. The ratio of radii of two right circular cylinders is 2 : 3 and their heights are in the ratio 5 : 4. The ratio of their curved surface area is :
(a) 5 : 6 (b) 3 : 4
(c) 4 : 5 (d) 2 : 3

17. A cylinder and a cone have equal radii of their bases and equal heights. If their curved surface areas are in the ratio 8 : 5, the ratio of their radius and height is :
(a) 1 : 2 (b) 1 : 3
(c) 2 : 3 (d) 3 : 4

18. Base of right prism is an equilateral triangle of side 6cm. If the volume of the prism is $108\sqrt{3}$ cc, its height is :
(a) 9 cm (b) 10 cm
(c) 11 cm (d) 12 cm

19. The perimeter of the triangular base of a right prism is 15cm and radius of the incircle of the triangular base is 3cm. If the volume of the prism be $270cm^3$, then the height of the prism is :
(a) 6 cm (b) 7.5 cm
(c) 10 cm (d) 12 cm

20. The diameter of a cylinder is 7 cm and its height is 16cm. Using the value of $\pi = \frac{22}{7}$, the lateral surface area of the cylinder is :
(a) $352\ cm^2$ (b) $350\ cm^2$
(c) $355\ cm^2$ (d) $348\ cm^2$

21. If the length of each side of a regular tetrahedron is 12cm, then the volume of the tetrahedron is :
(a) $144\sqrt{2}$ cu.cm (b) $72\sqrt{2}$ cu.cm
(c) $8\sqrt{2}$ cu.cm (d) $12\sqrt{2}$ cu.cm

22. If the radii of the circular ends of a truncated conical bucket which is 45cm high be 28cm and 7cm, then the capacity of the bucket in cubic centimetre is $\left(use\ \pi = \frac{22}{7}\right)$
(a) 48510 (b) 45810
(c) 48150 (d) 48051

23. A cone, a hemisphere and a cylinder stand on equal base and have the same height. Their volumes are in the ratio :
(a) 1 : 3 : 2 (b) 2 : 3 : 1
(c) 1 : 2 : 3 (d) 3 : 1 : 2

24. A circus tent is cylindrical up to a height of 3 m and conical above it. If its diameter is 105m and the slant height of the conical part is 63m, then the total area of the canvas required to make the tent is $\left(use\ \pi = \frac{22}{7}\right)$:
(a) $11385m^2$ (b) $10395m^2$
(c) $9900m^2$ (d) $990m^2$

26. The ratio of the areas of the incircle and the circumcircle of a square is :
(a) 1 : 2 (b) 2 : 3
(c) 3 : 4 (s) 4 : 5

27. The base of a right prism is a trapezium, The lengths of the paralle sides are 8cm and 14cm and the distance between the parallel sides is 8cm. If the volume of the prism is $1056cm^3$, then the height of the prism is :
(a) 44 cm (b) 16.5 cm

(c) 12 cm (d) 10.56 cm

28. A right angled sector of radius r cm is rolled up into a cone in such a way that the two binding radii are joined together. Then the curved surface area of the cone is :

(a) $\pi r^2 cm^2$ (b) $4\pi r^2 cm^2$ (c)

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

29. The areas of curved surface of a right circular cylinder and a sphere are equal. If the radii of the cylinder and the sphere be equal, then the ratio of their volumes will be :

(a) 2 : 3 (b) 3 : 2

(c) 3 : 4 (d) 4 : 3

30. The height of a solid right circular cylinder is 6 metres and three times the sum of the areas of its two end faces is twice the area of its curved surface. The radius of its base, in metre, is :

(a) 4 (b) 2

(c) 8 (d) 10

31. The radius of the base of a conical tent is 16 metre. If $427\frac{3}{7}$ sq. metre canvas is required to construct the tent, then the slant height of the tent is : $\left(take\ \pi = \frac{22}{7}\right)$

(a) 17 metre (b) 15 metre

(d) 19 metre (d) 8.5 metre

32. The base of a right pyramid is a square of side 16 cm long. If its height be 15cm, then the area of the lateral surface in square centimetre is:

(a) 136 (b) 544

(c) 800 (d) 128

33. A sector is formed by opening out a cone of base radius 8cm and height 6 cm. Then the radius of the sector is (in cm) :

(a) 4 (b) 8

(c) 10 (d) 6

34. The base of a right prism is an equilateral triangle of side 8 cm and height of the prism is 10cm. Then the volume of the prism is :

(a) $320\sqrt{3}$ cubic cm

(b) $160\sqrt{3}$ cubic cm

(c) $150\sqrt{3}$ cubic cm

(d) $300\sqrt{3}$ cubic cm

35. A right cylindrical vessel is full with water. How many right cones having the same diameter and height as that of as that of the right cylinder will be needed to store that water ? $\left(take\ \pi = \frac{22}{7}\right)$

(a) 4 (b) 2

(c) 3 (d) 5

36. A spherical lead ball of radius 10cm is melted and small lead balls of radius 5 mm are made. The total numbers of possible small lead balls is: $\left(take\ \pi = \frac{22}{7}\right)$

(a) 8000 (b) 400

(c) 800 (d) 125

37. Base of a right pyramid is a square length of diagonal of base is 24√2 m. If the volume of the pyramid is 17… cu. m, its height is :

(a) 7 m (b) 8 m

(c) 9 m (d) 10 m

38. Each edge of a regular tetrahedron is 3 cm, then its volume is :

(a) $\frac{9\sqrt{2}}{4}$ c.c. (b) $27\sqrt{3}$ c.c.

(c) $\frac{4\sqrt{2}}{9}$ c.c. (d) $9\sqrt{3}$ c.c.

39. The length of the diagonal of a cube is 6cm. The volume of the cube (in cm^3) is :

(a) $18\sqrt{3}$ (b) $24\sqrt{3}$

(c) $28\sqrt{3}$ (d) $30\sqrt{3}$

40. If the radius of a sphere is increased by 2m, its surface-area is increased by $704m^2$. What is the radius of the original sphere? $\left(take\ \pi = \frac{22}{7}\right)$

(a) $18\sqrt{3}$ (b) $24\sqrt{3}$

(c) $28\sqrt{3}$ (d) 13

41. A right circular cylinder is circumscribing a hemisphere such that their bases are common. The ratio of their volumes is :

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

42. The ratio of the volume of a cube to that of a sphere, which will exactly fit inside the cube is :

(a) $2 : \pi$ (b) $\pi : 6$
(c) $6 : \pi$ (d) $8 : \pi$

43. The radius of the base of a right circular cylinder is 3.5 cm and its height is 7.5 cm. The ratio of the total surface area of the cylinder to its curved surface area is

(a) 22 : 5 (b) 22 : 15
(c) 22 : 7 (d) 22 : 17

44. The radii of the base of cylinder and a cone are in the ratio $\sqrt{3} : \sqrt{2}$ and heights in the ratio $\sqrt{2} : \sqrt{3}$. Their volumes are in the ratio of :

(a) $\sqrt{3} : \sqrt{2}$ (b) $3\sqrt{3} : \sqrt{2}$

(c) $\sqrt{3} : 2\sqrt{2}$ (d) $\sqrt{2} : \sqrt{6}$

45. The base of a cone and a cylinder have the same radius 6 cm; they have also the same height 8 cm. The ratio os the curved surfaces of the cylinder to that of the cone is :

(a) 8 : 5 (b) 8 : 3
(c) 4 : 3 (d) 5 : 3

46. The radius of the base of a right circular cone is doubled keeping its height fixed. The volume of the cone will be.

(a) three times of the previous volume
(b) four times of the previous volume
(c) $\sqrt{2}$ times of the previous volume
(d) double of the previous volume

47. The base of a right circular cone has the same radius a as that of a sphere. Both the sphere and the cone have the same volume. Height of the cone is :

(a) 3 a (b) 4 a

(c) $\frac{7}{4}a$ (d) $\frac{7}{3}a$

48. Diagonal of a cube is $6\sqrt{3}$ cm. Ratio of its total surface area and volume (numerically) is :

(a) 2 : 1 (b) 1 : 6
(c) 1 : 1 (d) 1 : 2

49. A right circular cylinder and a sphere have same radius and same volume. The ratio of their surface area is

(a) 2 : 1 (b) 1 : 6

(c) 1 : 1

(d) 7 : 6

LEVEL - 2

1. A cube and a sphere have equal surface areas. The ratio of their volume is :

(a) p : 3
(b) $\sqrt{\pi} : \sqrt{6}$
(c) $\sqrt{6} : \sqrt{\pi}$
(d) $6 : \pi$

2. A cone, a hemisphere and a cylinder stand on equal bases and have the same height. The ratio of their respective volumes is :

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

3. A cube of sides 3cm is melted and smaller cubes of sides 1cm each are formed. How many such cubes are possible ?

(a) 21
b. 23
(c) 25
d. 27

4. A cuboidal block of 6cm x 9cm x 12cm is cut into exact number of equal cubes. The least possible number of cubes will be :

a. 6
b. 9
c. 24
d. 30

5. If the cone is cut along its axis from the middle, the new shape we obtain after opening the paper is :

(a) isosceles triangle
(b) right angle triangle
(d) equilateral triangle
(d) None of these

6. What is the height of the cone which is formed by joining the two ends of a sector of circle with radius r and angle 60° :

(a) $\frac{\sqrt{35}}{6}r$
(b) $\frac{\sqrt{25}}{6}r$
(c) $\frac{r^2}{\sqrt{3}}$
(d) $\frac{35}{6}r$

7. A sphere of 20cm radius is dropped into a cylindrical vessel of 60cm diameter, which is partly filled with water, then its level rises by x cm. Find x:

(a) $11\frac{21}{27}$cm
(b) 12cm
(c) 22.5cm
(d) $11\frac{23}{27}$cm

8. A right circular cone resting on its base is cut at $\frac{4}{5}th$ its height along a parallel to the circular base. The height of original cone is 75cm and base diameter is 42cm. What is the base radius of cut out (top portion) cone ?

(a) 4.2cm
(b) 8.4cm
(c) 2.8cm
(d) 3.5cm

9. A solid sphere is melted and recast into a right circular cone with a base radius equal to the radius of the sphere. What is the ratio of the height and radius of cone so formed ?

(a) 5 : 2
(b) 4 : 3
(c) 4 : 1
(d) 3 : 2

10. 125 identical cubes are cut from a big cube and all the smaller cubes are arranged in a row to form a long cuboid. What is the percentage increase in the total surface area of the cuboid over the total surface area of the cube ?

(a) $234\frac{1}{3}\%$
(b) $234\frac{2}{3}\%$
(c) 117%
(d) None of these

11. What is the total surface area of the identical cubes of largest possible size that are cut from a cuboid of size 75cm x 15cm x 4.5cm ?

(a) 20, 250cm^2
(b) 20, 520cm^2
(c) 22, 250cm^2
(d) None of these

12. If the volume of a sphere, a cube, a tetrahedron and a octahedron be same then which of the following has maximum surface area ?

(a) sphere
(b) cube

(c) tetrahedron (d) octahedron

13. A spherical ball of lead 6cm in radius is melted and recast into three spherical balls. The radii of two of these balls are 3cm and 4cm. What is the radius of the third sphere ?
(a) 6cm (b) 6.5cm
(c) 5.5cm (d) 5cm

14. The base of a right prism is a triangle whose perimeter is 45cm and the radius of incircle is 9cm. If the volume of the prism is $810cm^3$. Find its height :
(a) 5cm (b) 4cm
(c) 6cm (d) 4.5cm

15. What is the semi-vertical angle of a cone whose lateral surface area is double the base area ?
(a) 30° (b) 45°
(c) 60°
(d) None of these

16. What is the number of cones of semi-vertex angle and having r as the radius of the mid-section which can be moduled out of a cylinder of base radius r and height $2r \cot\alpha$:
(a) 5 (b) 7
(c) 6 (d) 4

17. A water tank is 30cm long, 20cm wide and 12m deep. It is made of iron sheet which is 3m wide. The tank is open at the top. If the cost of iron sheet is ₹ 10per meter. Find the total cost of iron required to build the tank ?
(a) ₹6000 (b) ₹5000
(c) ₹5500 (d) ₹5800

18. A trapezium based prism with two parallel sides 8cm and 12cm respectively and distance between two parallel sides is 8cm. Find the height of the prism if the volume of the prism is $1056cm^3$?
(a) 11cm (b) 10cm
(c) 9cm (d) 12cm

19. From a circular sheet of paper, radius 10cm, A sector of area 40% of the sheet is removed. If the remaining part is used to makde a conical surface. Then the ratio of radius and height will be :
(a) 4 : 3 (b) 3 : 4
(c) 2 : 3 (d) 2 : 1

20. If the area of circular cell having inner and outer radius 8cm and 12cm respectively is equal to the total surface area of cylinder of radius R_1 and height h, then h in terms of R_1 will be :
(a) $\frac{40-R_1}{R_1}$ (b) $\frac{40-R_1}{R_1^2}$
(c) $\frac{40-R_1^2}{R_1}$
(d) None of these

21. An iron pipe 20cm long has exterior diameter 25cm. If the thickness of the pipe is 1cm, then the whole surface area of the pipe ?
(a) $3168cm^2$ (b) $3186cm^2$
(c) $3200cm^2$ (d) $3150cm^2$

22. The capacity of two hemispherical bowls are 64 litre and 216 litre respectively. Then the ratio of their internal curved surface area will be:
(a) 2 : 3 (b) 1 : 3
(c) 16 : 81 (d) 4 : 9

23. If the length of a rectangular parallel pipe is three times of its breadth and five times of its height. If its volume is $14400cm^3$, then the total surface area will be :
(a) $4230cm^2$ (b) $4320cm^2$
(c) $4203cm^2$
(d) None of these

24. A right angled triangle with its sides 5cm, 12cm and 13cm is revolved about the side 12cm. Find the volume of the solid formed ?
(a) $942cm^3$ (b) $298cm^3$

(c) $314 cm^3$ (d) $302 cm^3$

25. A hemisphere bowl B_1 and a hollow right circular cylinder B_2 (having length equal to its radius) have the same diameter equal to the length of a side of a hollow cubical box B_3. Water is filled in all these vessels upto the same level and such that hemispherical bowl is full of water and the volumes of filled water are v_1, v_2 and v_3 respectively in B_1, B_2 and B_3 then :
(a) $V_1<V_2<V_3$ (b) $V_2<V_3<V_1$
(c) $V_3<V_2<V_1$ (d) $V_3<V_1<V_2$

26. A vertical cone of volume V with vertex downward is filled with water up to half of its height. The volume of the water is :
(a) V/16 (b) V/8
(c) V/4 (d) V/2

27. The heights of a cone, cylinder and hemisphere are equal. If their radii are in the ratio 2 : 3 : 1, then the ratio of their volumes is :
(a) 2 : 9 : 2 (b) 4 : 9 : 1
(c) 4 : 27 : 2 (d) 2 : 3 : 1

28. The height of a right circular cone and the radius of its circular base are respectively 9 cm and 3 cm. The cone is cut by a plane parallel to its base so as to divide it into two parts. The volume of the frustum (i.e., the lower part) of the cone is 44 cubic cm. The radius of the upper circular surface of the frustum $\left(take\ \pi = \frac{22}{7}\right)$ is :
(a) $\sqrt[3]{12}$ cm (b) $\sqrt[3]{13}$ cm
(c) $\sqrt[3]{13}$ cm (d) $\sqrt[3]{20}$ cm

29. A solid cylinder has total surface area of 462 sq. cm. Curved surface area is $\frac{1}{3}$rd of its total surface area. The volume of the cylinder is :
(a) $530 cm^3$ (b) $536 cm^3$
(c) $539 cm^3$ (d) $545 cm^3$

30. A solid is hemispherical at the bottom and conical above. If the surface areas of the two parts are equal, then the ratio of radius and height of its conical part is :
(a) 1 : 3 (b) 1 : 1
(c) $\sqrt{3}$: 1 (d) 1 : $\sqrt{3}$

31. The radius and the height of a cone are in the ratio 4 :3 . The ratio of the curved surface area and total surface area of the cone is :
(a) 5 : 9 (b) 3 : 7
(c) 5 : 4 (d) 16 : 9

32. From a right circular cylinder of radius 10 cm and height 21 cm, a right circular cone of same base-radius is removed. If the volume of the remaining portion is $4400 cm^3$ then the height of the removed cone $\left(take\ \pi = \frac{22}{7}\right)$ is :
(a) 15 cm (b) 18 cm
(c) 21 cm (d) 24 cm

33. A right circular cylinder and a cone have equal base radius and equal heights. If their curved surfaces are in the ratio 8 : 5, then the radius of the base to the height are in the ratio :
(a) 2 : 3 (b) 4 : 3
(c) 3 : 4 (d) 3 : 2

34. The curved surface area of a cylindrical pillar is 264 sq.m. and its volume is 924 cu.m. The ratio of its diameter to height is :
(a) 3: 7 (b) 7 : 3
(b) 6 : 7 (d) 7 : 6

35. A cube of edge 6 cm is painted on all sides and then cut into unit cubes. The number of unit cubes with no sides painted is :
(a) 0 (b) 64

(c) 186 (d) 108

36. There is a pyramid on a base which is a regular hexagon of side 2a cm. If every slant edge of this pyramid is of length $\frac{5a}{2}$ cm, then the volume of this pyramid is :

(a) $3a^3 cm^3$ (b) $3\sqrt{2}a^3 cm^3$

(c) $3\sqrt{3}a^3 cm^3$ (d) $6a^3 cm^3$

37. The base of a right prism is an equilateral triangleof area 173 cm^2 and the volume of the prism is 10380 cm^3. The area of the lateral surface of the prism is $use\left(\sqrt{3} = 1.73\right)$

(a) 1200 cm^2 (b) 2400 cm^2
(c) 3600 cm^2 (d) 4380 cm^2

38. Three spherical balls or radii 1 cm, 2 cm and 3 cm are melted to form a single spherical ball. In the process, the loss of material is 25 %. The radius of the new ball is :

(a) 6 cm (b) 5 cm
(c) 3 cm (d) 2 cm

39. If a sphere radius r is divided into four identical parts, then the total surface area of the four parts is :

(a) $4\pi r^2$ *square* unit

(b) $2\pi r^2$ *square* unit

(c) $8\pi r^2$ *square* unit

(d) $3\pi r^2$ *square* unit

40. A cube of side 1 metre is reduced 3 times in the ratio 1 : 2. The area of one face of the reduced cube to that of the original cube is in the ratio :

(a) 1 : 4 (b) 1 : 8
(c) 1 : 16 (d) 1 : 64

41. The volume of the largest cylinder formed, when a rectangular sheet of paper of size 22 cm × 15cm is rolled along its larger side, is $\left(use\,\pi = \frac{22}{7}\right)$:

(a) 288.75 cm^3
(b) 577.50 cm^3
(c) 866.25 cm^3
(d) 1155.00 cm^3

42. Each of the height and radius of the base of a right circular cone is increased by 100 %. The volume of the cone will be increased by :

(a) 700 % (b) 500 %
(c) 300 % (d) 100 %

43. The height of a right prism with a square base is 15cm. If the area of the total surfaces of the prism is 608 sq.cm, its volume is :

(a) 910 cm^3 (b) 920 cm^3
(c) 960 cm^3 (d) 980 cm

43. The height of a right prism with a square base is 15cm. If the area of the total surfaces of the prism is 608 sq.cm, its volume is :

(a) 910 cm^3 (b) 920 cm^3
(c) 960 cm^3 (d) 980 cm

44. The internal radius and thickness of a hollow metallic pipe are 24 cm and 1 cm respectively. It is melted and recast into a solid cylinder of equal length. The diameter of the solid cylinder will be :

(a) 7 cm (b) 14 cm
(c) 960 cm^3 (d) 980 cm

45. The radius of the base of a right circular cone is doubled. To keep the volume fixed, the height of the cone will be

(a) One-fourth of the previous height

(b) $\frac{1}{\sqrt{2}}$ times of the prevoious height

(c) half of the previous height

(d) one - third of the previous height

LEVEL - 3

1. If a cube maximum possible volume is cut off from a solid sphere of diameter d, then the volume of the remaining (waste) material of the sphere would be equal to :

(A) $\frac{d^3}{3}\left(\pi - \frac{d}{2}\right)$ b. $\frac{d^3}{3}\left(\frac{\pi}{2} - \frac{1}{\sqrt{3}}\right)$

(c) $\frac{d^2}{4}\left(\sqrt{2} - \pi\right)$ (d) None of these

2. A big cube of side 9cm is formed by rearranging together 81 small but identical cubes each of side 3cm. further, if the corner cubes in the topmost layer of the big cube are removed, what is the change in total surface area of the big cube ?
(a) $18cm^2$, decreases
(b) $54cm^2$, decreases
(c) $36cm^2$, decreases
(d) remains the same as previously

3. l, b are the length and breadth of a rectangle respectively. If the perimeter of this rectangle is numerically equal to the area of the rectangle. What is the value of l - b (where l > b) ?
(a) 1 (b) 2
(c) 3 (d) 4

4. A spherical steel ball was silver polished then it was cut into 4 similar pieces. What is the ratio of the polished area to the non-polished area :
(a) 1 : 1 (b) 1 : 2
(c) 2 : 1
(d) None of these

5. The height of a cone is 40cm. The cone is cut parllel to its base such that the volume of the small cone is $\frac{1}{64}$ of the cone. Find at which height the cone is cut ?
(a) 20cm (b) 30cm
(c) 25cm (d) 22.5cm

6. The base radius and height of a cone is 5cm and 25cm respectively. If the cone is cut parallel to its base at a height of h from the base. If the volume of this frustum is $110cm^3$. Find the radius of smaller cone ?
(a) $(104)^{1/3} cm$ (d) $(104)^{1/2} cm$
(c) 5cm
(d) None of these

7. Find the radius of maximum size sphere which can be inscribed or put in a cone whose base radius and height are 6cm and 8cm respectively?
(a) 4cm (b) 5cm
(c) 3cm
(d) None of these

8. A rectangle based pyramid, length and width of the base is 18cm and 10cm respectively. Find the total surface area, if its height is 12cm :
(a) $267cm^2$ (b) $564cm^2$
(c) $516cm^2$ (d) None of these

9. Find the length of the string bound on a cylindrical tank whose base diameter and height are $5\frac{1}{11}$ cm and 48cm respectively. The string makes exactly four complete turns round the cylinder, while its two ends touch the tank's top and bottom :
(a) 75cm (b) 70cm
(c) 60cm (d) 80cm

10. The height of a circular cylinder is increased by 6 times and base area is decreased by 1/9th times. By what factor its lateral surface area is increased ?
(a) 2 (b) 3
(c) 6 (d) 1.5

11. If h, c, v are respectively the height, the curved surface area and the volume of a cone then the value of $3\pi vh^3 - c^2h^2 + 9v^2$ is equal to :
(a) 1 (b) 2
(c) 0
(d) None of these

12. The difference between the outside and inside surface of a cylindrical metallic pipe, 14cm long, is $44cm^2$. If the pipe is made of $99cm^3$ of metal. Find the outer radii of the pipe ?
(a) 2cm (b) 2.5cm
(c) 4cm (d) 5cm

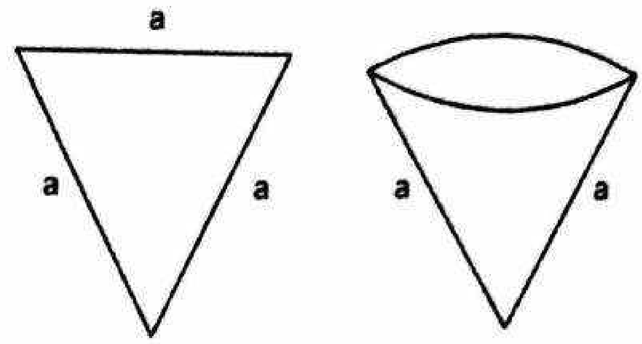
13. A semi-circular sheet of metal of diameter 28 cm is bent into an open conical cup. The depth of the cup is aproximately :
(a) 11 cm (b) 12 cm
(c) 13 cm (d) 14 cm

14. The radius of a cylinder is 10 cm and height is 4 cm. The number of centimetres that may be added either to the radius or to the height to get the same increase in the volume of the cylinder is :
(a) 5 (b) 4
(c) 25 (d) 16

Hints and Solutions:

LEVEL-1

1.(c)



Slant height = a and

$2\pi r = a \Rightarrow radius(r) = \frac{a}{2\pi}$

2.(b) Ratio of radius = (radius of diagonals$)^2$

$= \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

[$\because$ Surface area $= 6a2 = \left(\sqrt{3}a\right)^2 \times 2$
$= 2$ (diagonals$)^2$]

3.(a) $V = \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7}(14)^3 = 5749.33m^3$

4.(d) $V = \frac{4}{3}\pi\left(R^3 - r^3\right) = \frac{4}{3}\pi(6^3 - 4^3)$

$= \frac{4}{3}\pi(152) = \frac{608}{3}\pi cm^3$

5.(c) Since volume is constant

$\therefore n \times \frac{4}{3}\pi(1)^3 = \frac{4}{3}\pi(4)^3$

$\Rightarrow n = 64$

6.(b) Volume of pyramid = $\frac{1}{3}$ × base area × height

$\frac{1}{3} \times 20 \times 15 = 100cm^3$

7.(a) Volume of prist = base area × height

$= A \times h$

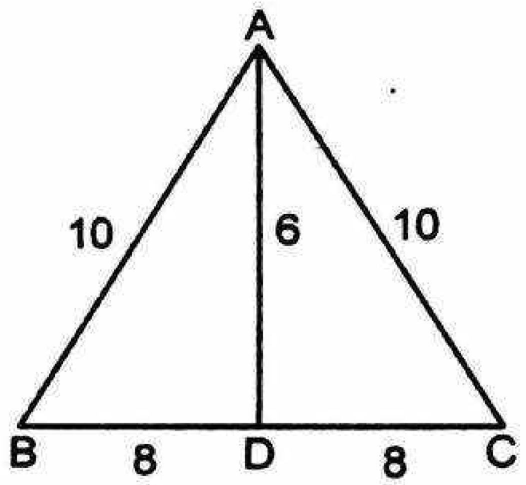
$\therefore$ new volume $= A \times \frac{h}{2}$ $\left[\because \text{height} = \frac{h}{2}\right]$

$\therefore$ % decrease in volume

$= \frac{Ah - Ah/2}{Ah} \times 100 = \frac{1}{2} \times 100 = 50\%$

8.(d) $\frac{\text{volume of cylinder}}{\text{volume of cone}} = \frac{\pi r^2 h}{\left(\frac{1}{3}\right)\pi r^2 h} = \frac{3}{1}$

9.(c)



By pythagoras theorem
AD = 6cm

$\therefore$ Area of axial section $= \frac{1}{2} \times 16 \times 6$

$= 48cm^2$

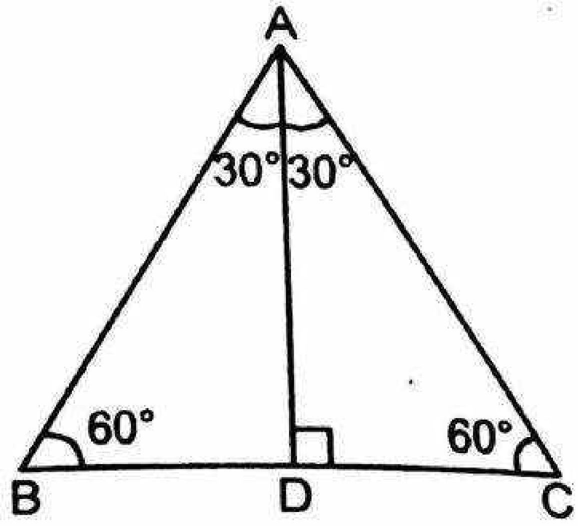
10.(c) $\frac{1}{3} \times \pi \times (5x)^2 \times (12x) = 314\frac{2}{7} = \frac{2200}{7}$

$\Rightarrow x = 1$

$\therefore r = 5$ and $h = 12$

$\therefore l = 13cm$

11.(a)



$\frac{BD}{AB} = \cos 60° = \frac{1}{2}$

12.(a) $V = \frac{1}{3}\pi r^2 h$

new radius $= 2r$ and new height $= 2h$

$\therefore$ new volume $= V^1 = \frac{1}{3}\pi(2r)^2(2h)$

$= 8\left(\frac{1}{3}\pi r^2 h\right) = 8V$

13.(d) Let side of the cube = a

$\therefore$ $v = a^3 = 512 \Rightarrow a = 8cm$

$\therefore$ Total surface area $= 6a^2$

$= 6 \times 64$

$= 384cm^2$

14.(c) Let 'r' be the radius of base and h be the height of the cylinder, then ;

$2prh = 264 \Rightarrow rh = \frac{132}{\pi}$

and $pr^2h = 924 \Rightarrow r = 7$

$\Rightarrow$ $2r = 14m$

15.(c) Area of the base $= \frac{1}{2} \times (\text{diagonal})^2$

$= \frac{1}{2} \times 24\sqrt{2} \times 24\sqrt{2} = 576$ sq. metre.

$\therefore$ volume of pyramid $= \frac{1}{3} \times$ height $\times$ area of base

$\Rightarrow 1728 = \frac{1}{3} \times h \times 576$

$\Rightarrow h = \frac{1728 \times 3}{576} = 9$ metre

16.(a) First cylinder Second cylinder
$r_1 = 2r$ $r_2 = 3r$
$h_1 = 5h h_2 = 4h$
$\therefore$ Required ratio $= 2\pi r_1 h_1 : 2\pi r_2 h_2$
$= 2 \times 5 : 3 : 4$
$= 5 : 6$

17.(d) $\frac{\text{curved surface of cylinder}}{\text{curved surface of cone}} = \frac{8}{5}$

$\Rightarrow \frac{2\pi rh}{\pi r\sqrt{h^2 + r^2}} = \frac{8}{5}$

$\Rightarrow \frac{h}{\sqrt{h^2 + r^2}} = \frac{4}{5}$

On squaring both sides,

$\frac{h^2}{h^2 + r^2} = \frac{16}{25} \Rightarrow \frac{h^2 + r^2}{h^2} = \frac{25}{16}$

$\Rightarrow 1 + \frac{r^2}{h^2} = \frac{25}{16} \Rightarrow \frac{r^2}{h^2} = \frac{25}{16} - 1 = \frac{9}{16}$

$\therefore \frac{r}{h} = \frac{3}{4}$

18.(d) Area of the base $= \frac{\sqrt{3}}{4} \times side^2$

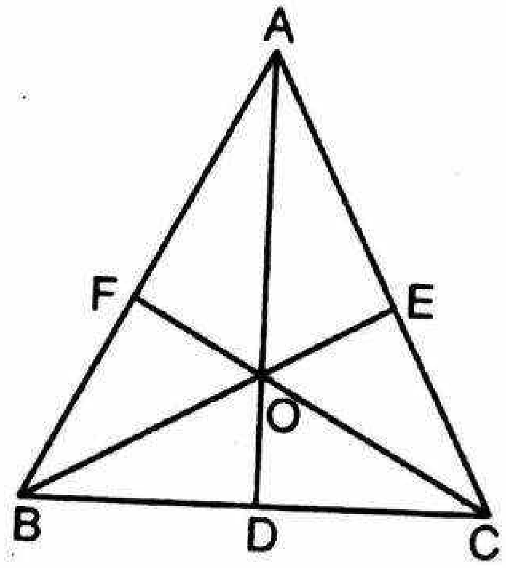
$= \frac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$ sq. cm

$\therefore$ volume of the prism
Area of the base $\times$ height

$\Rightarrow 108\sqrt{3} = 9\sqrt{3} \times h$

$h = \frac{108\sqrt{3}}{9\sqrt{3}} = 12$ cm

19. (d)



Radius of the in-circle = OE
= OD
= OF
= 3 cm

Area of triangular base =

$\left(\frac{1}{2} AB \times OF + \frac{1}{2} \times BC \times OD + \frac{1}{2} AC \times OE\right)$

$= \left(\frac{1}{2} \times 3 \times (AB + BC + AC)\right)$

$= \frac{1}{2} \times 3 \times 15 = \frac{45}{2}$ sq.cm

Volume of the prism = Area of the base $\times$ height

$\Rightarrow 270 = \frac{45}{2} \times height$

$\therefore$ Height $= \frac{270 \times 2}{45} = 12$cm.

20.(a) Lateral surface area of the cylinder = $2\pi rh$

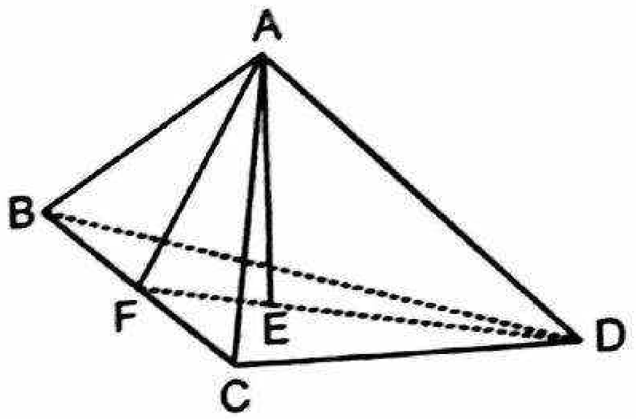
$= 2 \times \frac{22}{7} \times \frac{7}{2} \times 16 = 352$ sq.cm

21.(a) Volume of the tetrahedron

$= \frac{1}{3} \times$ Area of base $\times$ height

Area of the base $= \frac{\sqrt{3}}{4} \times 12 \times 12$

$= 36\sqrt{3}$ sq.cm



DF (perpendicular)

$= \sqrt{DC^2 - FC^2}$

$= \sqrt{12^2 - 6^2} = \sqrt{18 \times 6}$

$= 6\sqrt{3} = AF$

$FE = \frac{1}{3} \times 6\sqrt{3} = 2\sqrt{3}$ cm

$\therefore AE = \sqrt{AF^2 - FE^2}$

$= \sqrt{(6\sqrt{3})^2 - (2\sqrt{3})^2}$

$= \sqrt{108 - 12} = \sqrt{96} = 4\sqrt{6}$ cm

$\therefore$ Required volume

$= \frac{1}{3} \times 36\sqrt{3} \times 4\sqrt{6}$

$= 144\sqrt{2}$ cu.cm

22.(a) Volume of bucket

$= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$= \frac{1}{3} \times \frac{22}{7} \times 45\left(28^2 + 7^2 + 28 \times 7\right)$

$= \frac{1}{3} \times \frac{22}{7} \times 45(784 + 49 + 196)$

$= \frac{1}{3} \times \frac{22}{7} \times 1029$

$= 48510$ cu. cm

23.(c) Required ratio

$= \frac{1}{3}\pi^2 h : \frac{2}{3}\pi r^2 h : \pi r^2 h$

(height of cone = height of hemisphere = r)

$= \frac{1}{3} : \frac{2}{3} : 1 = 1 : 2 : 3$

24.(a) Total area of the canvas $= 2\pi rh + \pi rl$

$= \pi r(2h + l)$

$= \frac{22}{7} \times \frac{105}{2}(2 \times 3 + 63)$

$= \frac{22}{7} \times \frac{105}{2} \times 69 = 11385$ sq.metre

25.(c) Area of the base $= 40 \times 40$
$= 1600$ sq.cm

Volume of pyramid $= \frac{1}{3}$ area of base × height

$= 8000 \times \frac{1}{3} \times 1600 \times h$

$\Rightarrow \frac{8000 \times 3}{1600} = 15$cm

26.(a) If the length of the side of square be units, then

Radius of incircle $= \frac{a}{2}$

Radius of circum - circle $= \frac{\sqrt{2}a}{2} = \frac{a}{\sqrt{2}}$

$\therefore$ Required ratio $= \pi \times \left(\frac{a}{2}\right)^2 : \pi \times \left(\frac{a}{\sqrt{2}}\right)^2$

$= \frac{1}{4} : \frac{1}{2} = 1:2$

27.(c) Area of the base $= \frac{1}{2}$ (sume of parallel sides) × perpendicular distance

$= \frac{1}{2}(14+8) \times 8 = 88$ sq.cm.

$\therefore$ Volume = Area of the base × height

$\Rightarrow$ 1056 × 88 × h

$h = \frac{1056}{88} = 12$cm

28.(c) Radius of the base $(r_1) = \frac{r}{4}$, Slant height = r

$\therefore$ Curved surface area $= \pi r_1 l = \frac{\pi r^2}{4}$

29.(b) Let the radius of cylinder be r cm and its height be h cm.

$\therefore 2\pi rh = 4\pi r^2, \quad h = 2r$

$\therefore$ Ratio of volumes $= \pi r^2 h : \frac{4}{3}\pi r^3$

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

30.(a) Let the radius of the base be r metre.

$\therefore 3 \times 2\pi r^2 = 2 \times 2\pi rh \Rightarrow 3r = 2h$

$\Rightarrow 3r = 2 \times 6 \Rightarrow r = 4$ *metre*

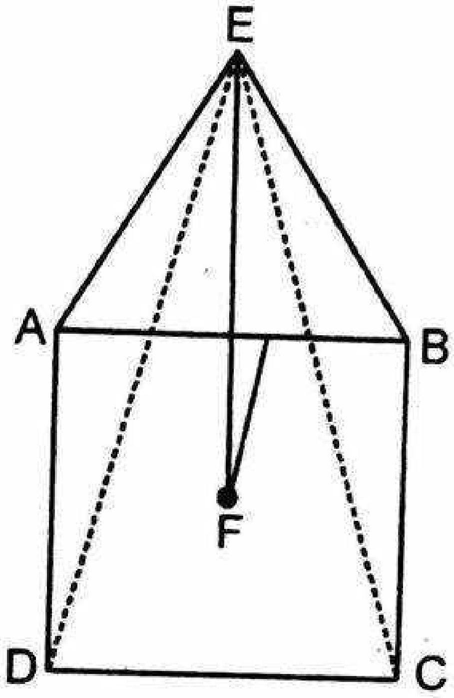
31.(d) Curved surface area of cone = πrl

$\therefore \frac{22}{7} \times 16 \times l = \frac{2992}{7}$

$\Rightarrow 22 \times 16 \times l = 2992$

$\Rightarrow l = \frac{2992}{22 \times 16} = 8.5$ metre

32. (b)



Height of the triangle = $\sqrt{15^2 + 8^2}$

$= \sqrt{225+64} = \sqrt{289} = 17cm$

$\therefore$ Area of the lateral surface of pyramid

= 4 × Area of trianle

= 4 × $\frac{1}{2}$ × base × height

= 4 × $\frac{1}{2}$ × 16 × 17

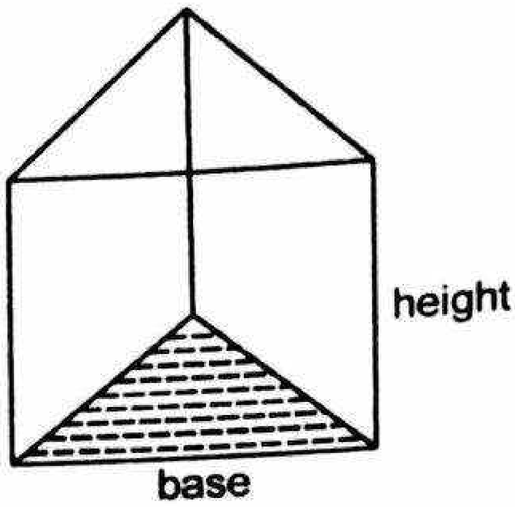
= 544 sq. cm

33.(c) Radius of sector = Slant height of cone

$= \sqrt{h^2 + r^2} = \sqrt{6^2 + 8^2} = \sqrt{36+64}$

$= \sqrt{100} = 10$cm

34. (b)



Area of the base $= \frac{\sqrt{3}}{4} \times (Side)^2$

$= \frac{\sqrt{3}}{4} \times 8 \times 8 = 16\sqrt{3}$ sq.cm

$\therefore$ Volume of prism = Area of base × height

$= 16\sqrt{3} \times 10 = 160\sqrt{3}$ cu. cm

35.(c) Volume of cylindrical vessel = $\pi r^2 h$

Volume of cone $= \frac{1}{3}\pi r^2 h$

$\therefore$ Number of cone $= \frac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = 3$

36. (a) Volume of bigger ball $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 10 \times 10 \times 10$ cu.cm

Volume of smaller ball $= \frac{4}{3}\pi(0.5)^3$

$= \frac{4}{3}\pi(0.5)^3$

$\therefore$ Probable number of smaller balls

$$= \frac{\frac{4}{3}\pi \times 10 \times 10 \times 10}{\frac{4}{3}\pi \times 0.5 \times 0.5 \times 0.5} = 8000$$

37. (c) Area of base $= \frac{1}{2}(\text{diagonal})^3$

$= \frac{1}{2} \times 24\sqrt{2} \times 24\sqrt{2} = 576$ sq. metre.

$\therefore$ Volume of pyramid

$= \frac{1}{3} \times \text{height} \times \text{area of base}$

$\Rightarrow 1728 = \frac{1}{3} \times h \times 576$

$\Rightarrow h = \frac{1728 \times 3}{576} = 9$ metre

38. (a) Area of the tetrahedron

$= \frac{1}{3} \times \text{area of base} \times \text{height}$

Area of the base $= \frac{\sqrt{3}}{4} \times (side)^2$

$= \frac{\sqrt{3}}{4} \times 3 \times 3 = \frac{9\sqrt{3}}{4}$ cm^2

Length of the perpendicular triangle

$= \sqrt{3^2 - \left(\frac{3}{2}\right)^2} = \sqrt{9 - \frac{9}{4}} = \frac{3\sqrt{3}}{2}$ cm

$\therefore$ Height $= \sqrt{\left(\frac{3\sqrt{3}}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2}$

$= \sqrt{\frac{27}{4} - \frac{3}{4}} = \sqrt{6}$ cm

$\therefore$ Required area $= \frac{1}{3} \times \frac{9\sqrt{3}}{4} \times \sqrt{6}$

$= \frac{9\sqrt{2}}{4}$ cu.cm.

39.(b) Diagonal (d) = $a\sqrt{3}$

$\therefore 6 = a\sqrt{3}$

$\Rightarrow a = 2\sqrt{3}$

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

$= 2\sqrt{3} \times 2\sqrt{3} \times 2\sqrt{3} = 24\sqrt{3}\text{ cm}^3$

40.(d) $4\pi(r+2)^2 - 4\pi r^2 = 704$

$\Rightarrow (r+2)^2 - r^2 = \frac{704}{4\pi}$

$\Rightarrow r^2 + 4r + 4 - r^2 = \frac{704 \times 7}{4 \times 22} = 56$

$\Rightarrow 4r = 56 - 4 = 52 \Rightarrow r = 13$ metre

41.(c) Required ratio = Vol. of hemisphere : Vol. of cylinder

$= \frac{2}{3}\pi r^3 : \pi r^2 h = \frac{2}{3}\pi r^3 : \pi r^3 = 2 : 3$

42.(c) If the edge of cube be x units then diameter of sphere = x units

$\therefore$ radius of sphere = $\frac{x}{2}$

$\therefore$ Required ratio $= x^3 : \frac{4}{3}\pi\frac{x^3}{8} = 6 : \pi$

43.(b) Required ratio = $(2\pi rh + 2\pi r^2) : 2\pi rh$

$= 2\pi r(h + r) : 2\pi rh = (h + r) : h$

$= (7.5 + 3.5) : 7.5$

$= 11 : 7.5$

$= 22 : 15$

44. (b) $\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$= 3.\left(\frac{r_1}{r_2}\right)^2\left(\frac{h_1}{h_2}\right) = 3 \times \left(\frac{\sqrt{3}}{\sqrt{2}}\right)^2 \times \frac{\sqrt{2}}{\sqrt{3}}$

$= 3 \times \frac{\sqrt{3}}{\sqrt{2}} = 3\sqrt{3} : \sqrt{2}$

45. (a) Slant height of cone $= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64} = \sqrt{100} = 10\,cm$

$\therefore$ Curved surface of cylinder : Curved surface of cone ₹

$2\pi rh : \pi rl = 2h : l = 16 : 10 = 8 : 5$

46.(b) Original volume of cone $=\frac{1}{3}\pi r^2 h$

New volume of cone $=\frac{1}{3}\pi(2r)^2 h=\frac{4}{3}\pi r^2 h$

47.(b) $=\frac{1}{3}\pi a^2 h=\frac{4}{3}\pi a^3$

$\Rightarrow h=4a$

48.(c) Diagonal of the cube = $6\sqrt{3}$ cm

$\therefore \sqrt{3}\times \text{edge}=6\sqrt{3}cm$

$\Rightarrow$ Edge = 6 cm

$\therefore$ Total surface area : Volume

$=6\times 6^2:6^3=1:1$

49.(d) Volume of cylinder = Volume of sphere

$\Rightarrow \pi r^2 h=\frac{4}{3}\pi r^3, \quad \Rightarrow \frac{h}{r}=\frac{4}{3}$

$\therefore \frac{\text{Surface area of cylinder}}{\text{Surface area of sphere}}$

$\Rightarrow \frac{2\pi rh+2\pi r^2}{4\pi r^2}=\frac{2\pi rh}{4\pi r^2}+\frac{2\pi r^2}{4\pi r^2}$

$=\frac{h}{2r}+\frac{1}{2}=\frac{4}{6}+\frac{1}{2}=\frac{7}{6}$

LEVEL-2

1.(b) Let the side of the cube and radius of the sphere be a and r respectively

$\because 6a^2=4\pi r^2 \Rightarrow a=r\left(\frac{2}{3}\pi\right)^{\frac{1}{2}}$

$\frac{V_1}{V_2}=\frac{a^3}{\frac{4}{3}\pi r^3}=\frac{r^3\left(\frac{2}{3}\pi\right)^{\frac{3}{2}}}{\frac{4}{3}\pi r^3}$

$=\frac{2\sqrt{2}\pi^{3/2}}{3\sqrt{3}}\times\frac{3}{4\pi}=\sqrt{\pi}:\sqrt{6}$

2.(a) V(cone) : V(hemisphere) : V(cylinder)

$=\frac{1}{3}\pi r^2.r:\frac{2}{3}\pi r^3:\pi r^2.r$

$=1:2:3$

3.(d) Volume of original cube = n × volume of smaller cubes

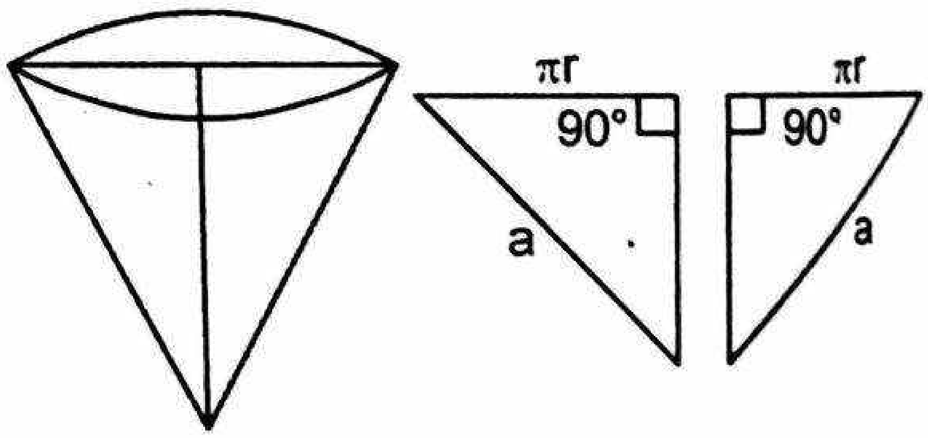
$\Rightarrow n=\frac{3\times3\times3}{1\times1\times1}=27$

4.(c) $\because$ H.C.F of 6,9 and 12 = 3

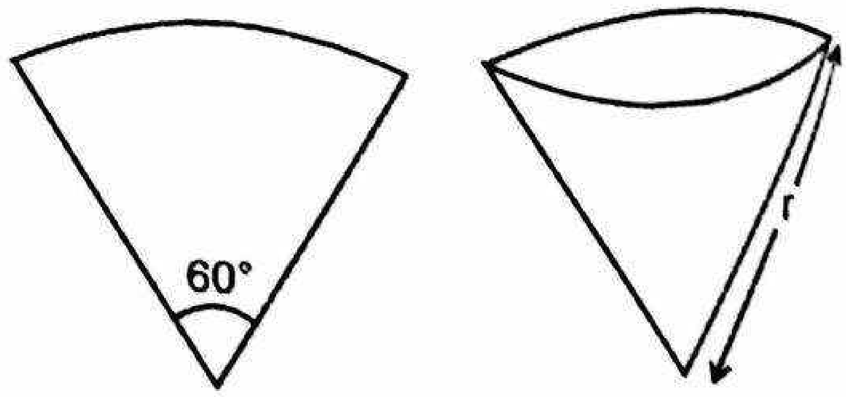
$\therefore$ Least possible number of cubes $=\frac{6\times9\times12}{3\times3\times3}=24$

[Note :- The cuboid is cut into smaller cubes of equal size i.e. size should be maximum]

5.(b) It will be in the form of a right angled triangle.



6.(a) Arc of sector $=2\pi r\cdot\frac{60}{360}=\frac{2\pi r}{6}$



This arc of sector will be equal to the perimeter of cone.

Let the radius of cone be R, then:

$2\pi R = \frac{2\pi r}{6} \Rightarrow R = \frac{r}{6}$, and slant height of cone (l) = radius of sector = r

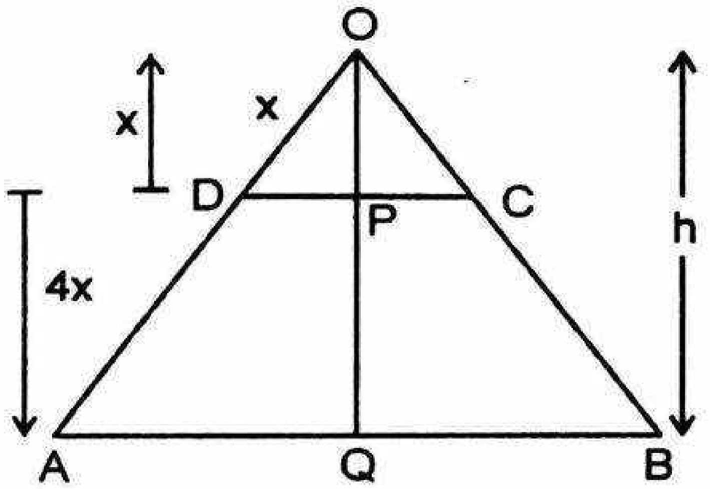
$$\therefore h = \sqrt{l^2 - R^2} = \sqrt{r^2 - \frac{r^2}{36}} = \frac{\sqrt{35}}{6} r$$

7.(d) Volume of water displaced = volume of sphere

$$\pi(30)^2 \times x = \frac{4}{3}\pi(20)^3$$

$$\Rightarrow x = \frac{320}{27} = 11\frac{23}{27} cm$$

8.(a) $\Delta ODC \sim \Delta OAB$



$$\therefore \frac{OP}{OQ} = \frac{1}{5} = \frac{PC}{BQ}$$

Since, the raio in radii of the two cones is 1 : 5.
There fore the radius of smaller cone ODC is $\frac{21}{5}$ = 4.2 cm.

9.(c) $\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$

(since radii of sphere and cone are same)

$\Rightarrow$ 4r = h

$$\therefore \frac{h}{r} = \frac{4}{1} \Rightarrow h : r = 4 : 1$$

10.(b) Area of large cube = $6(5)^2$
= 150 $(\text{unit})^2$

Area of cuboid = $2(1 \times 1 + 1 \times 125 + 125 \times 1)$
= 502sq. units

$\therefore$ % in crease in sarface area

$$= \frac{502 - 150}{150} \times 100 = 234\frac{2}{3}\%$$

11. (a) H.C.F of 75, 15, 4.5 = 1.5

$$\therefore \text{No. of cubes} = \frac{75 \times 15 \times 4.5}{1.5 \times 1.5 \times 1.5} = 1500$$

Area of each cube = $6(1.5)^2$

Area of all the 1500 cubes
= $1500 \times 6 \times (1.5)^2$
= $20{,}250 cm^2$

12. (c) The solid with the least number of sides will have maximum surface area. So, tetrahedron will have maximum surface area. Notice that in a sphere there are infinite number of sides with least possible length.

So, the surface area of the sphere will be least.

13.(d) $(\frac{4}{3}\pi(r_1^3 + r_2^3 + r_3^3) = \frac{4}{3}\pi(6)^3$

$\Rightarrow 27 + 64 + r_3^3 = 216$

$\Rightarrow r_3^3 = 125$

$\Rightarrow r_3 = 5cm$

14. (b) In-rabius (r) = 9cm

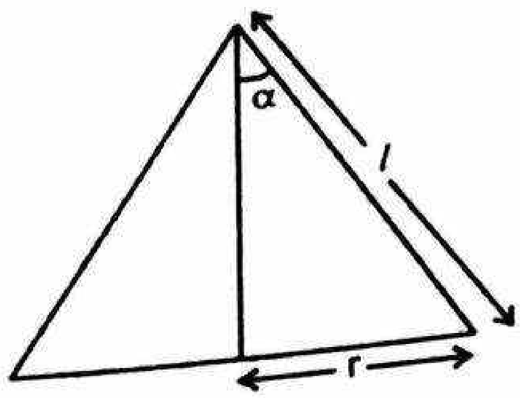
$$= \frac{\text{Area (A)}}{\text{semiperimeter (s)}}$$

$\Rightarrow$ A $9 \times \frac{45}{2} cm^2$

V= Area of base (A) $\times$ h

$$\Rightarrow h = \frac{810}{9 \times 45} \times 2 = 4cm$$

15. (a)



Lateral surface area = 2 × Base area

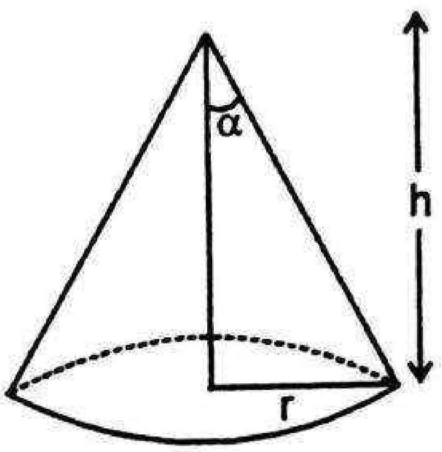
$\Rightarrow \pi rl = 2\pi r^2 \quad \Rightarrow l = 2r$

$Sin\alpha = \frac{r}{l} = \frac{r}{2r} = \frac{1}{2}$

$\Rightarrow \alpha = 30°$

16. (c) $\cot\alpha = \frac{h}{r} \Rightarrow h = r\cot\alpha.$

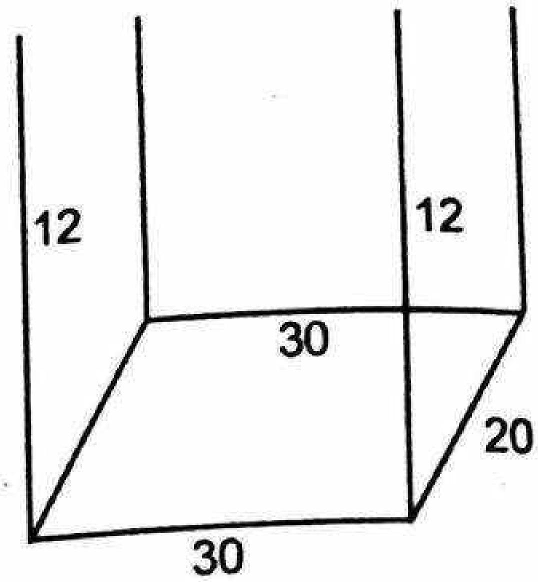
let no. of cones = n



$\therefore n\left(\frac{1}{3}\pi r^2 \times r\cot\alpha\right) = \pi r^2(2r\cot\alpha)$

$\Rightarrow n = 6$

17. (a)



Total surface area of tank

$TS\,A = 30\times 20 + 2(12\times 20) + 2(30\times 12)$

$= 1800$

$\therefore$ area of iron sheet = T.S.A

$\Rightarrow$ Length × width = 1800

$\Rightarrow$ Length = $\frac{1800}{3} = 600\ m$

$\therefore$ Cost = 600 × 10 = ₹6000

18.(d) Valume of prism = (Base area) × height.

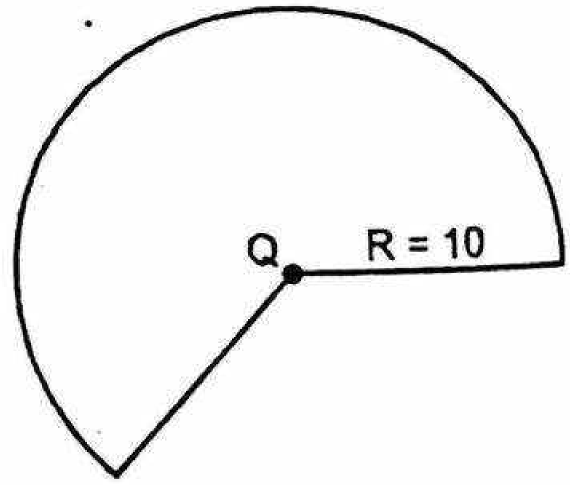
Base Area = Area of trapezium

$= \frac{1}{2}(8+14)\times 8 = 88$

$\therefore$ 1056 = 88 × height

height = $\frac{1056}{88}$ = 12cm

19. (b)



Let radius of conical surface = r

$\therefore 2\pi r = 60\,\%\ of\ 2\pi R$

$\Rightarrow r = \frac{3}{5} \times 10 = 6cm$

and slant height of cone = l

= R

= 10cm

$\therefore height(h) = \sqrt{l^2 - r^2} = \sqrt{(10)^2 - (6)^2} = 8cm$

$\therefore r : h = 6 : 8 = 3 : 4$

20. (c) we have ,

$2\pi R_1(R_1 + h) = \pi(12^2 - 8^2)$

$\Rightarrow R_1 + h = \frac{80}{2R_1} = \frac{40}{R_1}$

$\Rightarrow h = \frac{40}{R_1} - R_1 = \frac{40 - R_1^2}{R_1}$

21. (a) Total surface area of pipe (hallow c sylinder)

$= 2\pi(R + r)[h + (R - r)]$

here $- R - r = thickness = 1cm, h = 20cm$

$R = \frac{25}{2} = 12.5cm$

$\therefore r = 12.5 - 1 = 11.5$

Area = $2 \times \frac{22}{7}(12.5 + 11.5)(20 + 1)$

$= 44 \times 72 = 3168 \text{ cm}^2$

22. (d) $v_1 = 64$ ltr $v_2 = 216$ ltr

$\therefore \frac{r_1}{r_2} = \left(\frac{64}{216}\right)^{1/3} = \frac{4}{6} = \frac{2}{3} \quad [\because v \propto r^3]$

$\frac{A_1}{A_2} = \left(\frac{r_1}{r_2}\right)^2 = \frac{4}{9} \quad [\because v \propto r^2]$

23.(b) Let lenght (l) = 15R

$\therefore$ breadth (b) = 5R

and height (h) = 3R

$\therefore$ volume (V) = lbh = 15R × 5R × 3R

$\Rightarrow$ 14400 = 225R³

$\Rightarrow R^3 = 64$

$\Rightarrow R = 4$

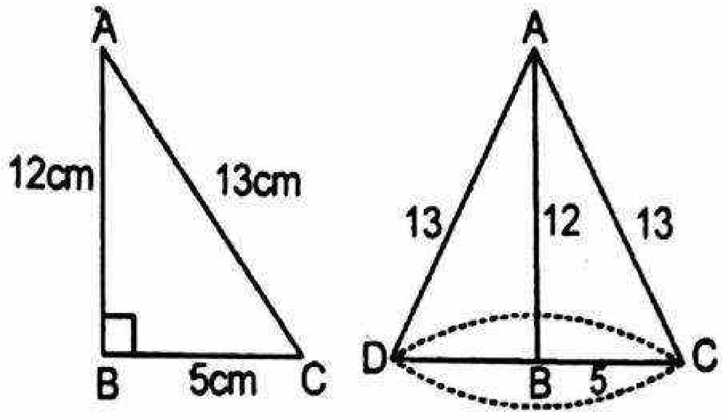
$\therefore$ l = 60cm, b = 20cm, h = 12cm

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

= 2(1200 + 240 + 720)

= 4320cm²

24. (c)



i.e. after revolution, a cone of radius 5cm & height 12cm is formed

$\therefore$ volume of the cone = $\frac{1}{3}\pi(5)^2 \times 12$

$= 100\pi$

$= 100 \times 3.14$

$= 314cm^3$

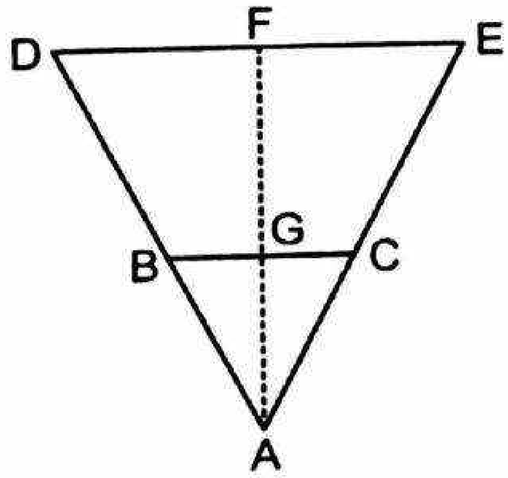
25.(a) $V_1 = \frac{2}{3}\pi r^3$, $V_2 = \pi r^2 r = \pi r^3$

$V_3 = (2r)^3 = 8r^3$

$\Rightarrow V_1 < V_2 < V_3$

26.(b) Let r be the radius and h be the height of the cone.

Since, $\Delta AGC \sim \Delta AFE$



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$\therefore \frac{AG}{AF} = \frac{GC}{FE} \Rightarrow GC = \frac{h/2}{h} \times r = \frac{r}{2}$

$\therefore$ volume of water filled in cone

$= \frac{1}{3}\pi\left(\frac{r}{2}\right)^2 \times \frac{h}{2} = \frac{1}{8}\left(\frac{1}{3}\pi r^2 h\right) = \frac{V}{8}$

27. (c) Height of cone = height of cylinder = radius of hemisphere = r units

$\therefore$ Ratio of the volumes of cone, cylinder and hemisphere

$= \frac{1}{3}\pi r_1^2 h : \pi r_2^2 h : \frac{2}{3}\pi r^3$

$= \frac{1}{3}\pi 2^2 r^3 : \pi 3^2 r^3 : \frac{2}{3}\pi r^3$

$= \frac{4}{3} : 9 : \frac{2}{3} = 4 : 27 : 2$

28. (b)

$\Rightarrow 44 = \frac{1}{3} \times \frac{22}{7}(9-3r)(9+r^2+3r)$

$\Rightarrow 44 = \frac{22}{7}(3-r)(3^2+3r+r^2)$

$\Rightarrow \frac{44 \times 7}{22} = 3^3 - r^3$

$\Rightarrow 14 = 27 - r^3 \Rightarrow r^3 = 27 - 14 = 13$

$\therefore r = \sqrt[3]{13}$ cm

29.(c) Let the height of cylinder be h cm and radius of base= r cm

$\therefore 2\pi r^2 + 2\pi rh = 462$ ______(i)

Area of curved surface $= 2\pi rh$

$= \frac{1}{3} \times 462 = 154$

$\therefore 2\pi r^2 + 154 = 462$

31.(a) $\frac{r}{h}=\frac{4}{3}\Rightarrow\frac{r}{4}=\frac{h}{3}=k$

$\Rightarrow r=4k, h=3k$

$\therefore l=\sqrt{r_2+h_2}=\sqrt{16k^2+9k^2}$

$=\sqrt{25k^2}=5k$

$\therefore \frac{\text{Curved surface area}}{\text{Total surface area}}$

$=\frac{\pi rl}{\pi r(r+l)}=\frac{l}{r+l}=\frac{5k}{4k+5k}=\frac{5}{9}$

32. (c) Volume of the cylinder $=\pi r^2 h$

$=\frac{22}{7}\times10\times10\times21=6600$ cu.cm

Volume of the cone =6600 - 4400 = 2200 cu.cm.

$\therefore 2200=\frac{1}{3}\pi\times10^2\times h$

$\Rightarrow 2200=\frac{2200}{21}\times h\Rightarrow 21$ cm.

33.(c) Radius of the base = r units and height = h units

$\Rightarrow \frac{\text{Curved surface of cylinder}}{\text{Curved surface of cone}}=\frac{2\pi rh}{\pi rl}$

$\Rightarrow\frac{8}{5}=\frac{2h}{l}\Rightarrow\frac{4}{5}=\frac{h}{\sqrt{h^2+r^2}}$

$\Rightarrow\frac{16}{25}=\frac{h^2}{h^2+r^2}\Rightarrow\frac{h^2+r^2}{h^2}=\frac{25}{16}$

$\Rightarrow 1+\frac{r^2}{h^2}=\frac{25}{16}\Rightarrow\frac{r^2}{h^2}=\frac{25}{16}-1=\frac{9}{16}$

$\Rightarrow\frac{r}{h}=\frac{3}{4}$

34.(b) Curved surface area of cylinder = $2\pi rh$

and volume = πr^2h

$\therefore\frac{\pi r^2h}{2\pi rh}=\frac{924}{264}\Rightarrow\frac{r}{2}=\frac{924}{264}$

$\Rightarrow r=\frac{924\times2}{264}=7$metre

$\therefore 2\pi rh=264$

$\Rightarrow 2\times\frac{22}{7}\times7\times h=264$

$\therefore h=\frac{264}{2\times22}=6$

$\therefore\frac{\text{Diameter}}{\text{Height}}=\frac{2\times7}{6}=\frac{7}{3}$

35.(b) Volume of bigger cube = $6\times6\times6$ = 216 cu. cm

Volume of unit cube = $1\times1\times1$ = 1 cu.cm

Number of uncoloured cubes
$=4\times4\times4$
= 64, because edge of uncoloured cube = 4 cm

36.(c) Area of the base $=6\times\frac{\sqrt{3}}{4}\times(2a)^2$

$=6\times\frac{\sqrt{3}}{4}\times4a^2=6\sqrt{3}a^2 sq.cm.$

Height $=\sqrt{\left(\frac{5a}{2}\right)^2-(2a)^2}$

$=\sqrt{\frac{25}{4}a^2-4a^2}=\sqrt{\frac{9a^2}{4}}=\frac{3}{2}a$ cm.

$\therefore$ volume of pyramid

$=\frac{1}{3}\times$area of base $\times$ height

$=\frac{1}{3}\times6\sqrt{3}a^2\times\frac{3}{2}a=3\sqrt{3}a^3cm^3$

37.(c) Volume of right prism =Area of the base × height

$\Rightarrow$ 10380 = 173 × h

$$\Rightarrow h = \frac{10380}{173} = 60 \text{ cm}$$

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

$$\Rightarrow 173 = \frac{\sqrt{3}}{4} \times (\text{Side})^2$$

$$\therefore \text{Side} = \sqrt{\frac{173 \times 4}{\sqrt{3}}} = \sqrt{\frac{173 \times 4}{1.73}} = 20 \text{ cm}$$

$\therefore$ Perimeter = 3×20 = 60 cm

$\therefore$ Area of the lateral surface

= Perimeter base × height

= 60×60 = 3600 sq.cm.

38.(a) Volume of the new ball

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 15 = 577.5 \text{cm}^3$$

42.(a) Volume of the original cone

$$= \frac{1}{3}\pi r^2 h$$

Volume of the new cone

$$= \frac{1}{3}\pi 4r^2 h \times 2h = 8\left(\frac{1}{3}\pi r^2 h\right)$$

$\therefore$ Percentage increase

$$= \frac{7\left(\frac{1}{3}\pi r^2 h\right)}{\frac{1}{3}\pi r^2 h} \times 100 = 700\%$$

43.(c) Total surface area of prism = Curved surface area + 2 × Area of base

$\Rightarrow$ 608 = Perimeter of base × height +

$$\therefore \frac{1}{3}\pi(2r)^2 \times h' = \frac{1}{3}\pi r^2 h$$

$$\Rightarrow 4h' = h \Rightarrow h' = \frac{h}{4}$$

LEVEL - 3

1.(b) The diagonal of cube will be equal to the diameter of the sphere.

$$\therefore \text{volume of sphere} = \frac{4}{3}\pi\left(\frac{d}{2}\right)^3 = \frac{\pi d^3}{6}$$

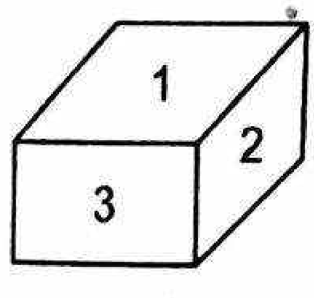
and each side of cube = a = $\frac{d}{\sqrt{3}}$

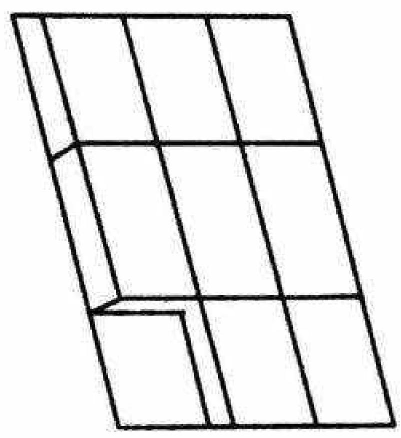
$$\therefore \text{volume of cube} = a^3 = \frac{d^3}{3\sqrt{3}}$$

$$\therefore \text{Remaining volume} = \frac{\pi d^3}{6} - \frac{d^3}{3\sqrt{3}}$$

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

2.(d)





Since, there are three faces which are visible in a corner cube. When the cube of corner is removed then the 3 faces of other cubes will be visible from outside. So, there will not be any change in the surface area of this solid figure.

3.(c) $l \times b = 2(l + b)$

$$\Rightarrow l = \frac{2b}{(b-2)} = \frac{2(b-2)+4}{(b-2)} = 2 + \frac{4}{(b-2)}$$

Since, l is an integer, so 4 must be divisible by (b-2) Thus, b can be 4 or 6 or 3.

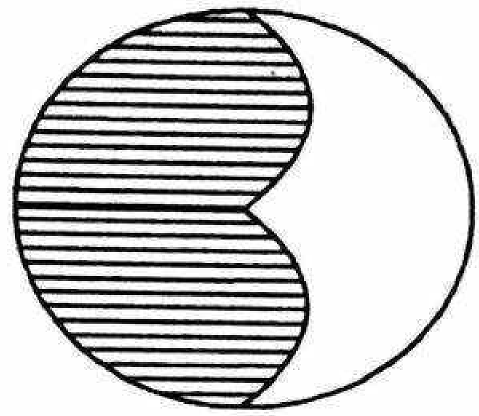
Therefore, if b = 4, l = 4, it will be secure.

if b = 6, l = 3 and if b = 3, l = 6

Hence, l = 6 and b = 3

$\therefore$ l - b = 3

4.(a)



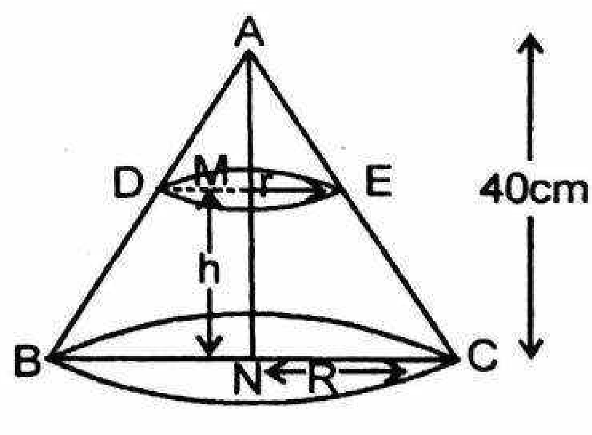
Non-polished area = 4p(r)²

polished area = $4 \times \left(2 \times \frac{\pi r^2}{2}\right) = 4\pi r^2$

In the adjoining figure one of the four parts of the sphere is shown.(To understand it properly, take an apple and cut it in the four parts one across horizontal and another cut make vertical to it then you will notice that in a piece there are 2 semicircles.)

Therefore required ratio =1 : 1

5. (b)



Let the radius of small cone = r and height = h from the base,

$$\therefore \frac{1}{64} \times \frac{1}{3}\pi R^2 h = \frac{1}{3}\pi r^2 (40 - h)$$

$$\Rightarrow \frac{R^2}{r^2} = (40-h)\times\frac{8}{5} \text{ ----(i)}$$

$\Delta AME \sim \Delta ANC$

$$\therefore \frac{40-h}{40} = \frac{r}{R} \text{ -----(ii)}$$

$\therefore$ from (i) and (ii)

$$\therefore \left(\frac{40}{40-h}\right)^2 = (40-h)\times\frac{8}{5}$$

$$\Rightarrow (40-h)^3 = 25\times 40 = 125\times 8$$

$$\Rightarrow 40-h = 5\times 2 = 10$$

$$\Rightarrow h = 40-10 = 30cm$$

5.(b) **Short Trick:-**

	Bigger cone	**Smaller cone**
Ratio of vol.	64	1
Ratio of (height /radius / slant height)	$\sqrt[3]{64} = 4$	$\sqrt[3]{1} = 1$

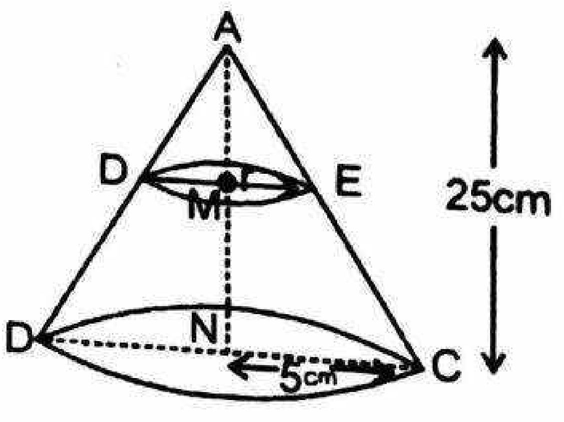
i.e. 4 represent = 40

$\Rightarrow 4 \cong 40$ cm

$\therefore 1 \cong \frac{40}{4} = 10$cm

$\therefore$ Required height = h = 40 - 10
= 30 cm

6.(a)



$\Delta AME \sim \Delta ANC$

$$\therefore \frac{25-h}{25} = \frac{r}{5}$$

$\Rightarrow h = 25-5r$ ____(i)

volume of frustum (V) =

$$\frac{1}{3}\pi\left[5^2 + r^2 + 5r\right]h$$

$$\Rightarrow 110 = \frac{1}{3}\pi\left[25 + r^2 + 5r\right](25-5r)$$

$$\Rightarrow \frac{5}{3}\pi\left[(5-r)(5^2 + r^2 + 5r)\right] = 110$$

$$\Rightarrow \frac{5}{3}\pi\left[5^3 - r^3\right] = 110$$

$$\Rightarrow 5^3 - r^3 = \frac{110\times 3}{5\pi}$$

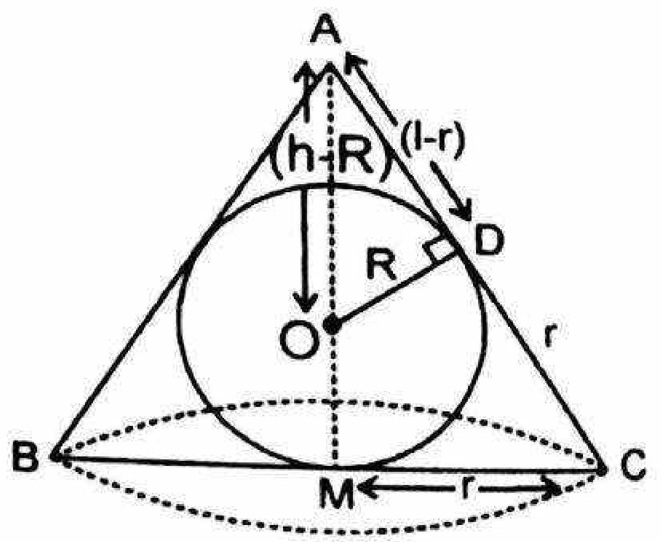
$$\Rightarrow 125 - r^3 = \frac{110\times 3}{5\times\frac{22}{7}}$$

$$\Rightarrow r = (104)^{1/3}\ cm$$

Short Trick :-

$$R^3 - r^3 = \frac{\text{Volume of frustrum}\times 3}{R\pi}$$

7. (c)



let the radius of cone = r
and height = h, slant height = l
and radius of sphere = R

$$\therefore R = \frac{hr}{l+r} = \frac{8\times 6}{10+6} = 3cm$$

8. (b) height (h) = 12cm (given)

$\therefore$ slant height of

ΔSDC = Slant height of ΔQAB

Detailed method :- CD and CM are tangents at c,

$\therefore$ CD = CM

Now in ΔADO,

$(h - R)^2 = (R)^2 + (l - r)^2$

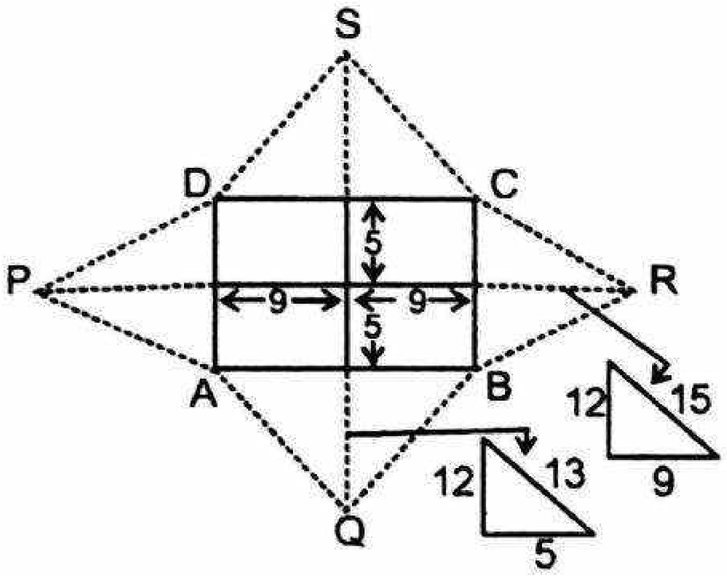
$\Rightarrow h^2 + R^2 - 2Rh = R^2 + l^2 + r^2 - 2lr$

$\Rightarrow h^2 - 2RH = h^2 + r^2 + r^2 - 2lr$ [$\because l^2 = h^2 + r^2$]

$$\Rightarrow R = \frac{r(l-r)}{h} = \frac{rh(l-r)}{h^2}$$

$$\Rightarrow R = \frac{rh(l-r)}{(l^2 - r^2)} = \frac{rh(l-r)}{(l-r)(l+r)} = \frac{rh}{l+r}$$

$$= \frac{8 \times 6}{10+6} = 3cm$$



$$= \sqrt{(12)^2 + (5)^2} = 13cm$$

and slant height of ΔPDA = Slant height of ΔRCB

$$= \sqrt{(12)^2 + (9)^2} = 15cm$$

$\therefore$ Area of ΔABQ = Area of ΔSDC

$$= \frac{1}{2} \times 18 \times 13 = 117cm^2$$

Area of Δ PDA = Area of ΔRCB

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

& Area of ▭ABCD (Base area)

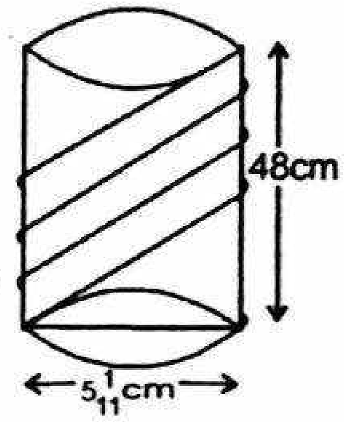
= 10 × 18

= 180 cm^2

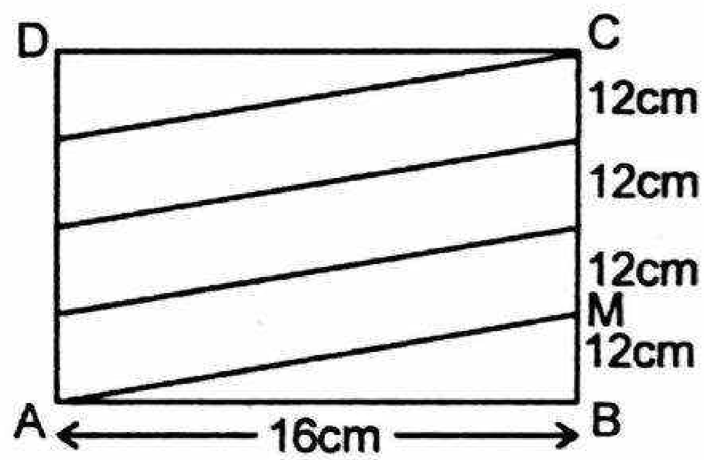
Total surface area = Base area + area of (ΔABQ + ΔSDC + ΔPDA + ΔRCB)

= 180 + 2 × 117 + 2 × 75 = 564cm^2

9. (d) According to the given information, the string will be bounded on a cylindrical tank as shown in the figure,



The above figure, will look like the figure (below), when we open it.



The base circumference

$$= 2\pi r = 2 \times \frac{22}{7} \times \frac{56}{11} \times \frac{1}{2}$$

= 16cm

$\therefore$ AM = length of one complete turn $= \sqrt{16^2 + 12^2}$

= 20cm

$\therefore$ Total length = 4 × 20 = 80cm

10. (a) Lateral surface area c ylinder (A) = $2\pi rh$

$\because$ Base area is decreased by 1/9th times

$\therefore$ side (radius) will decrease by 1/3 time

[$\because$ area d(side)^2]

$\therefore$ new radius = $r' = r/3$

and new height = $h' = 6h$

$\therefore$ new lateral surface area of cylinder

$$\Rightarrow A' = 2\pi\left(\frac{r}{3}\right)\times(6h) = 4\pi rh$$

$$\Rightarrow A' = 2(2\pi rh) = 2A$$

i.e. $A' = 2$times of A.

11. (c) Let slant height = l and radius = r

$$\therefore v = \frac{1}{3}\pi r^2 h \Rightarrow 3v = \pi r^2 h$$

$$\Rightarrow 9v^2 = \pi^2 r^4 h^2$$

and C = πrl

$\Rightarrow$ $C^2 = \pi^2 r^2 l^2 = \pi^2 r^2 (h^2 + r^2)$

[$\because l^2 = h^2 + r^2$]

$\Rightarrow$ $C^2 = \pi^2 r^2 h^2 + \pi^2 r^4$

$\therefore$ $3\pi v h^3 - c^2 h^2 + 9v^2$

= $(\pi^2 r^2 h)\pi h^3 - (\pi^2 r^2 h^2 + \pi^2 r^4)\ h^2 + \pi^2 r^4 h^2$

= $\pi^2 r^2 h^4 - \pi^2 r^2 h^4 - \pi^2 r^4 h^2 + \pi^2 r^4 h^2$

= 0

12. (b) Let outer radii = R_1 and inner radii = R_2

$\therefore$ $2\pi R_1 h - 2\pi R_2 h = 44$

[Where, h = height of pipe]

$$\Rightarrow 2\times\frac{22}{7}\times 14[R_1 - R_2] = 44$$

$$\Rightarrow R_1 - R_2 = \frac{1}{2} = 0.5 ----(i)$$

and $\pi(R_1^2 - R_2^2)\times h = 99$ (given)

$$\Rightarrow \frac{22}{7}(R_1 + R_2)(R_1 - R_2)\times 14 = 99$$

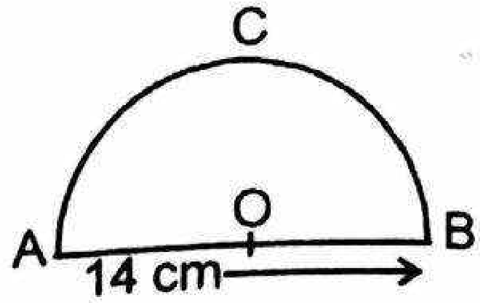
$$\Rightarrow 4\times 0.5(R_1 + R_2) = 9$$

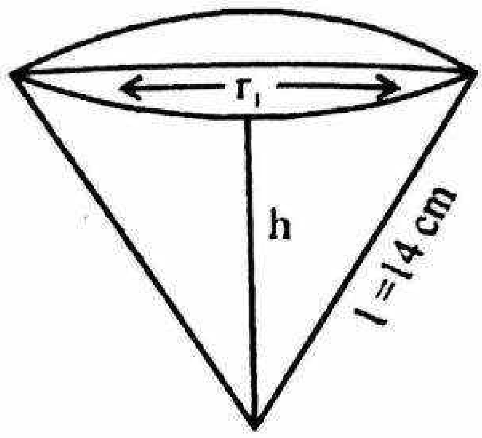
$R_1 + R_2 = 4.5$ ----------(ii)

On adding (i) and (ii) :-

$2R_1 = 5 \Rightarrow R_1 = 2.5$cm

13. (b)





Length (ACB) of semi-circular sheet = π r

$$= \frac{22}{7}\times 14 = 44 \text{ cm.}$$

Slant height of the cone = 14cm.

Circumference of the base of the cone

$$= 2\pi r_1 = \frac{44}{7} r_1$$

$$\Rightarrow 44 = \frac{44}{7} r_1 \Rightarrow r_1 = 7\text{cm}$$

$$\therefore h = \sqrt{l2\text{-}r12} = \sqrt{14^2 - 7^2}$$

$$= 7\sqrt{3} \text{ cm}$$

$$= 7\times 1.732 = 12 \text{ cm}$$

14. (c) Let radius be increased by x cm.

Volume of cylinder

$$= \pi\times 10^2(4+x)$$

$$\therefore \pi(10+x)^2\times 4 = \pi(10)^2(4+x)$$

$$\Rightarrow (10+x)^2 = 25(4+x)$$

$$\Rightarrow 100 + 20x + x^2 = 100 + 25x$$

$$\Rightarrow x^2 - 5x = 0$$

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

$$\Rightarrow x = 5 \text{ cm}$$

Answerkey

LEVEL - 1

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

LEVEL - 2

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

LEVEL - 3

1. (b)	2. (d)	3. (c)
4. (a)	5. (b)	6. (a)
7. (c)	8. (b)	9. (d)
10. (a)	11. (c)	12. (b)
13. (b)	14. (a)	