KD EDUCATION ACADEMY [9582701166]

Time : 8 hour | STD 9 Maths | Total Marks : 310

kd 90+ questions ch- 11 Surface ,Area and volume

*** Choose the right answer from the given options. [1 Marks Each] [83]**

1. If a spherical balloon grows to twice its radius when inflated, then the ratio of the volume of the inflated balloon to the original balloon is:

(A) 5 : 1 (B) 4 : 1 (C) 8 : 1 (D) 6 : 1

Ans. :

c. 8 : 1

Solution:

Volume of the inflated balloon : Volume of the original balloon

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

$= 8 : 1$

2. An ice cream cone has hemispherical top. If the height of the cone is 9cm and base radius is 2.5cm, then the volume of ice cream is:

(A) 90.67cm^3 (B) 96.67cm^3 (C) 91.67cm^3 (D) 91.76cm^3

Ans. :

c. 91.67cm^3

Solution:

Height of ice-cream cone is 9cm and radius of the hemispherical top is 2.5cm.

Now, Volume of ice-cream cone = Volume of cone + volume of Hemispherical top

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

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

$= \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5(9+5)$

$= \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 \times 14$

$= 91.67 cm^3$

3. If the ratio of volumes of two spheres is 1 : 8, then the ratio of their surface areas is

(A) 1 : 2 (B) 1 : 4 (C) 1 : 8 (D) 1 : 16

Ans. :

b. 1 : 4

Solution:

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

$\frac{V_1}{V_1} = \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi r_2^3} = \frac{r_1^3}{r_2^3} = \frac{1}{8}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{2}$

now, Surface Area of Sphere $= 4\pi r^2 = S$

$\frac{S_1}{S_2} = \frac{4\pi r_1^2}{4\pi r_2^2} = \left(\frac{r_1}{r_2}\right)^2 = \frac{1}{4} = 1 : 4$

Hence, correct option is (b).

4. The radius of a hemispherical balloon increases from 6cm to 12cm as air is being pumped into it. The ratios of the surface areas of the balloon in the two cases is.

(A) 1 : 4 (B) 2 : 3 (C) 1 : 3 (D) 2 : 1

Ans. :

a. 1 : 4

Solution:

Total surface area of a hemisphere $= 2\pi r^2 + \pi r^2 = 3\pi r^2$

r = 6, surface area $= 3\pi(6)^2 = 36$

r = 12, surface area $= 3\pi(12)^2 = 144$

Ratio = 36 : 144

= 1 : 4

5. A cylindrical rod whose height is 8 times of its radius is melted and recast into spherical balls of same radius. The number of balls will be:

(A) 3 (B) 6 (C) 8 (D) 4

Ans. :

b. 6

Solution:

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

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

Given, cylindrical rod whose height is 8 times of its radius is melted and recast into spherical balls of same radius.

Let the number of such balls be 'a'.

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

$\Rightarrow a = 6$

6. The total surface area of a cube is 96cm^2. Find its lateral surface area.

(A) 64cm^2 (B) 512cm^2 (C) 27cm^2 (D) 32cm^2

Ans. :

a. 64cm^2

Solution:

Total surface area of cube = 6a^2 (let a be a side of cube)

So, 6a^2 = 96,

$a^2 = \frac{96}{6} = 16$

$a = 4cm$

Now, lateral surface area of cube is 4a^2

So, 4a^2 = 4 × (4)^2

= 4 × 16

= 64cm^2

7. How many lead shots, each 0.3cm in diameter, can be made from a cuboid of dimension 9cm × 11cm × 12cm?

(A) 7200 (B) 8400 (C) 72000 (D) 84000

Ans. :

d. 84000

Solution:

Let the number of lead shots be n.

Volume of the cuboid = n × volume of each lead shot

$\Rightarrow 9 \times 11 \times 12 = \mathrm{n} \times \frac{4}{3}\pi\left(\frac{0.3}{2}\right)^3 \ldots \left(\text{since radius} = \frac{0.3}{2}\text{cm}\right)$

$\Rightarrow 9 \times 11 \times 12 = \mathrm{n} \times \frac{4}{3} \times \frac{22}{7} \times \frac{27}{8000}$

$\Rightarrow \mathrm{n} = 84000$

Thus, there are 84000 lesd shots.

8. The CSA of a right circular cylinder whose base radius is x units and height is z units is:

(A) $\pi\mathrm{xz}$ sq.units (B) $2\pi\mathrm{xz}$ sq.units (C) $\pi\mathrm{x}^2\mathrm{z}$ sq.units (D) 2π sq.units

Ans. :

b. $2\pi\mathrm{xz}$ sq.units

Solution:

Since CSA of a right circular cylinder $= 2\pi\mathrm{rh}$ sq.units

Therefore, according to the question,

CSA of a right circular cylinder $= 2\pi\mathrm{xz}$ sq.units

9. The number of planks of dimension (4m × 5m × 2m) that can be stored in a pit which is 40m long, 12m wide and 16m deep, is:

(A) 190 (B) 192 (C) 184 (D) 180

Ans. :

b. 192

Solution:

Number of planks $= \frac{\text{Volume of the pit}}{\text{Volume of 1 plank}}$

$= \frac{40 \times 12 \times 16}{4 \times 5 \times 2}$

$= 192$

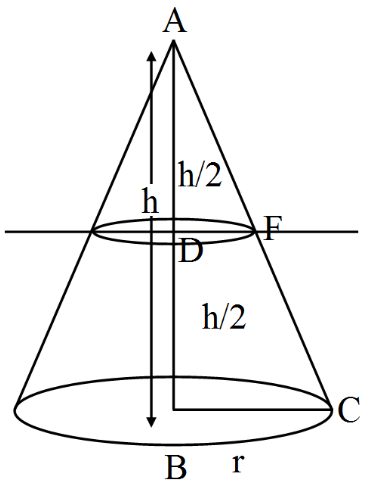
10. If a cone is cut into two parts by a horizontal plane passing through the mid-point of its axis, the axis, the ratio of the volumes of upper and lower part is:

(A) 1 : 2 (B) 2 : 1 (C) 1 : 7 (D) 1 : 8

Ans. :

c. 1 : 7

Solution:



$\frac{AD}{AB} = \frac{DF}{BC}$

$\Rightarrow \frac{\frac{h}{2}}{\frac{h}{2}+\frac{h}{2}} = \frac{DF}{BC}$

$\Rightarrow \frac{DF}{BC} = \frac{1}{2}$

$\Rightarrow DF = \frac{BC}{2} = \frac{r}{2}$

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

Volumeof small cone formed $= \frac{1}{3}\pi\left(\frac{r}{2}\right)^2 \frac{h}{2}$

$= \frac{1}{3}\pi \frac{r^2}{4} \frac{h}{2}$

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

Ratio of volume of two parts $= \frac{\text{Volume of small cone}}{\text{Volume of full cone}-\text{Volume of small cone}}$

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

$= \frac{1}{7}$

11. If A_1, A_2 and A_3 denote the areas of three adjacent faces of a cuboid, then its volume is:

(A) $A_1\ A_2\ A_3$ (B) $2A_1\ A_2\ A_3$ (C) $\sqrt{A_1 A_2 A_3}$ (D) $\sqrt[3]{A_1 A_2 A_3}$

Ans. :

c. $\sqrt{A_1 A_2 A_3}$

Solution:

We have;

Here A_1, A_2 and A_3 are the area of three adjacent faces of a cuboid.

But the areas of three adjacent faces of a cuboid are lb, bh and hl where,

l → Length of the cuboid

b → Breadth of the cuboid

h → Height of the cuboid

We have to find the volume of the cuboid

Here,

$A_1A_2A_3$ = (lb)(bh)(hl)

= (lbh)(lbh)

= V^2 {Since, V = lbh}

$V = \sqrt{A_1 A_2 A_3}$

Thus, volume of the cuboid is $\sqrt{A_1 A_2 A_3}$.

Hence, the correct choice is (c).

12. The diameter of a roller, 1m long, is 84cm. If it takes 500 complete revolutions to level a playground, the area of the playground is:

(A) $1440m^2$ (B) $1320m^2$ (C) $1260m^2$ (D) $1550m^2$

Ans. :

b. $1320m^2$

Solution:

The diameter of the roller $= 84\mathrm{cm} = \frac{84}{100}\mathrm{m}$

So, the radius $= \frac{84}{200}\mathrm{m}$

The area covered by the roller in 1 revolution

$= 2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{84}{200} \times 1$

$= 2.64m^2$

$\therefore$ Area covered in 500 complete revolution = 500 × 2.64 = $1320m^2$

Thus, the area of the playground is $1320m^2$.

13. The volumes of two spheres are in the ratio 64 : 27 and the sum of their radii is 7cm. The difference in their total surface areas is:

(A) $38cm^2$ (B) $58cm^2$ (C) $78cm^2$ (D) $88cm^2$

Ans. :

d. $88cm^2$

Solution:

Let the radii be x cm and (7 - x)cm.

Volume of the two spheres are in the ratio 64 : 27.

$\Rightarrow \frac{\frac{4}{3}\pi x^3}{\frac{4}{3}\pi(7-x)^3} = \frac{64}{27}$

$\Rightarrow \left(\frac{x}{7-x}\right)^3 = \left(\frac{4}{3}\right)^3$

$\Rightarrow \frac{x}{7-x} = \frac{4}{3}$

$\Rightarrow x = 4\mathrm{cm}$

So, their radii are 4cm and 3cm.

Difference of their tital surface areas

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

$= 4 \times \frac{22}{7}(16 - 9)$

$= 88cm^2$

14.

The slant height of a cone is increased by 10%. If the radius remains the same, the curved surface area is increased by.

(A) 10% (B) 21% (C) 12.1% (D) 20%

Ans. :

a. 10%

Solution:

The formula of the curved surface area of a cone with base radius 'r' and slant height '' is given as

Curved Surface Area $= \pi \mathrm{rl}$

Now, it is said that the slant height has increase by 10%. So the new slant height '1.1 l'

So, now

New Curved Surface Area $= 1.1\pi \mathrm{rl}$

We see that the percentage increase of the Curved Surface Area is 10%

15. The volume of a right circular cylinder is 2310cm^3. If the radius of its base is 7cm, then its height is

(A) 7.5cm (B) 22.5cm (C) 15cm (D) 30cm

Ans. :

c. 15cm

Solution:

Volume of cylinder $= \pi \mathrm{r}^2\mathrm{h}$

$2310 = \frac{22}{7} \times 7 \times 7 \times \mathrm{h}$

$\mathrm{h} = \frac{2310}{22 \times 7}$

$\mathrm{h} = 15\mathrm{cm}$

$= 15\mathrm{cm}$

16. If the ratio of the volumes of two spheres is 1 : 8 then the ratio of their surface area is:

(A) 1 : 2 (B) 1 : 4 (C) 1 : 8 (D) 1 : 16

Ans. :

b. 1 : 4

Solution:

The ratio of the volumes of two sphere is given by $\frac{\frac{4}{3}\pi \mathrm{r}^3}{\frac{4}{3}\pi \mathrm{R}^3}$.

$\Rightarrow \frac{\frac{4}{3}\pi \mathrm{r}^3}{\frac{4}{3}\pi \mathrm{R}^3} = \frac{1}{8}$

$\Rightarrow \frac{\mathrm{r}^3}{\mathrm{R}^3} = \frac{1}{8}$

$\Rightarrow \left(\frac{\mathrm{r}}{\mathrm{R}}\right)^3 = \frac{1}{8}$

$\Rightarrow \frac{\mathrm{r}}{\mathrm{R}} = \frac{1}{2} \ldots (\mathrm{i})$

⇒ Ratio of the volumes = 1 : 2

Now,

Ratio of their surface area $= \frac{4\pi r^2}{4\pi R^2}$

$= \frac{r^2}{R^2}$

$= \left(\frac{r}{R}\right)^2$

$= \left(\frac{1}{2}\right)^2$ ...(from (i))

$= \frac{1}{4}$

⇒ Ratio of their surface area = 1 : 4.

17. If a sphere is inscribed in a cube, then the ratio of the volume of the cube to the volume of the sphere is:

(A) $\pi : 6$ (B) $4 : \pi$ (C) $\pi : 4$ (D) $6 : \pi$

Ans. :

d. $6 : \pi$

Solution:

Let side of cube be a

Here, side of cube= diameter of sphere

So, radius of sphere $= \frac{a}{2}$

The volume of cube : volume of sphere

$a^3 : \frac{4}{3}\pi r^3$

$a^3 : \frac{4}{3}\pi\left(\frac{a}{2}\right)^3$

$3 \times 8 \times a^3 : 4\pi a^3$

$6 : \pi$

18. The volume of a spherical shell is given by:

(A) $\frac{4}{3}\pi(R^2 - r^2)$ (B) $\frac{4}{3}\pi(R^3 - r^3)$ (C) $\pi(R^3 - r^3)$ (D) $4\pi(R^3 - r^3)$

Ans. :

b. $\frac{4}{3}\pi(R^3 - r^3)$

Solution:

The volume of a spherical shell is given by $\frac{4}{3}\pi(R^3 - r^3)$ where R = Larger radius and r = smaller radius.

19. A river 1.5m deep and 30m wide is flowing at the rate of 3km per hour. The volume of water that rims into the sea per minute is.

(A) $2250m^3$ (B) $2750m^3$ (C) $2500m^3$ (D) $2000m^3$

Ans. :

a. $2250m^3$

Solution:

Length of the river = 1.5m

Breadth of the river = 30m

Depth of the river = 3km = 3000m

Now, volume of water that runs into the sea = $1.5 \times 30 \times 3000m^3 = 135000m^3$

$\therefore$ Volume of water that runs into the sea per minute $= \frac{135000}{60} = 2250\mathrm{m}^3$

20. The sum of the length, breadth and depth of a cuboid is 19cm and its diagonal is $5\sqrt{5}$. Its surface area is.

(A) 125cm^2 (B) 361cm^2 (C) 236cm^2 (D) 486cm^2

Ans. :

c. 236cm^2

Solution:

Given,

l + b + h = 19

Squaring we get

$l^2 + b^2 + h^2 + 2\{lb + bh + hl\} = 361$ .....(i)

Also we know that

$l^2 + b^2 + h^2 = d^2$ 125 $(\text{since } \mathrm{d} = 5\sqrt{5})$

And Total Surface Area = 2(lb + bh + hl)

Using in (i) we get T.S.A = 361 - 125 = 236cm^2

21. The volumes of two spheres are in the ratio 125 : 64. The ratio of their surface areas is:

(A) 25 : 16 (B) 9 : 16 (C) 16 : 25 (D) 16 : 9

Ans. :

a. 25 : 16

Solution:

Let r_1 and r_2 be the radius of the two spheres, respectively. Therefore, the ratio of their surface areas,

$$\frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{125}{64}$$

$$\Rightarrow \frac{r_1^3}{r_2^3} = \frac{125}{64}$$

$$\Rightarrow \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{5}{4}\right)^3$$

$$\Rightarrow \frac{r_1}{r_2} = \frac{5}{4}$$

Now, Ratio of their surface area

$$\frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{r_1}{r_2} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{5}{4}\right)^3 = \frac{25}{16}$$

$\therefore$ SA1 : SA2 = 25 : 16

22. If the base radius and the height of a right circular cone are increased by 20%, then the percentage increase in volume is approximately:

(A) 60 (B) 68 (C) 73 (D) 78

Ans. :

c. 73

Solution:

Let the radius of the cone = R and height = H

Then, volume $= \frac{1}{3}\pi R^2 H$

Now, R' = R + 20% of R $= R + \frac{R}{5} = \frac{6R}{5}$

H' = H + 20% of H $= H + \frac{H}{5} = \frac{6H}{5}$

New volume, $v' = \frac{1}{3}\pi R'^2 H'$

$= \frac{1}{3}\pi\left(\frac{6r}{5}\right)^2\left(\frac{6H}{5}\right)$

$= \frac{216}{125}\left(\frac{1}{3}\pi R^2 H\right)$

$= \frac{216}{125} v$

% increase in volume $= \frac{v'-v}{v} \times 100$

$= \frac{\frac{216v}{125} - v}{v} \times 100$

$= \frac{91}{125} \times 100$

$= 72.8\%$

$\approx 73\%$

23. The ratio of the radii of two spheres whose volumes are in the ratio 64 : 27 is:

(A) 4 : 3 (B) 10 : 7 (C) 8 : 3 (D) 16 : 9

Ans. :

a. 4 : 3

Solution:

Volume of sphere 1 : Volume of sphere 2

$\frac{4}{3}\pi r_1^3 : \frac{4}{3}\pi r_2^3$

$r_1^3 : r_2^3 = 64 : 27$

$r_1 : r_2 = 4 : 3$

24. The ratio of the radii of two spheres whose volumes are in the ratio 64 : 27 is:

(A) It is 4 : 3. (B) It is 8 : 3. (C) It is 10 : 7. (D) It is 16 : 9.

Ans. :

a. It is 4 : 3.

Solution:

Volume of sphere 1 : volume of sphere 2

$\frac{4}{3\pi r_1{}^3} : \frac{4}{3\pi r_2{}^3}$

$r_1{}^3 : r_2{}^3 = 64 : 27$

$r_1 : r_2 = 4 : 3$

25. Two right circular cones have equal radii. If their slant heights are in the ratio 4 : 3, then their respective curved surface areas are in the ratio:

(A) 6 : 8 (B) 3 : 4 (C) 4 : 3 (D) 16 : 9

Ans. :

c. 4 : 3

Solution:

Let l_1 and l_2 be the slant heights of two cones respectively

Given $\frac{l_1}{l_2} = \frac{4}{3}$

Now, required ratio $= \frac{\pi r l_1}{\pi r l_2} = \frac{l_1}{l_2} = \frac{4}{3}$

$\Rightarrow \mathrm{CSA}_1 : \mathrm{CSA}_2 = 4 : 3$

26. The radii of the bases of a cylinder and a cone are in the ratio 3 : 4 and their heights are in the ratio 2 : 3. Then, their volumes are in the ratio:

(A) 9 : 8 (B) 8 : 9 (C) 3 : 4 (D) 4 : 3

Ans. :

a. 9 : 8

Solution:

Let the radii of the bases of a cylinder and a cone be 3x cm and 4x cm respectively and let their heights be 2y cm and 3y cm respectively.

⇒ Ratio of the volumes $= \frac{\pi(3x)^2 \times 2y}{\frac{1}{3}\pi(4x)^2 \times 3y}$

$= \frac{9 \times 2}{16}$

$= \frac{9}{8}$

⇒ Ratio of the volume is 9 : 8.

27. The length, width and height of a rectangular solid are in the ratio of 3 : 2 : 1. If the volume of the box is $48cm^3$, the total surface area of the box is:

(A) $27cm^2$ (B) $32cm^3$ (C) $44cm^3$ (D) $88cm^3$

Ans. :

d. $88cm^3$

Solution:

Length (l), width (b) and height (h) of the rectangular solid are in the ratio 3 : 2 : 1.

So, we can take,

(l) = 3x cm

(b) = 2x cm

(h) = x cm

We need to find the total surface area of the box

Volume of the box,

V = $48cm^3$

lbh = 48

(3x)(2x)x = 48

$6x^3 = 48$

$x^3 = 8$

x = 2

Thus,

Surface area of the box,

= 2(lb + bh + hl)

= 2[(3x)(2x) + (2x)x + (x)(3x)]

= $2(11x^2)$

$= 22x^2$

$= 22(2)^2$

$= 88cm^2$

Thus total surface area of the box is $88cm^2$.

Hence, the correct option is (d).

28. A sphere and a cube are of the same height. The ratio of their volumes is:

(A) 21 : 11 (B) 4 : 3 (C) 11 : 21 (D) 3 : 4

Ans. :

c. 11 : 21

Solution:

Volume of a cube = side3

Volume of a sphere $= \left(\frac{4}{3}\right)\pi r3$

Given, sphere and a cube are of the same height.

Side = diameter = 2r

Ratio of their volumes $= \frac{\frac{4}{3}\times\frac{22}{7}\times r^2}{(2r)^3} = 11 : 21$

29. The cost of digging a pit of dimensions 4.5m × 2.5m × 2.5m at the rate of ₹ 20 per cubic metre is:

(A) ₹ 281.25 (B) ₹ 1687.50 (C) ₹ 1125 (D) ₹ 562.50

Ans. :

d. ₹ 562.50

Solution:

Cost of digging would be = (4.5m × 2.5m × 2.5m) × 20

= ₹ 562.50

30. How many bricks will be required to construct a wall 8m long, 6m high and 22.5cm thick if each brick measures (25cm × 11.25 × 6cm)?

(A) 4800 (B) 5600 (C) 6400 (D) 5200

Ans. :

c. 6400

Solution:

Volume of the wall = length × breadth × height

= (8 × 100) × (6 × 100) × 22.5 ...(1m = 100cm)

$= 800 \times 600 \times \frac{225}{10}$

$= 800 \times 60 \times 225$

Volume of 1 brick = length × breadth × height

$= 25 \times \frac{1125}{100} \times 6$

$= \frac{1125}{2} \times 3$

Required number of bricks $= \frac{\text{Volume of the wall}}{\text{Volume of 1 brick}}$

$= \frac{800\times60\times225}{\frac{1125}{2}\times3}$

$= \frac{800 \times 60 \times 225 \times 2}{1125 \times 3}$
$= 6400$

31. The ratio between the radius of the base and the height of a cylinder is 2 : 3. If its volume is 1617cm^3, then its total surface area is:

(A) 308cm^2 (B) 462cm^2 (C) 540cm^2 (D) 770cm^2

Ans. :

d. 770cm^2

Solution:

Let the radius be 2x and the height be 3x cm.

We know that,

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

$= \pi \times (2x)^2 \times 3x$

$= \frac{22}{7} \times 12 \times x^3$

$\Rightarrow 1617 = \frac{22}{7} \times 12x^3$

$\Rightarrow x^3 = \frac{7 \times 1617}{22 \times 12}$

$\Rightarrow x^3 = \frac{7 \times 49}{2 \times 4}$

$\Rightarrow x^3 = \frac{343}{8}$

$\Rightarrow x^3 = \left(\frac{7}{2}\right)^3$

$\Rightarrow x = \frac{7}{2}$

$\therefore$ radius $= 2 \times \frac{7}{2} = 7\text{cm}$

Height $= 3 \times \frac{7}{2} = \frac{21}{2}\text{cm}$

$\therefore$ total surface area $= 2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times 7\left(\frac{21}{2} + 7\right)$

$= 44\left(\frac{21}{2} + 7\right)$

$= 44\left(\frac{35}{2}\right)$

$= 770\text{cm}^2$

32. The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their volumes is:

(A) 20 : 27 (B) 125 : 27 (C) 10 : 9 (D) 8 : 27

Ans. :

a. 20 : 27

Solution:

Let r_1, r_2 be the radii of two cylinders and h_1, h_2 be the height of two cylinder respectively.

Then $\frac{r_1}{r_2} = \frac{2}{3}$ and $\frac{h_1}{h_2} = \frac{5}{3}$

$\therefore$ Required ratio $= \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$

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

$= \left(\frac{2}{3}\right)^2 \left(\frac{5}{3}\right)$

$= \frac{20}{27} = 20 : 27$

33. A right circular cylinder and a right circular cone have the same radius and the same volume. The ratio of the height of the cylinder to that of the cone is:

(A) 3 : 5 (B) 3 : 1 (C) 1 : 3 (D) 2 : 5

Ans. :

c. 1 : 3

Solution:

Let r be the radius of cylinder and cone and volumes are equal and h_1 and h_2 be their have h_2 is respectively

$\therefore$ Volume of cylinder $= \pi r h_1$

and volume of cone $= \frac{1}{3\pi r^2 h_2}$

$\therefore \pi r^2 h_1 = \frac{1}{3\pi r^2 h_2}$

$\Rightarrow h_1 = \frac{1}{3h_2}$

$\Rightarrow \frac{h_1}{h_2} = \frac{1}{3}$

$\therefore h_1 : h_2 = 1 : 3$

34. Write the correct answer in the following:

The lateral surface area of a cube is $256m^2$. The volume of the cube is:

(A) $512m^3$ (B) $64m^3$ (C) $216m^3$ (D) $256m^3$

Ans. :

a. $512m^3$

Solution:

Given, lateral surface area of a cube = $256m^2$

We know that, lateral surface area of a cube = 4 × $(\text{Side})^2$

$\Rightarrow 256 = 4 \times (\text{Side})^2$

$\Rightarrow (\text{Side})^2 = \frac{256}{4} = 64$

$\Rightarrow \text{Side} = \sqrt{64} = 8\text{m}$

[taking positive square root because side is always a positive quantity]

Now, volume of a cube = $(\text{Side})^3$ = $(8)^3$ = 8 × 8 × 8 = $512m^3$

Hence, the volume of the cube is $512m^3$.

35. If the radius of the base of a right circular cylinder is halved, keeping the same height, then the ratio of the volume of the reduced cylinder to the volume of the original cylinder is:

(A) 2 : 1 (B) 1 : 4 (C) 1 : 2 (D) 4 : 1

Ans. :

b. 1 : 4

Solution:

Volume of reduced cylinder : Volume of original cylinder

$\pi\left(\frac{r}{2}\right)^2 h : \pi(r)^2 h$

$1 : 4$

36. The ratio of the volume of a right circular cylinder and a right circular cone of the same base and height, is:

(A) 4 : 3 (B) 3 : 4 (C) 3 : 1 (D) 1 : 3

Ans. :

c. 3 : 1

Solution:

The formula of the volume of a cone with base radius 'r' and vertical height 'h' is given as

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

And, the formula of the volume of a cylinder with base radius 'r' and vertical height 'h' is given as

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

Now, substituting these to arrive at the ratio between the volume of a cylinder and the volume of a cone,

$\text{We get } \frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{3\pi r^2 h}{\pi r^2 h}$

$= \frac{3}{1}$

37. The area of the curved surface of a cone of radius 2r and slant height $\frac{1}{2}$, is:

(A) $12\pi rl$ (B) $2\pi rl$ (C) $\pi(r+l)r$ (D) πrl

Ans. :

d. πrl

Solution:

The formula of the curved surface area of a cone with base radius 'r' and slant height '1' us given as

Curved Surface Area $= \pi rl$

Hence the base radius is given as '2r' and the slant height is given as $\frac{1}{2}$

Substituting these values in the above equation we have

Curved Surface Area $= \frac{(\pi)(2)(r)(l))}{2}$

$= \pi rl$

38. Two cylindrical jars have their diameters in the ratio 3 : 1, but height 1 : 3. Then the ratio of their volumes is:

(A) 1 : 4 (B) 1 : 3 (C) 3 : 1 (D) 2 : 5

Ans. :

c. 3 : 1

Solution:

Let V_1 and V_2 be the volume of the two cylinders with radius r_1 and height h_1, and radius r_2 and height h_2,

Where, $\frac{2r_1}{2r_2} = \frac{3}{1}, \frac{h_1}{h_2} = \frac{1}{3}$

So,

$V_1 = \pi r_1^2 h_1 \ldots (i)$

Now,

$V_2 = \pi r_2^2 h_2 \ldots (ii)$

From equation (i) and (ii), we have

$\frac{V_1}{V_2} = \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$

$\Rightarrow \frac{V_1}{V_2} = \left(\frac{2r_1}{2r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$

$\Rightarrow \frac{V_1}{V_2} = (3)^2 \left(\frac{1}{3}\right) = \frac{3}{1}$

39. If the surface area of a sphere is $144\pi m^2$ then its volume (in m^3) is:

(A) 300π (B) 188π (C) 316π (D) 288π

Ans. :

d. 288π

Solution:

Surface area of a sphere $= 4\pi r^2$

Given, surface area of a sphere is $144\pi m^2$

$\Rightarrow 4\pi r^2 = 144\pi$

$\Rightarrow r = 6m$

Volume of the sphere $= \left(\frac{4}{3}\right) \times \pi \times 6^3$

$\Rightarrow$ Volume of the sphere $= 288\pi m^3$

40. The volume of a right circular cone of height 24cm is $1232cm^3$. Its curved surface area is.

(A) $704cm^2$ (B) $1254cm^2$ (C) $550cm^2$ (D) $462cm^2$

Ans. :

c. $550cm^2$

Solution:

Radius of cone = r cm

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

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

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

$\Rightarrow r = \sqrt{49} = 7cm$

Area of curved surface area $= \pi rl$

$l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = 25$

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

41. If h, S and V denote respectively the height, curved surface area and volume of a right circular cone, then $3\pi Vh^3 - S^2h^2 + 9V^2$ is equal to:

(A) 8 (B) 0 (C) 4π (D) $32\pi^2$

Ans. :

b. 0

Solution:

For a cone,

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

S = curved Surface Area $= \pi RL$

$L = \sqrt{h^2 + R^2}$

$3\pi Vh^3 - S^2h^2 + 9V^2$

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

$+ 9 \times \frac{1}{9}\pi^2R^4h^2$

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

$= 0$

42. The number of surfaces of a cone has, is:

(A) 1 (B) 3 (C) 4 (D) 2

Ans. :

d. 2

Solution:

The surface or faces that a cone has are:

(i) Base, (ii) Slanted surface

So, the number of surfaces that a cone has is 2.

43. If a solid sphere of radius 10cm is moulded into 8 spherical solid balls of equal radius, then the surface area of each ball (in sq.cm) is:

(A) 100π (B) 75π (C) 60π (D) 50π

Ans. :

a. 100π

Solution:

Volume of solid sphere $= \frac{4}{3}\pi(10)^3 = \frac{4000\pi}{3}\text{cm}^3$

Vomule 8 solid sphere of radius (say) $r = 8 \times \frac{4}{3}\pi r^3 = \frac{32\pi r^3}{3}\text{cm}^3$

Now, $\frac{32\pi r^3}{3} = \frac{4000\pi}{3}$

$\Rightarrow r = \left(\frac{1000}{8}\right)^{\frac{1}{3}} = \frac{10}{2} = 5\text{cm}$

Surface Area of each small ball $= 4\pi r^2 = 4\pi(5)^2 = 100\pi\ \text{cm}^2$

Hence, correct option is (a).

44. The slant height of a cone is increased by 10%. If the radius remains the same, the curved surface area is increased by:

(A) 10% (B) 12.1% (C) 20% (D) 21%

Ans. :

a. 10%

Solution:

C.S.A of a cone $= \pi \mathrm{rl}$

If l' = 1 + 10% of l

$= \mathrm{l} + \frac{10}{100} \times \mathrm{l}$

$= \mathrm{l} + \frac{1}{10}$

And, r' = r

$\mathrm{C.S.A.} = \pi \mathrm{r}\left(\mathrm{l} + \frac{\mathrm{l}}{10}\right) = \frac{11}{10}\pi \mathrm{rl}$

So, increase in C.S.A. $= \frac{\frac{11}{10}\pi \mathrm{rl} - \pi \mathrm{rl}}{\pi \mathrm{rl}} \times 100\% = 10\%$

45. A cube whose volume is $\frac{1}{8}$ cubic centimeter is placed on top of a cube whose volume is 1cm^3. The two cubes are then placed on top of a third cube whose volume is 8cm^3. The height of the stacked cubes is:

(A) None of these (B) 3cm (C) 3.5cm (D) 7cm

Ans. :

c. 3.5cm

Solution:

Let a, b, c. be the sides of three cubes

Then $a^3 = \frac{1}{8} \Rightarrow \mathrm{a} = \frac{1}{2}$

$b^3 = 1 \Rightarrow b = 1$

$c^3 = 8 \Rightarrow c = 2$,

Now height of resulting cube

0.5 + 1 + 2 = 3.5cm

46. Volume of a cuboid is 12cm^3. The volume (in cm^3) of a cuboid whose side are doubled of the above cuboid is:

(A) 24 (B) 48 (C) 72 (D) 96

Ans. :

d. 96

Solution:

Let,

l → Length of the first cuboid

b → Breadth of the first cuboid

h → Height of the first cuboid

Volume of the cuboid is 12cm^3

Dimensions of the new cuboid are,

Lenghth (L) = 2l

Breadth (B) = 2b

Height (H) = 2h

We are asked to find the volume of the new cuboid

We know that,

Volume of the new cuboid,

V' = LBH

= (2l)(2b)(2h)

= 8(lbh)

= 8V {Since, V = lbh}

= 8 × 12 {Since, V = 12cm^3}

= 96cm^3

Thus, volume of the new cuboid is 96cm^3.

Hence, the correct option is (d).

47. How many planks of dimensions (5m × 25cm × 10cm) can be stored in a pit which is 20m long, 6m wide and 50cm deep?

(A) 320 (B) 450 (C) 480 (D) 360

Ans. :

c. 480

Solution:

Volume of a cuboid = Length × Breadth × Height

1m = 100cm

Volume of pit = 20m × 6m × 0.5m = 60m^3

Volume of plank = 5m × 0.25m × 0.1m = 0.125m^3

No. of planks $= \frac{\text{Volume of pit}}{\text{Volume of plank}} = \frac{60}{0125}$

$= 480$

48. The volume of a cube is 512cm^3. Its total surface area is:

(A) 512cm^2 (B) 256cm^2 (C) 384cm^2 (D) 64cm^2

Ans. :

c. 384cm^2

Solution:

Volume of a cube = $(\text{side})^3$

Given volume = 512cm^3

⇒ $(\text{side})^3$ = 512cm^3

$\Rightarrow \text{side} = \sqrt[3]{512} = 8\text{cm}$

Total surface area of a cube = $6(\text{side})^2$

⇒ Total surface area = $6(8)^2cm^2$ = 384cm^2

49. If each edge of a cube is increased by 50%, then the percentage increase in its surface area is.

(A) 75% (B) 50% (C) 100% (D) 125%

Ans. :

d. 125%

Solution:

Let the original side be a then

Original surface area S = $6a^2$

When side is increased by 50%, side becomes $\frac{3}{2a}$ than

Surface area $s = \frac{27}{2}a^2$

Hence,

Surface area is increases by $x = \frac{\frac{27}{2}a^2 - 6a^2}{6a^2} \times 100 = 125\%$

50. A solid cylinder is melted and cast into a cone of same radius. The heights of the cone and cylinder are in the ratio:

(A) 3 : 1 (B) 1 : 9 (C) 9 : 1 (D) 1 : 3

Ans. :

a. 3 : 1

Solution:

Since the cylinder is re cast into a cone both their volumes should be equal.

So, let Volume of the cylinder = Volume of the cone

= V

It is also given that their base radii are the same

= r

Let the height of the cylinder and the cone be $h_{cylinder}$ and h_{cone} respectively.

The formula of the volume of a cone with base radius 'r' and vertical height 'h' is given as

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

The formula of the volume of a cylinder with base radius 'r' and vertical height 'h' is given as

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

So, we have

$$\frac{\text{Volume of cone}}{\text{Volume of cylinder}} = \frac{\frac{1}{3}\pi r^2 h_{cone}}{\pi r^2 h_{cylinder}}$$

$$\Rightarrow \frac{V}{V} = \frac{\frac{1}{3}h_{cose}}{h_{cylinder}}$$

$$= \frac{h_{cose}}{h_{cylinder}} = \frac{3}{1}$$

51. In a cylinder, if radius is halved and height is doubled, the curved surface area will be:

(A) Halved (B) Same (C) Doubled (D) Four times

Ans. :

b. Same

Solution:

CSA of original cylinder $= 2\pi rh$

CSA of new cylinder $= 2 \times \pi \times \frac{r}{2} \times 2h$

$= 2\pi rh$

52. If V is the volume of a cuboid of Dimensions x, y, z and A is its surface area, then $\frac{A}{V}$

(A) $x^2y^2z^2$

(B) $\frac{1}{2}\left(\frac{1}{xy}+\frac{1}{yz}+\frac{1}{zx}\right)$

(C) $\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

(D) $\frac{1}{xyz}$

Ans. :

c. $\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

Solution:

Dimensions of the cuboid are x, y, z.

So, the surface area of the cuboid (A) = 2(xy + yz + zx)

Volume of the cuboid (V) = xyz

$\frac{A}{V}=\frac{2(xy+yz+zx)}{xyz}$

$=2\left(\frac{xy}{xyz}+\frac{yz}{xyz}+\frac{zx}{xyz}\right)$

$=2\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

Hence, the correct choice is (c).

53. If the height of a cone is doubled then its volume is increased by:

(A) 100%

(B) 200%

(C) 300%

(D) 400%

Ans. :

a. 100%

Solution:

Let the original height of the cone be h and the radius be r.

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

New height is 2h and the radius is the same

So, the new volume of the cone $=\frac{1}{3}\pi r^2(2h)=\frac{2}{3}\pi r^2h$

Increase in the volume $=\frac{2}{3}\pi r^2h-\frac{1}{3}\pi r^2h=\frac{1}{3}\pi r^2h$

Increase $\%=\frac{\text{Increase}}{\text{Original volume}}\times 100$

⇒ Increase $=\frac{\frac{1}{3}\pi r^2h}{\frac{1}{3}\pi r^2h}\times 100$

⇒ Increase $\%=100$

54. The volume of a sphere is 38808cm^3. Its curved surface area is:

(A) 5544cm^2

(B) 8316cm^2

(C) 4158cm^2

(D) 1386cm^2

Ans. :

a. 5544cm^2

Solution:

Volume of sphere = 38808cm^3

$\Rightarrow \frac{4}{3}\pi r^3=38808$

$\Rightarrow \frac{4}{3}\times\frac{22}{7}\times r^3=38808$

$\Rightarrow r^3=\frac{38808\times 7\times 3}{88}$

$\Rightarrow r^3=441\times 21$

$\Rightarrow r^3 = (21)^3$

$\Rightarrow r = 21cm$

Curved surface area of a sphere $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times 21 \times 21$

$= 4 \times 22 \times 3 \times 21$

$= 5544cm^2$

55. The height h of a cylinder equals the circumference of the cylinder. In terms of h, what is the volume of the cylinder:

(A) $\frac{h^2}{4\pi}$ (B) πh^3 (C) $\frac{h^3}{2}$ (D) $\frac{h^2}{2\pi}$

Ans. :

a. $\frac{h^2}{4\pi}$

Solution:

Let h be the height of the cylinder with radius r.

It is given that:

$\Rightarrow r = \frac{h}{2\pi}$

Therefore, the volume of the cylinder is

$V = \pi r^2 h$

$\Rightarrow V = \pi\left(\frac{h}{2\pi}\right)^2 h = \frac{h^2}{4\pi}$

56. **Directions:** In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following:

Assertion: The length of the minute hand of a clock is 7cm. Then the area swept by the minute hand in 5 minute is $\frac{77}{6}cm^2$.

Reason: The length of an arc of a sector of angle q and radius r is given by $I = \frac{\theta}{360^\circ} \times 2\pi r$.

(A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(B) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(C) Assertion (A) is true but reason (R) is false.

(D) Assertion (A) is false but reason (R) is true.

Ans. :

b. Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

57. If the height and the radius of a cone are doubled, the volumes of the cone becomes:

(A) 3 times. (B) 4 times. (C) 6 times. (D) 8 times.

Ans. :

d. 8 times.

Solution:

The volume of a cone of height h and radius r $= \frac{1}{3}\pi r^2 h = v$

Since the height and the radius of cone are doubled, New height = 2h and new radius = 2r

⇒ New volume $= \frac{1}{3}\pi(2r)^2 \times 2h$

$= \frac{1}{3}\pi \times 4r^2 \times 2h$

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

$= 8v$

58. If the volume of two cones be in the ratio 1 : 4 and the radii of their bases be in the ratio 4 : 5 then the ratio of their heights is:

(A) 1 : 5 (B) 5 : 4 (C) 25 : 16 (D) 25 : 64

Ans. :

d. 25 : 64

Solution:

Let the radii of the cones be 4x cm and 5x cm respectively.

Let their be h cm and H cm respectively.

⇒ Ratio of the volume of the cones $= \frac{\frac{1}{3}\pi \times (4x^2 \times h)}{\frac{1}{3}\pi \times (5x)^2 \times H}$

$\Rightarrow \frac{V}{4v} = \frac{\frac{1}{3}\pi \times (4x)^2 \times h}{\frac{1}{3}\pi \times (5x)^2 \times H}$

$\Rightarrow \frac{1}{4} = \frac{16h}{25H}$

$\Rightarrow \frac{h}{H} = \frac{1}{4} \times \frac{25}{16}$

$\Rightarrow \frac{h}{H} = \frac{25}{64}$

$\Rightarrow h : H = 25 : 64$

59. The ratio between the curved surface area and the total surface area of a right circular cylinder is 1 : 2. If the total surface area is 616cm^2 then the volume of the cylinder is.

(A) 1848cm^3 (B) 924cm^3 (C) 1232cm^3 (D) 1078cm^3

Ans. :

d. 1078cm^3

Solution:

Given that curved surface area : total surface area = 1 : 2

Curved surface area: 616 = 1 : 2

Curved surface area $= \frac{616}{2} = 308$

$\Rightarrow \frac{2\pi rh}{2\pi r(h+r)} = \frac{1}{2}$

$\Rightarrow \frac{h}{h+r} = \frac{1}{2}$

$\Rightarrow 2h = h + r$

$\Rightarrow h = r$

Curved surface area $= 2\pi rh = 2\pi r^2 = 308 \text{ Since } h = r$

$\Rightarrow 2 \times \frac{22}{7} r^2 = 308$

$\Rightarrow r^2 = \frac{308 \times 7}{44} = 49$

$\Rightarrow r = 7cm$

Since $\mathrm{r} = \mathrm{h}$

$\mathrm{h} = 7\mathrm{cm}$

Volume of cylinder $= \pi \mathrm{r}^2 \mathrm{h} = \frac{22}{7} \times 7 \times 7 \times 7 = 1078\mathrm{cm}^2$

60. Each edge of a cube is increased by 40%. The % increase in the surface area is.

(A) 24% (B) 60% (C) 96% (D) 40%

Ans. :

d. 40%

Solution:

Let edge of cube be x

New edge of cube = x + 40% of x

$= \mathrm{x} + \frac{40}{100} \times \mathrm{x}$

$= \mathrm{x}(1 + \frac{4}{10})$

$= \frac{14}{10}\mathrm{x}$

TSA of original cube = $6x^2$

TSA of new cube $= 6 \times \left(\frac{14}{10}\mathrm{x}\right)^2$

% increase in surface area = [(New surface area - original surface area) ÷ original surface area] × 100

$= \left[[6(\frac{14}{10}\mathrm{x})^2 - 6\mathrm{x}^2] \div 6\mathrm{x}^2\right] \times 100$

$= \frac{6\mathrm{x}^2(\frac{14}{10} - 1)}{6\mathrm{x}^2} \times 100$

$= \frac{4}{10} \times 100$

$= 40\%$

61. Two circular cylinders of equal volume have their heights in the ratio 1 : 2. The ratio of their radii is:

(A) $1 : \sqrt{2}$ (B) $\sqrt{2} : 1$ (C) $1 : 2$ (D) $1 : 4$

Ans. :

b. $\sqrt{2} : 1$

Solution:

Let their heights be x cm and 2x cm respectively and let their radii be R_1 and R_2 respectively.

$\Rightarrow \pi \mathrm{R}_1^2 \mathrm{h} = \pi \mathrm{R}_2^2 \mathrm{h}$

$\Rightarrow \pi \times \mathrm{R}_1^2 \times \mathrm{x} = \pi \times \mathrm{R}_2^2 \times 2\mathrm{x}$

$\Rightarrow \mathrm{R}_1^2 = \mathrm{R}_2^2 \times 2$

$\Rightarrow \left(\frac{\mathrm{R}_1}{\mathrm{R}_2}\right)^2 = 2$

$\Rightarrow \frac{\mathrm{R}_1}{\mathrm{R}_2} = \frac{\sqrt{2}}{1}$

⇒ Ratio of their radii is $\sqrt{2} : 1$

62. If the volumes of two cones are in the ratio 1 : 4 and their diameters are in the ratio 4 : 5, then the ratio of their heights, is:

(A) 25 : 64 (B) 5 : 16 (C) 5 : 4 (D) 1 : 5

Ans. :

a. 25 : 64

Solution:

The formula of the volume of a cone with base radius 'r' and vertical height 'h' is given as

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

Let the volume, base radius and the height of the two cones be V_1, r_1, h_1 and V_2, r_2, h_2 respectively.

It is given that the ratio between the volume of the two cones is 1 : 4.

Since only the ratio is gives, to use then in our equation we introduce a constant 'k'.

So V_1 = 1k

V^2 = 4k

It is also gives that the ratio between the base diameters of the two cones is 4 : 6

Hence the ratio between the base radius will also be 4 : 5.

Again, since only the ratio is given, to use them in our equation we introduce another constant 'p'

So, r_1 = 4p

r_1 = 5p

Substituting these values in the formula for volume of cone we get.

$\frac{\text{Volume of cone 1}}{\text{Volume of cone 2}} = \frac{(\pi)(4p)(4p)(h_1)(3)}{(3)(\pi)(5p)(5p)(h_2)}$

$\frac{V_1}{V_0} = \frac{16h_1}{25h_2}$

$\frac{1k}{4k} = \frac{16h_1}{25h_2}$

$\frac{h_1}{h_2} = \frac{25}{64}$

63. A sphere of diameter 12.6cm is melted and cast into a right circular cone of height 25.2cm. The radius of the base of the cone is:

(A) 6.3cm (B) 2.1cm (C) 6cm (D) 4cm

Ans. :

a. 6.3cm

Solution:

Let the radius of the base be r cm.

Since the sphere is melted and cast into a cone,

Volume of the sphere = volume of the cone

$\Rightarrow \frac{4}{3}\pi(6.3)^3 = \frac{1}{3}\pi r^2(25.2)$

$\Rightarrow 4(6.3)^3 = r^2(25.2)$

$\Rightarrow \frac{4\times(6.3)^3}{(25.2)} = r^2$

$\Rightarrow r = 6.3\text{cm}$

64. A conical pandal 240m in radius and 100m high is made of cloth which is 100π wide. Then, the length of cloth used to make the pandal is:

(A) 624m. (B) 676m. (C) 600m. (D) 625m.

Ans. :

a. 624m.

Solution:

Surface area of conical pandal $= \pi rl$

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

$l = \sqrt{240^2 + 100^2}$

$l = \sqrt{6700}$

$l = 240m$

Now surface of pandal $= \pi \times 240 \times 260$ area of cloth used

$= \pi \times 240 \times 260 = 100\pi \times \text{length}$

Length of cloth $= \frac{240 \times 260}{100}$

$= 624m$

65. The radius of a wire is decreased to one-third. If volume remains the same, the length will become:

(A) 9 times (B) 3 times (C) 27 times (D) 6 times

Ans. :

a. 9 times

Solution:

Let V_1 and V_2 be the volume of the two cylinders with h_1 and h_2 as their heights:

Let r_1 and r_2 be their base radius.

It is given that

$\pi r_1^2 h_1 = \pi r_2^2 h_2$

$V_1 = V_2 \text{ and } = \frac{1}{3} r_1 \Rightarrow r_1^2 h_1 = \left(\frac{1}{3} r_1\right)^2 h_2$

$\Rightarrow h_2 = 9h_1$

Hence, the length will becomes 9 times.

66. He surface areas of two spheres are in the ratio 16 : 9. The ratio of their volumes is:

(A) 64 : 27 (B) 27 : 64 (C) 16 : 27 (D) 16 : 9

Ans. :

a. 64 : 27

Solution:

Let r_1 and r_2 be the radius of the two spheres, respectively.

Therefore, the ratio of their surface Areas,

$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{16}{19} \Rightarrow \frac{r_1^2}{r_2^3} = \frac{(4)^2}{(3)^2} \frac{r^1}{r^2} = \frac{4}{3}$

Now, ratio of their Volumes

$\frac{4\pi r_1^3}{4\pi r_2^3} = \frac{r_1^2}{r_2^3} = \left(\frac{r^1}{r^2}\right)^3 = \left(\frac{4}{3}\right)^3 = \frac{64}{27} = 64 : 27$

67. A cone is 8.4cm high and the base is 2.1cm. It is melted and recast into a sphere. The radius of the sphere is:

(A) 4.2cm (B) 2.1cm (C) 2.4cm (D) 1.6cm

Ans. :

b. 2.1cm

Solution:

Let the radius of the sphere be r cm.

Since the cone is melted and recast into a sphere,

Volume of the sphere = volume of the cone

$\Rightarrow \frac{4}{3}\pi \times \mathrm{r}^3 = \frac{1}{3}\pi \times (2.1)^2 \times 8.4$

$\Rightarrow \mathrm{r}^3 = 2.1 \times 2.1 \times 2.1$

$\Rightarrow \mathrm{r} = 2.1\mathrm{cm}$

68. The altitude of a circular cylinder is increased six times and the base area is decreased one-ninth of its value. The factor by which the lateral surface of the cylinder increases, is:

(A) $\frac{2}{3}$ (B) $\frac{1}{2}$ (C) $\frac{3}{2}$ (D) 2

Ans. :

d. 2

Solution:

If h is initial altitude, then h' = 6h

initial Base Area $= \pi \mathrm{r}^2 = \mathrm{B}$

New base Area $= \mathrm{B}' = \pi \mathrm{r}'^2$

Now, $\mathrm{B}' = \frac{\mathrm{B}}{9}$

$\Rightarrow \pi \mathrm{r}'^2 = \frac{\pi \mathrm{r}^2}{9}$

$\Rightarrow \mathrm{r}'^2 = \frac{\mathrm{r}^2}{9}$

$\Rightarrow \mathrm{r}' = \frac{\mathrm{r}}{3}$

Intial Lateral surface Area $= 2\pi \mathrm{rh}$

New Lateral surface Area $= 2\pi \mathrm{r}'\mathrm{h}'$

$= 2\pi\left(\frac{\mathrm{r}}{3}\right)6\mathrm{h}$

$= 2(2\pi \mathrm{rh})$

= 2(Intial Lateral surface Area)

69. If the TSA of a solid cylinder is $200\pi \text{ sq .cm}$ and its radius is 5cm then the sum of its height and radius is:

(A) 20cm (B) 15cm (C) 25cm (D) 10cm

Ans. :

a. 20cm

Solution:

TSA of solid cylinder $= 200\pi \text{ sq .cm}$

$\Rightarrow 2\pi \mathrm{r}(\mathrm{r}+\mathrm{h}) = 200\pi$

$\Rightarrow 12 \times 5(5+\mathrm{h}) = 200$

$\Rightarrow \mathrm{h}+5 = 20$

$\Rightarrow \mathrm{h} = 15\mathrm{cm}$

$\therefore$ Sum of height and radius = 5 + 15 = 20cm

70. The curved surface area of a cylindrical pillar is $264\mathrm{m}^2$ and its volume is $924\mathrm{m}^3$. The height of the pillar is.

(A) 5m (B) 4m (C) 6m (D) 7m

Ans. :

c. 6m

Solution:

Curved surface area = $264\mathrm{m}^2$

Volume = $924\mathrm{m}^3$

Let r m be the radius and h m be the height of the cylinder.

Then we have:

$2\pi\mathrm{rh} = 264$ and $\pi\mathrm{r}^2\mathrm{h} = 924$

$\Rightarrow \mathrm{rh} = \frac{264}{2\pi}$

$\Rightarrow \mathrm{h} = \frac{264}{2\mathrm{r}\pi}$

Now, $\pi\mathrm{r}^2\mathrm{h} = \pi \times \mathrm{r}^2 \times \frac{264}{2\mathrm{r}\times\pi} = 924$

$\Rightarrow \mathrm{r} = \frac{924\times2}{264}$

$\Rightarrow \mathrm{r} = 7\mathrm{m}$

$\therefore \mathrm{h} = \frac{264\times7}{2\times7\times22} = 6\mathrm{m}$

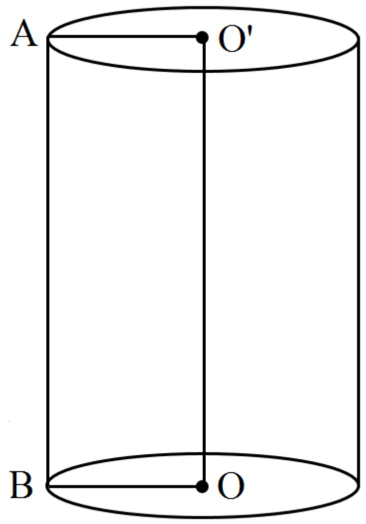
71. If the radius of a cylinder is doubled and the height remains same, the volume will be:

(A) Halved (B) Doubled (C) Same (D) Four times

Ans. :

d. Four times

Solution:



Let V_1 be the volume of the cylinder with radius r_1 and height h_1, then

$\mathrm{V}_1 = \pi\mathrm{r}_1^2\mathrm{h}_1 \ldots \text{(i)}$

Now, let V_2 be the volume after changing the dimension, then

$r_2 = 2r_1, h_2 = h_1$

So,

$V_2 = \pi r_2^2 h_2 = \pi \times (2\pi_1)^2 \times h_1$

$\Rightarrow V_2 = 4 \times \pi r_1^2 h_1 = 4V_1$

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

(A) 3 : 2 : 1 (B) 2 : 3 : 1 (C) 2 : 1 : 3 (D) 1 : 2 : 3

Ans. :

d. 1 : 2 : 3

Solution:

Volume of a hemisphere $= \left(\frac{2}{3}\right)\pi r^3$

Volume of a right circular cone $= \left(\frac{1}{3}\right)\pi r^2 h$

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

Given, a cone, a hemisphere and a cylinder stand on equal bases and have the same height.

Height of a hemisphere is the radius and equal bases implies equal base radius.

Thus, height of cone = height of cylinder = base radius = r

Ratio of volumes $= \left(\frac{1}{3}\right)\pi r^2 h : \left(\frac{2}{3}\right)\pi r^3 : \pi r^2 h$

⇒ Ratio of volumes = $r^3 : 2r^3 : 3r^3$ = 1 : 2 : 3

73. The volume of a cylinder of radius r is $\frac{1}{4}$ of the volume of a rectangular box with a square base of side length x. If the cylinder and the box have equal heights, what is r in terms of x?

(A) $\frac{x^2}{2\pi}$ (B) $\frac{x}{2\sqrt{\pi}}$ (C) $\frac{\sqrt{2}x}{\pi}$ (D) $\frac{\pi}{2\sqrt{x}}$

Ans. :

b. $\frac{x}{2\sqrt{\pi}}$

Solution:

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

Area of base of box $= x^2$

Let the height of both objects = h

Then, $v_{\text{cylinder}} = \pi r^2 h$

$v_{\text{box}} = x^2 h$

Now, $v_{\text{cylinder}} = \frac{1}{4} v_{\text{box}}$

$\Rightarrow \pi r^2 \cancel{h} = \frac{1}{4} x^2 \cancel{h}$

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

$\Rightarrow r = \frac{x}{2\sqrt{\pi}}$

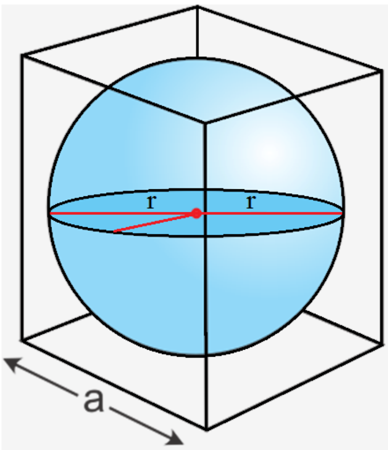
74. If a sphere is inscribed in a cube, then the ratio of the volume of the sphere to the volume of the cube is:

(A) $\pi : 2$ (B) $\pi : 3$ (C) $\pi : 4$ (D) $\pi : 6$

Ans. :

d. $\pi : 6$

Solution:



Edge of cube = a

⇒ Volume of cube = a^3

If Sphere is inscribed inside cube then a $= 2r \Rightarrow r = \frac{a}{2}$

Volume of sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\left(\frac{a}{2}\right)^3 = \frac{\pi}{6}a^3$

Ratio of volume of sphere to volume of cube $= \frac{\frac{\pi}{6}a^3}{a^3} \frac{\pi}{6}$

Hence, correct option is (d).

75. The radii of the bases of a cylinder and a cone are in the ratio 3 : 4 and their heights are in the ratio 2 : 3. Then, their volumes are in the ratio:

(A) 9 : 8 (B) 3 : 4 (C) 4 : 3 (D) 8 : 9

Ans. :

a. 9 : 8

Solution:

Let the radii of the bases of a cylinder and a cone be 3x cm and 4x cm respectively and let their heights be 2y cm and 3y cm respectively. Then,

Ratio of the their volumes $= \frac{\pi \times (3x)^2 \times 2y}{\frac{1}{3}\pi \times (4x)^2 \times 3y} = \frac{54}{48} = \frac{9}{8} = 9 : 8$

76. If the height of a cone is doubled then its volume is increased by.

(A) 400% (B) 100% (C) 200% (D) 300%

Ans. :

b. 100%

Solution:

Let the radius of the cone is r and height is h then

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

If the height of the cone is double the

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

Increment of the volume $= \frac{2}{3}\pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 h$

$$\% \text{ increase } = \frac{\frac{1}{2}\pi r^2 h}{\frac{1}{2}\pi r^2 h} \times 100 = 100\%$$

77. The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their curved surface areas is

(A) 10 : 9 (B) 8 : 7 (C) 16 : 9 (D) 2 : 5

Ans. :

a. 10 : 9

Solution:

Suppose that the radii of the cylinders are 2r and 3r and their respective heights are 5h and 3h.

Then, ratio of the curved surface areas $= \frac{2\pi(2r)(5h)}{2\pi(3r)(3h)} = 10 : 9$

78. A river 1.5m deep and 30m wide is flowing at the rate of 3km per hour. The volume of water that runs into the sea per minute is:

(A) $2000m^3$ (B) $2250m^3$ (C) $2500m^3$ (D) $2750m^3$

Ans. :

b. $2250m^3$

Solution:

Volume of the water running into the sea per hour = 1.5 × 30 × 3000

...(1km = 1000m)

= 45 × 3000

Volume of the water running into the sea per minute $= \frac{45 \times 3000}{60}$

$= 45 \times 50$

$= 2250m^3$

79. If each edge of a cube, of volume V, is doubled, then the volume of the new cube is.

(A) 4V (B) 6V (C) 8V (D) 2V

Ans. :

c. 8V

Solution:

Let edge = a

Volume, V = a^3

If a' = 2a, then

V' = $(a)^3 = (2a)^3 = 8a^3$

V' = 8V

80. The radius and height of a right circular cylinder are each increased by 20%. The volume of cylinder is increased by-

(A) 72.8% (B) 54% (C) 20% (D) 40%

Ans. :

a. 72.8%

Solution:

Let radius of original cylinder = r

and height of original cylinder= h

radius of new cylinder= r + 20% of r

$= \mathrm{r} + \frac{(20\times \mathrm{r})}{100}$
$= \mathrm{r} + \mathrm{r} \times \frac{2}{10}$
$= \frac{12}{10}\mathrm{r}$

And height of new cylinder = h + 20% of $\mathrm{h} = \frac{12}{10\mathrm{h}}$

Volume of original cylinder $= \pi \mathrm{r}^2\mathrm{h}$

Volume of new cylinder $= \pi \times (\frac{12}{10}\mathrm{r})^2\mathrm{h}$

Increase % in volume = {(volume of new cylinder - volume of original cylinder) /volume of original
cylinder} × 100

$= \left[\frac{\pi(\frac{12}{10\mathrm{r}})^2(\frac{12}{10\mathrm{h}}) - \mathrm{r}^2\mathrm{h}}{\mathrm{r}^2\mathrm{h}}\right] \times 100$

$= \mathrm{r}^2\mathrm{h}\left[\frac{\pi(\frac{12}{10})^2(\frac{12}{10}) - 1}{\mathrm{r}^2\mathrm{h}}\right] \times 100$

$= \left[\left(\frac{728}{1000}\right) \times 100\right]\%$

$= 72.8\%$

81. If the radius and slant height of a cone are in the ratio 7 : 13 and its curved surface area is 286cm^2 then its radius is:

(A) 7.5cm. (B) 10cm. (C) 10.5cm. (D) 7cm.

Ans. :

d. 7cm.

Solution:

Let radius = 7y and Slant height = 13y

CSA of cone $= \pi \mathrm{rl}$

$286 = \frac{22}{7} \times 7\mathrm{y} \times 13\mathrm{y}$

$\mathrm{y}^2 = \frac{286}{22\times 13}$

$\mathrm{y} = 1\mathrm{cm}$

Hence, radius = 7y

= 7 × 1

= 7cm

82. If h, S and V denote respectively the height, curved surface area and volume of a right circular cone, $3\pi \mathrm{Vh}^3 - \mathrm{S}^2\mathrm{h}^2 + 9\mathrm{V}^2$ is equal to:

(A) 4π (B) 0 (C) $32\pi^2$ (D) 8

Ans. :

b. 0

Solution:

Here we are asked to find the value for a given specific equation which is in terms of V, h and Srepresenting the volume, vertical height and the Curved Surface Area of a cone. F

We know $\mathrm{V} = \frac{1}{3}(\pi \mathrm{r}^2\mathrm{h})$ and S = pirl

Also, $l = \sqrt{r^2 + h^2}$

Now the given eqution is

$3\pi Vh^3 - S^2h^2 + 9V^2$

So,

$$\begin{aligned}
x &= 3\pi Vh^3 - S^2h^2 + 9V^2 \\
&= 3\pi(\tfrac{1}{3}\pi r^2 h)h^3 - (\pi rl)^2 + 9(\tfrac{1}{3}\pi r^2 h)^2 \\
&= \pi^2 r^2 h^2 - \pi^2 r^2 l^2 + 9(\tfrac{1}{9}\pi^2 r^4 h^2) \\
&= \pi^2 r^2 h^4 - \pi^2 r^2 h^2 (\sqrt{r^2 + h^2})^2 + \pi^2 r^4 h^2 \\
&= \pi^2 r^2 h^4 - \pi^2 r^2 h^2 (\sqrt{r^2 + h^2})^2 + \pi^2 r^4 h^2 \\
&= \pi^2 r^2 h^4 - \pi^2 r^2 h^2 (r^2 + h^2)^2 + \pi^2 r^4 h^2 \\
&= \pi^2 r^2 h^4 - \pi^2 r^4 h^2 + \pi^2 r^2 h^4 + \pi^2 r^4 h^2 \\
&= 0
\end{aligned}$$

83. If V is the volume of a cuboid of dimensions x, y, z and A is its surface area, then $\frac{A}{V}$.

(A) $\frac{1}{2}\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)$ (B) $x^2y^2z^2$ (C) $\frac{1}{2}\left(\frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx}\right)$ (D) $\frac{1}{xyz}$

Ans. :

a. $\frac{1}{2}\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)$

Solution:

Sides of a cuboid are x, y, z

Volume of cuboid = xyz = V

Surface Area = 2(xy + yz + zx) = A

$$\frac{A}{V} = \frac{2(xy+yz+zx)}{xyz} = 2\left(\frac{1}{z} + \frac{1}{x} + \frac{1}{y}\right) = 2\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)$$

*** A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.** **[5]**

84. **Directions:** In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following:

Assertion: If the inner dimensions of a cuboidal box are 50cm × 40cm × 30cm, then the length of the longest rod that can be placed in the box is $50\sqrt{2cm}.$

Reason: The line joining opposite corners of a cuboid is called its diagonal.

Also, length of longest rod = length of diagonal.

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

a. Both assertion and reason are true and reason is the correct explanation of assertion.
b. Both assertion and reason are true but reason is not the correct explanation of assertion.
c. Assertion is true but reason is false.
d. Assertion is false but reason is true.

Ans. :

a. Both assertion and reason are true and reason is the correct explanation of assertion.

85. **Directions:** In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following:

Assertion: The slant height of the frustum of a cone is 5cm and the difference between the radii of its two circular ends is 4cm than the height of the frustum is 3cm.

Reason: Slant height of frustum of cone is given by $\mathrm{I} = \sqrt{(\mathrm{R}-\mathrm{r})}^2 + \mathrm{h}^2$

a. Both Assertion and reason are correct and reason is correct explanation for Assertion.
b. Both Assertion and reason are correct but reason is not correct explanation for Assertion.
c. Assertion is correct but reason is false.
d. Both Assertions and reason are false.

Ans. :

a. Both Assertion and reason are correct and reason is correct explanation for Assertion.

86. **Directions:** In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following:

Assertion: The total surface area of a cone whose radius is $\frac{\mathrm{r}}{2}$ and slant height 2l is $(\pi)\mathrm{r}(\mathrm{l}+\frac{\mathrm{r}}{4})$.

Reason: Total surface area of cone is $\pi\mathrm{r}(\mathrm{l}+\mathrm{r})$ where r is radius and l is the slant height of the cone.

a. Both assertion and reason are true and reason is the correct explanation of assertion.
b. Both assertion and reason are true but reason is not the correct explanation of assertion.
c. Assertion is true but reason is false.
d. Assertion is false but reason is true

Ans. :

a. Both assertion and reason are true and reason is the correct explanation of assertion.

87. **Directions:** In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following:

Assertion: The radius of hemispherical balloon increase from 6cm to 12cm as air is being pumped into it the ratio of the surfaces areas of balloon in two cases is 1 : 4.

Reason: Total surface area of hemisphere $= 3\pi\mathrm{r}^2$

a. Both Assertion and reason are correct and reason is correct explanation for Assertion.
b. Both Assertion and reason are correct but reason is not correct explanation for Assertion.
c. Assertion is correct but reason is false.
d. Both Assertions and reason are false.

Ans. :

a. Both Assertion and reason are correct but reason is not correct explanation for Assertion

88. **Directions:** In the following questions, the Assertions (A) and Reason(s) (R) have been put forward. Read both the statements carefully and choose the correct alternative from the following:

Assertion: Volume of sphere $= \frac{4}{3}\pi \mathrm{r}^3$ and it's surface area $4\pi \mathrm{r}^2$

Reason: If the volumes of two spheres are in the ratio 27 : 8 then their surface area are in ratio 9 : 4

a. Both Assertion and reason are correct and reason is correct explanation for Assertion.
b. Both Assertion and reason are correct but reason is not correct explanation for Assertion.
c. Assertion is correct but reason is false.
d. Both Assertions and reason are false.

Ans. :

a. Both Assertion and reason are correct and reason is correct explanation for Assertion.

* Answer the following questions in one sentence. [1 Marks Each] [2]

89. Find the amount of water displaced by a solid spherical ball of diameter 0.21 m.

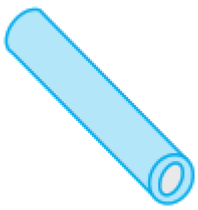
Ans. : Diameter = 0.21 m

∴ Radius (r) = $\frac{0.21}{2}$ m = 0.105 m

∴ Amount of water displaced = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (0.105)^3 = 0.004851\ m^3$

90. Savitri had to make a model of a cylindrical Kaleidoscope for her science project. She wanted to use chart paper to make the curved surface of the Kaleidoscope. What should be the area of chart paper required by her, if she wanted to make a Kaleidoscope of length 25 cm with a 3.5 cm radius? You may take $\pi = \frac{22}{7}$.



Ans. :

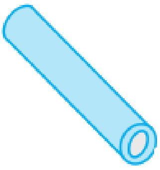
We have given that,

r = Radius of the base of the cylindrical Kaleidoscope = 3.5 cm

h = Height (length) of Kaleidscope = 25 cm

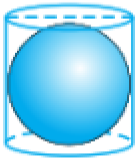
Therefore, Area of the chart paper required = Curved surface area of the Kaleidoscope

= $2\pi rh = 2 \times \frac{22}{7} \times 3.5 \times 25\ cm^2 = 550\ cm^2$



*** Answer the following short questions. [2 Marks Each]** **[10]**

91. A right circular cylinder just encloses a sphere of radius r. Find

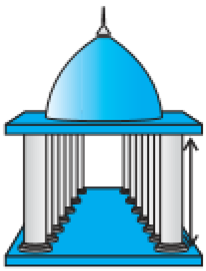


i. surface area of the sphere.
ii. curved surface of the cylinder.
iii. ratio of the area obtained in (i) and (ii).

Ans. :

i. Surface area of the sphere $= 4\pi r^2$
ii. For cylinder
Radius of the base = r
Height = 2r
$\therefore$ Curved surface area of the cylinder $= 2\pi rh = 2\pi(r)(2r) = 4\pi r^2$
iii. Ratio of the areas obtained in (i) and (ii)
$= \frac{surface\ area\ of\ the\ sphere}{curved\ surface\ area\ of\ the\ cylinder}$
$= \frac{4\pi r^2}{4\pi r^2} = \frac{1}{1} = 1 : 1$

92. The pillars of a temple are cylindrically shaped if each pillar has a circular base of radius 20cm and height 10 m. How much concrete mixture would be required to build 14 such pillars?



Ans. : Radius of base of cylinder = 20cm
Height of pillar = 10m = 1000cm
Volume of each cylinder = $\pi r^2 h$
$= \frac{22}{7} \times 20 \times 20 \times 1000\ cm^3$
$= \frac{8800000}{7}\ cm^3$
$= \frac{8.8}{7} m^3\ [\because 1000000cm^3 = 1m^3]$
$\therefore$ Volume of 14 pillars = volume of each cylinder $\times$ 14

$= \frac{8.8}{7} \times 14cm^3 = 17.6m^3$

So 14 pillars would need $17.6m^3$ of concrete mixture

93. Three cubes of metal with edges 3cm, 4cm and 5cm respectively are melted to form a single cube. Find the lateral surface area of the new cube formed.

Ans. : Three cubes of metal with edges 3cm, 4cm and 5cm are melted to form a single cube.

$\therefore$ Volume of the new cube = sum of the volumes the old cubes

= $(3^3 + 4^3 + 5^3)cm^3$

= $(27 + 64 + 125)cm^3$

= $216cm^3$

Suppose the edge of the new cube = x cm

Then we have:

Then 216 = x^3

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

$\therefore$ Lateral surface area of the new cube = $4x^2cm^2 = 4 \times 6^2cm^2 = 144cm^2$

94. A cylindeical tub of radius 12cm contains water to a depth of 20cm. A sphrical iron ball is dropped into the tub and thus the leval of water is raised by 6.75cm. What is the radius of the ball.

Ans. : Suppose that the radius of the ball is r cm.

Radius of the cylindrical tub = 12cm

Depth of the tub = 20cm

Now, volume of the ball = volume of water raised in the cylinder

$\Rightarrow \frac{4}{3}\pi \mathrm{r}^3 = \pi \times 12^2 \times 6.75$

$\Rightarrow \mathrm{r}^3 = \frac{144 \times 6.75 \times 3}{4}$

$= 36 \times 6.5 \times 3 = 729$

$\Rightarrow \mathrm{r} = 9\mathrm{cm}$

$\therefore$ The radius of the ball is 9cm.

95. The surface area of sphere is $(576\pi)\mathrm{cm}^2$. Find its volume.$\left(\mathrm{Take}\ \pi = \frac{22}{7}\right)$.

Ans. : Surface area of the sphere $= (576\pi)\mathrm{cm}^2$

Suppose that r cm is the radius of the sphere.

Then $4\pi\mathrm{r}^2 = 576\pi$

$\Rightarrow \mathrm{r}^2 = \frac{576}{4} = 144$

$\Rightarrow \mathrm{r} = 12\mathrm{cm}$

$\therefore$ Volume of the sphere $= \frac{4}{3} \times \pi \times 12 \times 12 \times 12\mathrm{cm}^3$

$= 2304\mathrm{cm}^3$

*** Answer the following questions. [3 Marks Each]** **[48]**

96. A Joker's cap is in the form of a right circular cone of base radius 7 cm and height 24 cm. Find the area of the sheet required to make 10 such caps.

Ans. : Radius of cap (r) = 7 cm, Height of cap (h) = 24 cm

Slant height of the cone (l) = $\sqrt{r^2+h^2}$ = $\sqrt{(7)^2+(24)^2}$

= $\sqrt{49+576}$

= $\sqrt{625}$

= 25 cm

Area of sheet required to make a cap = CSA of cone = πrl πrl

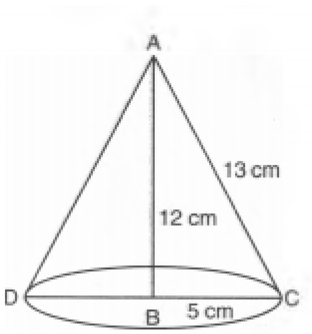
= $\frac{22}{7}\times 7\times 25$

$=\ 550\ cm^2$ =550 cm^2

$\therefore$ Area of sheet required to make 10 caps =10 $\times$ 550 = 5500 cm^2

97. A right triangle ABC with its sides 5 cm, 12 cm, and 13 cm is revolved about the side 12 cm. Find the volume of the solid so formed. If the triangle ABC is revolved about side 5 cm, then find the volume of the solid so obtained. Find also the ratio of the volumes of the two solids obtained.

Ans. : Let ABC be a right triangle with AB = 12 cm, BC = 5 cm and AC = 13 cm.
When this triangle is revolved about AB, it forms a right circular cone of radius = BC = 5 cm and height AB = 12 cm.



$\therefore$ V_1 = Volume of the solid formed = Volume of the cone of radius 5 cm and height 12 cm

$=\frac{1}{3}\times\pi\times 5\times 5\times 12$ cm^3 = 100 π cm^3

When triangle ABC is revolved about BC, it forms a right circular cone of radius AB = 12 cm and height BC = 5 cm.

$\therefore$ V_2 = Volume of the solid formed

$\Rightarrow$ V_2 = Volume of the cone of radius 12 cm and height 5 cm

$\Rightarrow$ $V_2=\frac{1}{3}\times\pi\times 12\times 12\times 5$ cm^3 = 240 π cm^3

$\therefore$ Required ratio = $V_1 : V_2$ = 100π : 240 π = 5 : 12

98. The diameter of the moon is approximately one-fourth the diameter of the earth. What fraction is the volume of the moon of the volume of the earth?

Ans. : Let diameter of earth be x

$\therefore$ Radius of earth $(r)=\frac{x}{2}$

Now, Volume of earth = $\frac{4}{3}\pi r^3$ [$\because$ Earth is considered to be a sphere]

=$\frac{4}{3}\times\pi\times\frac{x}{2}\times\frac{x}{2}\times\frac{x}{2}$

$=\frac{1}{8} \times \frac{4}{3}\pi x^3$ ....(i)

According to question, Diameter of moon = $\frac{1}{4}\times$ Diameter of earth= $\frac{1}{4} \times x = \frac{x}{4}$

$\therefore$ Radius of moon (R) = $\frac{x}{8}$

Now, Volume of Moon = $\frac{4}{3}\pi\mathrm{R}^3$ [$\because$ Moon is considered to be a sphere]

$=\frac{4}{3} \times \pi \times \frac{x}{8} \times \frac{x}{8} \times \frac{x}{8}$

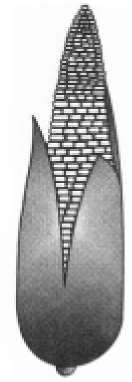
$=\frac{1}{512} \times \frac{4}{3}\pi x^3$

$=\frac{1}{64} \times \left[\frac{1}{8} \times \frac{4}{3}\pi x^3\right]$

$=\frac{1}{64}\times$ Volume of Earth [From eq. (i)]

$\therefore$ Volume of moon is $\frac{1}{64}th$ the volume of earth.

99. A corn cob (see Fig.), shaped somewhat like a cone, has the radius of its broadest end as 2.1 cm and length as 20 cm. If each 1 cm^2 of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob?



Ans. : Since the grains of corn are found on the curved surface of the corn cob.

So, Total number of grains on the corn cob = Curved surface area of the corn cob $\times$ Number of grains of corn on 1 cm^2

Now, we will first find the curved surface area of the corn-cob.

We have, r = 2.1 and h = 20

Let l be the slant height of the conical corn cob. Then,

$l = \sqrt{r^2 + h^2} = \sqrt{(2.1)^2 + (20)^2} = \sqrt{4.41 + 400} = \sqrt{404.41}$ = 20.11

$\therefore$ Curved surface area of the corn cub = πrl

= $\frac{22}{7}\times$ 2.1 $\times$ 20.11 cm^2

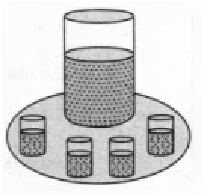
= 132.726 cm^2 = 132.73 cm^2

Hence, Total number of grains on the corn cob = 132.73 $\times$ 4 = 530.92

So, there would be approximately 531 grains of corn on the cob.

100. At a Ramzan Mela, a stall keeper in one of the food stalls has a large cylindrical vessel of the base radius 15 cm filled upto a height of 32 cm with the orange juice. The juice is filled in small cylindrical glasses **(see figure)** of radius 3 cm upto a height of 8 cm and sold for Rs.15 each. How much money does the stall keeper receive by selling the juice

completely?



Ans. : Given, radius of large cylindrical vessel (r) = 15 cm and height of orange juice in large vessel (h) = 32 cm

$\therefore$ Volume of juice in the large vessel = $\pi r^2 h = \pi \times 15 \times 15 \times 32\ cm^3$

For small cylindrical glasses, radius (r_1) = 3 cm and height of juice (h_1) = 8 cm

$\therefore$ Volume of juice in each glass = $\pi r_1^2 h_1 = \pi \times 3 \times 3 \times 8\ cm^3$

Since, small cylindrical glasses are filled with juice from large vessel.

So, Volume of juice in vessel = Number of glasses $\times$ Volume of juice in each glass

$\therefore$ Number of glasses of juice = $\frac{\text{Volume of juice in vessel}}{\text{Volume of juice in each glass}}$

= $\frac{\pi \times 15 \times 15 \times 32}{\pi \times 3 \times 3 \times 8}$ = 100

Now, cost of one glass juice = Rs.15

$\therefore$ Cost of 100 glass juice = 100 $\times$ 15 = Rs.1500

Hence, the stall keeper receive Rs.300 by selling the juice completely.

101. Find the weight of a solid cone whose base is of diameter 14cm and vertical height 51cm, supposing the material of which it is made weighs 10 grams per cubic cm.

Ans. : It is given that:

Diameter (d) = 14cm

Height of the cone (h) = 51cm

Radius of the cone(r) $= \frac{\mathrm{d}}{2}$

$= \frac{14}{2} = 7\mathrm{cm}$

Therefore, Volume of cone (v) $= \frac{1}{3}\pi \mathrm{r}^2 \mathrm{h}$

$= \frac{1}{3} \times 3.14 \times 7 \times 5 \times 51 = 2618\mathrm{cm}^3$

Now it is given that 1cm^3 material weighs 10gm.

Therefore, 2618cm^3 weighs = 2618 × 10 = 26180 grams or 26.180kg.

102. The area of the curved surface of a cone is $60\pi\mathrm{cm}^2$. If the slant height of the cone be 8cm, find the radius of the base.

Ans. : It is given that:

Curved surface area (C.S.A) $= 60\pi\mathrm{cm}^2$

Slant height of the cone (l) = 8cm

Radius of the cone (r) = ?

Now we know,

Curved Surface Area (C.S.A) $= \pi \mathrm{rl}$

$\Rightarrow \pi \mathrm{rl} = 60\pi\mathrm{cm}^2$

$\Rightarrow \mathrm{r} \times 8 = 60$

$\Rightarrow \mathrm{r} = 7.5\mathrm{cm}$

Therefore the radius of the base of the cone is 7.5cm.

103. A tent is in the form of a right circular cylinder surmounted by a cone. The diameter of cylinder is 24m. The height of the cylindrical portion is 11m while the vertex of the cone is 16m above the ground. Find the area of the canvas required for the tent.

Ans. : It is given that

Diameter of cylinder = 24m

Therefore $\mathrm{Radius} = \frac{\mathrm{Diameter}}{2}$

$= \frac{24}{2} = 12\mathrm{cm}$

Also radius of cone = 12m

Height of cylinder = 11m

Height of cone = 16 - 11 = 5m

Slant height of cone

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

$= 13\mathrm{m}$

Therefore area of canvas required for the tent $= \pi\mathrm{rl} + 2\pi\mathrm{rh}$

$= \frac{22}{7}\left[(12 + 13) + (2 \times 12 \times 11)\right] = 490.286 + 829.741$

$= 1320\mathrm{m}^3$

104. A conical pit of top diameter 3.5m is 12m deep. What is its capacity in kilolitres?

Ans. : It is given that:

Diameter of the conical pit (d) = 3.5m

Height of the conical pit (h) = 12m

Radius of the conical pit (r) = ?

Volume of the conical pit (v) = ?

Radius of the conical pit (r) $= \frac{\mathrm{d}}{2} = \frac{3.5}{2} = 1.75\mathrm{m}$

Volume of the cone (v) $= \frac{1}{3}\pi\mathrm{r}^2\mathrm{h}$

$= \frac{1}{3} \times 3.14 \times 1.75^2 \times 12 = 38.5\mathrm{m}^3$

Capacity of the pit = (38.5 × 1) kilolitres = 38.5 kilolitres

105. There are two cones. The curved surface area of one is twice that of the other. The slant height of the later is twice that of the former. Find the ratio of their radii.

Ans. : Let the curved surface area of 1st cone = 2x

C.S.A of 2nd cone = x

Slant height of 1st cone = h

Slant height of 2nd cone = 2h

Therefore $\frac{\mathrm{C.S.A\ of\ 1^{st} cone}}{\mathrm{C.S.A\ of\ 2^{nd} cone}}$

$= \frac{2\mathrm{x}}{\mathrm{x}}$

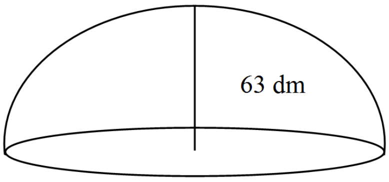
$\Rightarrow \frac{\pi\mathrm{r}_1\mathrm{l}_1}{\pi\mathrm{r}_2\mathrm{l}_2} = \frac{2}{1}$

$\Rightarrow \mathrm{r}_1 \times \frac{\mathrm{h}}{\mathrm{r}_2} \times \mathrm{h} = \frac{2}{1}$

$\Rightarrow \frac{r_1}{r_2} = \frac{4}{1}$

Therefore ratio of r_1 and r_2 is 4 : 1

106. The dome of a building is in the form of a hemisphere. Its radius is 63dm. Find the cost of painting it at the rate of Rs. 2 per sq m.



Ans. :

Dome radius = 63dm = 6.3m

Inner surface area of dome $= 2\pi r^2$

$= 2 \times 3.14 \times (6.3)^2$

$= 249.48 m^2$

Now, cost of $1m^2$ = Rs. 2

Therefore cost of $249.48m^2$ = Rs. (249.48 × 2) = Rs. 498.96

107. If a sphere is inscribed in a cube, find the ratio of the volume of cube to the volume of the sphere.

Ans. : In the given problem, we are given a sphere inscribed in a cube. So, here we need to find the ratio between the volume of a cube and volume of sphere. This means that the diameter of the sphere will be equal to the side of the cube. Let us take the diameter as d.

Here,

Volume of a cube $(V_1) = S^3$

$= d^3$

Volume of a sphere $(V_2) = \left(\frac{4}{3}\right)\pi\left(\frac{d}{2}\right)^3$

$= \left(\frac{4}{3}\right)\pi\left(\frac{d^3}{8}\right)$

$= \frac{\pi d^3}{6}$

Now, the ratio of the volume of sphere to the volume of the cube $= \frac{V_1}{V_3}$

$\frac{V_1}{V_2} = \frac{d^3}{\left(\frac{\pi d^3}{6}\right)}$

$= \frac{6}{\pi}$

So, the ratio of the volume of cube to the volume of the sphere is $6 : \pi$.

108. A sphere, a cylinder, and a cone have the same diameter. The height of the cylinder and also the cone are equal to the diameter of the sphere. Find the ratio of their volumes.

Ans. : Let r be the common radius

Height of the cone = height of the cylinder = 2r

Let

v_1 = Volume of sphere $= \frac{4}{3}\pi r^3$

v_1 = Volume of cylinder $= \pi r^2 h = \pi r^2 \times 2r$

v_1 = Volume of cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^3$

Now

$v_1 : v_2 : v_3$ $\frac{4}{3}\pi r^3 : 2\pi r^3 : \frac{2}{3}\pi r^3$

= 4 : 6 : 2 = 2 : 3 : 1

109. A cylindrical tub of radius 12cm contains water to a depth of 20cm. A spherical form ball is dropped into the tub and thus the level of water is raised by 6.75cm. What is the radius of the ball?

Ans. : Radius of cylindrical tub = 12cm

Depth = 20cm

Let r be the radius of the ball

Then

Volume of the ball = Volume of water raised

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

$r^3 = \frac{3.14 \times (12)^2 \times 6.75 \times 3}{4}$

$r^3 = 729$

$r = \sqrt[3]{729}$

$r = 9cm$

Therefore radius of the ball = 9cm

110. The diameter of the moon is approximately one-fourth of the diameter of the earth. Find the ratio of their surface areas.

Ans. : Let the diameter of the earth be d

Then,

Diameter of moon will be $\frac{d}{4}$

Radius of earth $= \frac{d}{2}$

Radius of moon $= \frac{\frac{d}{2}}{4} = \frac{d}{8}$

Surface area of moon $= \frac{4\pi\left(\frac{d}{8}\right)^2}{4\pi\left(\frac{d}{2}\right)^2}$

$= \frac{4}{64} = \frac{1}{16}$

Thus the required ratio of the surface areas is $\frac{1}{16}$

111. A spherical ball of radius 3cm is melted and recast into three spherical balls. The radii of two of these balls are 1.5cm and 2cm. Find the radius of the third ball.

Ans. : Radius of the original spherical ball = 3cm

Suppose that the radius of third ball is r cm.

Then,

Volume of the original spherical ball = Volume of the three spherical balls

$\Rightarrow \frac{4}{3}\pi \times 3^3 = \frac{4}{3}\pi \times 1.5^3$

$+ \frac{4}{3}\pi \times 2^3 + \frac{4}{3}\pi \times \mathrm{r}^3$

$\Rightarrow 27 = 3.375 + 8 + \mathrm{r}^3$

$\Rightarrow \mathrm{r}^3 = 27 - 11.375 = 15.625$

$\Rightarrow \mathrm{r} = 2.5\mathrm{cm}$

$\therefore$ The radius of the third ball is 2.5cm.

*** Questions with calculation. [4 Marks Each] [108]**

112. 30 circular plates, each of radius 14cm and thickness 3cm are placed one above the another to form a cylindrical solid. Find:
   i. The total surface area.
   ii. Volume of the cylinder so formed.

Ans. : Radius of one circular plate = 14cm.

Thickness of one circular plate = 3cm.

As the plates are placed one above the other, so the height of the cylinder formed by placing 30 plates = 30 × 3 = 90cm

i. Total surface area of circular $= 2\pi \mathrm{rh} + 2\pi \mathrm{r}^2$

$= 2\pi \mathrm{r}(\mathrm{r}+\mathrm{h}) = 2 \times \frac{22}{7} \times 14(14 + 90) = 44 \times 208 = 9152\mathrm{cm}^2$

ii. Volume of the cylinder $= \pi \mathrm{r}^2\mathrm{h} = \frac{22}{7} \times 14 \times 14 \times 90 = 55440\mathrm{cm}^3$

113. A cube of side 4cm contains a sphere touching its sides. Find the volume of the gap in between.

Ans. : Side of cube = 4cm.

Volume of cube = $(4)^3$ = 4 × 4 × 4 = $64\mathrm{cm}^3$

As cube contains a sphere touching its sides, so the diameter of the sphere = 4cm.

Radius of sphere $= \frac{4}{3}\pi \mathrm{r}^3 = \frac{4}{3} \times \frac{22}{7} \times (2)^3$

$= \frac{88\times 8}{21} = \frac{704}{21} = 33.52\mathrm{cm}^3$

Volume of gap in between them = $64\mathrm{cm}^3$ - $33.52\mathrm{cm}^3$ = $30.48\mathrm{cm}^3$.

114. The length and breadth of a hall are in the ratio 4 : 3 and its height is 5.5 meters. The cost of decorating its walls (including doors and windows) at ₹ 6.60 per square meter is ₹ 5082. Find the length and breadth of the room.

Ans. : Let the length be 4a and breadth be 3a

Height = 5.5m[Given]

As mentioned in the question, the cost of decorating 4 walls at the rate of Rs. 6.60 per m^2 is ₹ 5082.

Area of four walls × rate = Total cost of Painting

2(l + b) × h × 6.6 = 5082

2(4a + 3a) × 5.5 × 6.6 = 5082

$7\mathrm{a} = \frac{5082}{2\times 5.5\times 6.6}$

$7\mathrm{a} = 70$

$\mathrm{a} = \frac{70}{7}$

$a = 10$

Length = 4a = 4 × 10 = 40m

Breadth = 3a = 3 × 10 = 30m.

115. A village having a population of 4000 requires 150 liters of water per head per day. It has a tank measuring 20m × 15m × 6m. For how many days will the water of this tank last?

Ans. : Given that:

Length of the cuboidal tank (l) = 20m

Breadth of the cuboidal tank (b) = 15m

Height of the cuboidal tank (h) = 6m

Capacity of the tank = l × b × h = 20 × 15 × 6

= 1800m^3

= 1800000 litres

Water consumed by the people of village in one day = 4000 × 150 litres

= 600000 litres

Let water of this tank last for 'n' days

Therefore, water consumed by all people of village in n days = Capacity of the tank

= n × 600000 = 1800000

$= \mathbf{n} = \frac{1800000}{600000} = \mathbf{3}$

Thus, the water will last for 3 days in the tank.

116. The dimentional of rectangular box are inthe ratio of 2 : 3 : 4 and the difference between the cost of covering it with sheet of paper at the rates of ₹ 8 and ₹ 9.50 per m^2 is ₹ 1248. Find the dimensions of the box.

Ans. : The dimensions of the rectangular box are in the ratio 2 : 3 : 4.

So, let the dimensions be,

Lenght (l) = (4x)m

Breadth (b) = (3x)m

Height (h) = (2x)m

We are asked to find the dimensions of the box

The total surface area of the box,

A = 2(lb + bh + hl)

= 2[(4x)(3x) + (3x)(2x) + (2x)(4x)]

= ($52x^2$)m^2

The cost of covering it at the rate of ₹ 8 per m^2

= ₹ (8 × A)

The cost of covering it at the rate of ₹ 9.50 per m^2

= ₹ (9.50 × A)

We know that, The difference between above two costs is ₹ 1248.

So,

1248 = (9.50)A - (8)A

= 1.50A

A = 832m^2

$52x^2$ = 832 {Since A = $52x^2$}

$x^2 = \frac{832}{52}$

$= \frac{64}{4}$

= 16

x = 4

So, the dimensions of the box are;

2x = 2 × 4

= 8m

3x = 3 × 4

= 12m

4x = 4 × 4

= 16m

Hence, The dimensions of the box are 8m, 12m and 16m.

117. A rectangular tank is 80m long and 25m broad. Water flows into it through a pipe whose cross-section is 25cm^2, at the rate of 16km per hour. How much the level of the water rises in the tank in 45 minutes?

Ans. : Consider 'h' be the rise in water level.

Volume of water in rectangular tank = 8000 × 2500 × h cm^2

Cross-sectional area of the pipe = 25cm^2

Water coming out of the pipe forms a cuboid of base area 25cm^2 and length equal to the distance travelled in 45 minutes with the speed 16km/hour

i.e., length = Length $= 16000 \times 100 \times \frac{45}{60}\mathrm{cm}$

Therefore, The Volume of water coming out pipe in 45 minutes

$$= 25 \times 16000 \times 100 \times \left(\frac{45}{60}\right)$$

Now, volume of water in the tank = Volume of water coming out of the pipe in 45 minutes

$$\Rightarrow 8000 \times 2500 \times \mathrm{h} = 16000 \times 100 \times \frac{45}{60} \times 25$$

$$\Rightarrow \mathrm{h} = \frac{25 \times 16000 \times 100 \times 45}{60 \times 8000 \times 2500} = 1.5\mathrm{cm}$$

118. A river 3m deep and 40m wide is flowing at the rate of 2km per hour. How much water will fall into the sea in a minute?

Ans. : Radius of the water flow = 2km per hour $= \left(\frac{2000}{60}\right)\mathrm{m/min}$

$$= \left(\frac{100}{3}\right)\mathrm{m/min}$$

Depth of the river (h) = 3m

Width of the river (b) = 40m

Volume of the water flowing in 1 min $= \frac{100}{3} \times 40 \times 3 = 4000^3$

Thus, 1 minute 4000m^3 = 4000000 litres of water will fall in the sea.

119. If V is the volume of a cuboid of dimensions a, b, c and S is its surface area, then prove that:

$\frac{1}{V} = \frac{2}{S}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

Ans. : Given Data:

Length of the cube (l) = a

Breadth of the cube (b) = b

Height of the cube (h) = c

Volume of the cube (V) = l × b × h

= a × b × c

= abc

Surface area of the cube (S) = 2 (lb + bh + hl)

= 2(ab + bc + ca)

Now, $\frac{ab+bc+ca}{abc} \frac{2}{2(ab+bc+ca)} = \frac{2}{S}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

$\therefore\ \frac{1}{abc} = \frac{2}{S}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

$\therefore\ \frac{1}{V} = \frac{2}{S}\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

Hence Proved.

120. Twenty cylindrical pillars of the Parliament House are to be cleaned. If the diameter of each pillar is 0.50m and height is 4m.What will be the cost of cleaning them at the rate of ₹ 2.50 per square meter?

Ans. : Diameter of each pillar = 0.5

Radius of each pillar(r) $= \frac{d}{2}$

$= \frac{0.5}{2} = 0.25\mathrm{m}$

Height of each pillar = 4m

Lateral surface area of one pillar$= 2\pi \mathrm{rh}$

$= 2 \times 3.14 \times 0.25 \times 4$

$= \frac{44}{7}\mathrm{m}^2$

Lateral surface area of 20 pillars $= 20 \times \frac{44}{7}\mathrm{m}^2$

Cost of cleaning one pillar $= 2.50$ per square me

Cost of cleaning 20 pillars $= 2.50 \times 20 \times \frac{44}{7}\mathrm{m}^2$

$= 314.28$

121. Water flows out through a circular pipe whose internal diameter is 2cm, at the rate of 6 meters per second into a cylindrical tank. The water is collected in a cylindrical vessel radius of whose base is 60cm. Find the rise in the level of water in 30 minutes?

Ans. : Given data is as follows:

Internal diameter of the pipe = 2cm

Water flow rate through the pipe = 6m/ sec

Radius of the tank = 60cm

Time = 30 minutes

The volume of water that flows for 1 sec through the pipe at the rate of 6m/ sec is nothing but the volume of the cylinder with n = 6

Also, given is the diameter which is 2cm. Therefore,

R = 1cm

Since the speed with which water flows through the pipe is in meters/ second, let us convert the radius of the pipe from centimeters to meters. Therefore,

$\mathrm{r} = \frac{1}{100}\mathrm{m}$

Volume of water that flows for 1 sec $= \frac{22}{7} \times \frac{1}{100} \times \frac{1}{100} \times 6$

Now, we have to find the volume of water that flows for 30 minutes.

Since, speed of water is in metres/second, let us convert 30 minutes into seconds. It will be 30 × 60

Volume of water that flows for 30 minutes

$= \frac{22}{7} \times \frac{1}{100} \times \frac{1}{100} \times 6 \times 30 \times 60$

Now, considering the tank, we have been given the radius of tank in centimeters. Let us first convert it into metres. Let radius of tank be 'R'.

R = 60cm

$\mathrm{R} = \frac{60}{100}\mathrm{m}$

Volume of water collected in the tank after 30 minutes = Volume of water that flows through the pipe for 30 minutes

$= \frac{22}{7} \times \frac{60}{100} \times \frac{60}{100} \times 6$

$= \frac{22}{7} \times \frac{1}{100} \times \frac{1}{100} \times 6 \times 30 \times 60$

$\mathrm{h} = 3\mathrm{m}$

Therefore, the height of the tank is 3 metres.

122. A well with 10m inside diameter is dug 8.4m deep. Earth taken out of it is spread all around it to a width of 7.5m to form an embankment. Find the height of the embankment.

Ans. : Given data is as follows,

Inner diameter of the well = 10m

Height = 8.4m

Width of embankment = 7.5m

We have to find the height of the embankment.

Given is the diameter of the well which is 10m. Therefore,

r = 5m

The outer radius of the embankment,

R = Inner radius of the well + width of the embankment

= 5 + 7.5

= 12.5m

Let H be the height of the embankment.

The volume of earth dug out is equal to the volume of the embankment. Therefore,

Volume of embankment = Volume of earth dug out

$\pi(\mathrm{R}^2 - \mathrm{r}^2)\mathrm{H} = \pi \mathrm{r}^2 \mathrm{h}$

$\frac{22}{7} \times (12.52 - 52)\mathrm{H} = \frac{22}{7} \times 5 \times 5 \times 8.4$

$\mathrm{H} = 1.6\mathrm{m}$

Thus, height of the embankment is 1.6m.

123. It is required to make a closed cylindrical tank of height 1m and the base diameter of 140cm from a metal sheet. How many square meters of the sheet are required for the same?

Ans. : Height of the cylindrical tank (h) = 1m

Base radius of cylindrical tank (r) $= \frac{140}{2} = 70\mathrm{cm} = 0.7\mathrm{m}$

Area of sheet required =total surface area of tank $= 2\pi\mathrm{rh}$

= 2 × 3.14 × 0.7(0.7 + 1)

= 4.4 × 1.7 = 7.48m^2

Therefore it will require 7.48m^2 of metal sheet.

124. A well with 14m diameter is dug 8m deep. The earth taken out of it has been evenly spread all around it to a width of 21m to form an embankment. Find the height of the embankment.

Ans. : Let, r be the radius of well

h be the height of well

here, h = 8m

2r = 14

$\Rightarrow \mathrm{r} = \frac{14}{2}$

$= 7\mathrm{m}$

Volume of well = r^2 × h

$= \frac{22}{7} \times 7 \times 7 \times 8$

$= 22 \times 56$

$= 1232\mathrm{m}^3$

Let, $\mathrm{r_e}$ be the radius of embankment

he be the height of embankment

Volume of well = Volume of embankment

$1232\mathrm{m}^3 = \pi \times \mathrm{r_e} \times \mathrm{h_e}$

$1232 = \frac{22}{7} \times (282 - 72) \times \mathrm{h}$

$\mathrm{h_e} = \frac{1232 \times 7}{22(789-49)}$

$\mathrm{h_e} = \frac{1232 \times 7}{22 \times 735}$

$\mathrm{h_e} = 0.533\mathrm{m}$

125. The ratio between the radius of the base and height of a cylinder is 2 : 3. If its volume is 1617cm^3, find the total surface area of the cylinder.

Ans. : Given data is as follows

$\frac{\mathrm{r}}{\mathrm{h}} = \frac{2}{3}$

Volume of the cylinder = 1617cm^3

We have to find the total surface area of this cylinder

It is given that $\frac{\mathrm{r}}{\mathrm{h}} = \frac{2}{3}$

Therefore $\mathrm{h} = \frac{3}{2}\mathrm{r}$

Volume of the cylinder $= \pi \mathrm{r}^2 \mathrm{h}$

Therefore, $= \pi \mathrm{r}^2 \mathrm{h} = 1617$

$\frac{22}{7}\mathrm{r}^2 \times \frac{3}{2} \times \mathrm{r}$

$= 1617\left(\mathrm{As\ h} = \frac{3}{2}\mathrm{r}\right)$

$\mathrm{r} = 7$

So, $\mathrm{h} = \frac{3}{2} \times 7 = \frac{21}{2}$

Therefore,

Total surface area $= 2\pi \mathrm{rh} + 2\pi \mathrm{r}^3$

$= 2\pi \mathrm{r}\left(\mathrm{h} + \mathrm{r}\right)$

$= 2 \times \frac{22}{7} \times 7\left(\frac{21}{2}\right) + 7$

$= 770\mathrm{cm}^2$

$\mathrm{T.S.A} = 770\mathrm{cm}^2$

126. If the radius and slant height of a cone are in the ratio 7 : 13 and its curved surface area is $286\mathrm{cm}^2$, find its radius.

Ans. : It is given that the curved surface area (C.S.A) of the cone is $286\mathrm{cm}^2$ and that the ratio between the base radius and the slant height is 7 : 13. The formula of the curved surface area of a cone with base radius 'r' and slant height 'l' is given as:

Curved Surface Area $= \pi \mathrm{rl}$

Since only the ratio between the base radius and the slant height is given, we shall use them by introducing a constant 'k'

So, r = 7k

l = 13k

Substituting the values of C.S.A, base radius, slant height and using $\pi = \frac{22}{7}$ in the above equation,

Curved Surface Area, $286 = \frac{(22).(7\mathrm{k}).(13\mathrm{k})}{7}$

286 = $286k^2$

1 = k^2

Hence the value of k = 1

From this we can find the value of base radius,

r = 7k

r = 7

Therefore the base radius of the cone is 7cm.

127. The circumference of the base of a 10m height conical tent is 44m, calculate the length of canvas used in making the tent if width of canvas is 2m $\left(\text{Use } \pi = \frac{22}{7}\right)$.

Ans. : We know that

C.S.A of cone $= \pi \mathrm{rl}$

Given circumference $= 2\pi \mathrm{r}$

$\Rightarrow 2 \times \frac{22}{7} \times \mathrm{r} = 44$
$\Rightarrow \frac{\mathrm{r}}{7} = 1$
$\Rightarrow \mathrm{r} = 7\mathrm{m}$

Therefore

$\mathrm{l} = \sqrt{\mathrm{r}^2 + \mathrm{h}^2}$
$\mathrm{l} = \sqrt{7^2 + 10^2}$
$\mathrm{l} = \sqrt{149}\mathrm{m}$

Therefore C.S.A of tent $= \pi \mathrm{rl}$

$= \frac{22}{7} \times 7 \times \sqrt{149}$
$= 22\sqrt{149}$

Therefore the length of canvas used in making the tent

$= \frac{\text{Area of canvas}}{\text{Width of canvas}}$
$= \frac{22}{2\sqrt{149}}$
$= \frac{11}{\sqrt{149}}$
$= 134.2\mathrm{m}$
$= \frac{22}{7} \times 24 \times 26$
$= \frac{1378}{7}\mathrm{m}^2$

Cost of 1m^2 canvas = Rs 70

Cost of $\frac{1378}{7}\mathrm{m}^2$ canvas $\mathrm{Rs.} = \frac{1378}{7} \times 70$

$\mathrm{Rs.} = 1,37,280$

Thus the cost of canvas required to make the tent is Rs. 1,37,280.

128. The radius and the height of a right circular cone are in the ratio 5 : 12. If its volume is 314 cubic meter, find the slant height and the radius. (Use $\pi = 3.14$).

Ans. : Let us assume the ratio to be y

Radius (r) = 5y

Height (h) = 12y

We know that:

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

$= 5y^2 + 12y^2$

$= 25y^2 + 144y^2$

$= 169^2 = 13y$

Now it is given that volume = 314m^3

$\Rightarrow \frac{1}{3}\pi \mathrm{r}^2\mathrm{h} = 314\mathrm{m}^3$
$\Rightarrow \frac{1}{3} \times 3.14 \times 25\mathrm{y}^2 \times 12\mathrm{y} = 314\mathrm{m}^3$
$\Rightarrow \mathrm{y}^3 = 1$
$\Rightarrow \mathrm{y} = 1$

Therefore,

Slant height (l) = 13y = 13m

Radius = 5y = 5m

129. What length of tarpaulin 4m wide will be required to make a conical tent of height 8m and base radius 6m? Assume that the extra length of material will be required for stitching margins and wastage in cutting is approximately 20cm. $(\text{Use } \pi = 3.14)$

Ans. : Given that,

Height of conical tent (h) = 8m

Radius of base of tent (r) = 6m

Slant height (l)

$(\mathrm{l}) = \sqrt{\mathrm{r}^2 + \mathrm{h}^2}$

$= \sqrt{8^2 + 6^2}$

$= \sqrt{100} = \sqrt{10}\mathrm{m}$

C.S.A of conical tent $= \pi \mathrm{rl}$

= (3.14 × 6 × 10)m^2 = 188.4m^2

Let the length of tarpaulin sheet required be l

As 20cm will wasted, so effective

Length will be (l - 0.2m)

Breadth of tarpaulin = 3m

Area of sheet = C.S.A of sheet

[l × 0.2 × 3]m = 188.4m^2 = l - 0.2m = 62.8m

Accounting extra for wastage:

⇒ l = 63m

Thus the length of the tarpaulin sheet will be = 63m

130. A right angled triangles of which the sides containing the right angle are 6.3cm and 10cm in length, is made to turn round on the longer side. Find the volume of the solid, thus generated. Also, find its curved surface area.

Ans. : It is given that:

Radius of cone(r) = 6.3cm

Height of the cone (h) = 10cm

We know that

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

$= \mathrm{l} = \sqrt{6.3^2 + 10^2} = 11.819\mathrm{cm}$

Therefore Volume of cone (v) $= \frac{1}{3}\pi \mathrm{r}^2\mathrm{h}$

$= \frac{1}{3} \times 3.14 \times 6.3^2 \times 10 = 415.8\mathrm{cm}^3$

Curved surface area of cone $= \pi \mathrm{rl}$

$= 3.14 \times 6.3 \times 11.819 = 234.01\mathrm{cm}^2$

131. A measuring jar of internal diameter 10cm is partially filled with water. Four equal spherical balls of diameter 2cm each are dropped in it and they sink down in water completely. What will be the change in the level of water in the jar?

Ans. : Given that,

Diameter of jar = 10cm

Radius of jar = 5cm

Let the level of water be raised by h

Diameter of the spherical bowl = 2cm

Radius of the ball = 1cm

Volume of jar = 4 (Volume of spherical ball)

$\pi r_1^2 r = 4\left(\frac{4}{3}\pi r_2^3\right)$

$r_1^2 h = 4\left(\frac{4}{3} r_2^3\right)$

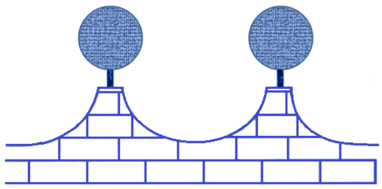
$5 \times 5 \times h = 4 \times \frac{4}{3} r_2^3$

$5 \times 5 \times h = 4 \times \frac{4}{3} \times 1 \times 1 \times 1$

$h = \frac{4 \times 4 \times 1}{3 \times 5 \times 5}$

Height of water in jar $= \frac{16}{75}$cm.

132. The front compound wall of a house is decorated by wooden spheres of diameter 21cm, placed on small supports as shown in the Fig. Eight such spheres are used for this purpose, and are to be painted silver. Each support is a cylinder of radius 1.5cm and height 7cm and is to be painted black. Find the cost of paint required if silver paint costs 25 paise per cm^2 and black paint costs 5 paise per cm^2.



Ans. : Wooden sphere radius $= \frac{21}{2} = 10.5$cm

Surface area of a wooden sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times (10.5)^2 = 1386 cm^2$

Radius r of cylindrical support = 1.5cm

Height h of cylindrical support = 7cm

Curved surface area of cylindrical support $= 2\pi rh = 2 \times \frac{22}{7} \times 1.5 \times 7 = 66 cm^2$

Area of circular end of cylindrical support $= \pi r^2 = \frac{22}{7} \times (1.5)^2 = 7.07 cm^2$

Area to be painted silver = 8(1386 - 7.07)cm^2

= 8(1378.93)cm^2

= 11031.44cm^2

Cost occurred in painting silver colour = (11034.44 × 0.25) = Rs. 2757.86

Area to be painted black = (8 × 66)cm^2 = 528cm^2

Cost occurred in painting black colour = (528 × 5.05) = Rs. 26.40

Therefore total cost in painting = Rs.2757.86 + Rs. 26.40

= Rs. 2784.26

133. It costs ₹ 3300 to paint the inner curved surface of a cylindrical vessel 10m deep at the rate of ₹ 30 per m^2. Find the:

i. Inner curved surface area of the vessel.
ii. Inner radius of the base.
iii. Capacity of the vessel.

Ans. :
i. Cost of painting inner curved surface area of vassel
= Cost of painting per m^2 × Inner curved surface of vessel
⇒ ₹ 3300 = ₹ 30 × Inner curved surface of vessel
⇒ Inner curved surface of vessel = $110m^2$
ii. Let inner radius of the base = r
Depth, h = 10m
Inner curved surface of vessel $= 2\pi \mathrm{rh}$
$\Rightarrow 10 = 2 \times \frac{22}{7} \times \mathrm{r} \times 10$
$\Rightarrow \mathrm{r} = \frac{110 \times 7}{2 \times 22 \times 10} = 1.75\mathrm{m}$
iii. Capacity of the vessel $= \pi \mathrm{r}^2 \mathrm{h}$
$= \left(\frac{22}{7} \times 1.75 \times 1.75 \times 10\right)\mathrm{m}^3$
$= 96.25\mathrm{m}^3$

134. Water flows at the rate of 10 metres per minute through a cylindrical pipe 5mm in diameter. How long would it take to fill a conical vessel whose diameter art the surface 40cm and depth 24cm?

Ans. : Diameter of the pipe = 5mm = 0.5cm
Radius of the pipe $= \frac{0.5}{2} = 0.25\mathrm{cm}$
Length of the pipe = 10 metres = 1000cm
Volume that flows in 1 min $= \left[\pi \times (0.25)^2 \times 1000\right]\mathrm{cm}^3$
∴ Volume of the conical vessel $= \left[\frac{1}{3}\pi \times (20)^2 \times 24\right]\mathrm{cm}^3$
∴ Required time $= \left[\frac{\frac{1}{3}\pi \times (20)^2 \times 24}{\pi \times (0.25)^2 \times 1000}\right]\mathrm{min}$
$= \left[\frac{\frac{1}{3} \times 400 \times 24}{\pi \times 0.0625 \times 1000}\right]\mathrm{min}$
$= 51.2 \text{ min}$
$= 51 \text{ min } 12 \text{ sec}$

135. Water in a canal, 30dm wide and 12dm deep, is flowing with a velocity of 20km per hour. How much area will it irrigate, if 9cm of standing water is desired?

Ans. : Width of the canal = 30dm = 3m (1m = 10dm)
Depth of the canal = 12dm = 1.2m
Speed of the water flow = 20km/h = 20000m/h
∴ Volume of water flowing out of the canal in 1h = 3 × 1.2 × 20000 = $72000m^3$
Height of standing water on field - 9cm - 0.09m (1m - 100cm)
Assume that water flows of the canal for 1h. Then,

Area of the field irrigated

$= \frac{\text{Volume of water flowing out of the canal}}{\text{Height of standing water on the field}}$

$= \frac{72000}{0.09}$

$= 800000\mathrm{m}^2$

$= \frac{800000}{10000}\left(1 \text{ hectare} = 1000\mathrm{m}^2\right)$

$= 80 \text{ hectare}$

Thus, the area of the field irrigated is 80hectares.

Disclaimer: In this question time is not given, so the question is solved assuming that the water flows out of the canal for i hour.

136. Each edge of a cube is increased by 50%. Find the percentage increase in the surface area of the cube.

Ans. : Let the initial edge of the cube be a units.

$\therefore$ Initial surface area of the cube = $6a^2$ square units

New edge of the cube = a + 50% of a $= \mathrm{a} + \frac{50}{100}\mathrm{a} = 1.5\mathrm{a}$ units

$\therefore$ New surface of the cube = $6(1.5a)^2 = 13.5a^2$ square units

Increase in surface area of the cube = $13.5a^2 - 6a^2 = 7.5a^2$ square units

$\therefore$ Percentage increase in the surface area of the cube

$= \frac{\text{Increase in surface area of the cube}}{\text{Initial surface area of the cube}} \times 100\%$

$= \frac{7.5\mathrm{a}^2}{6\mathrm{a}^2} \times 100\%$

$= 125\%$

137. A cylindrical bucket, 28cm in diameter and 72cm and high, is full of water. The water is emptied into a rectangular tank, 66cm long and 28cm wide. Find the height of the water level in the tank.

Ans. : Here, cylindrical bucket has diameter = 28cm.

$\therefore$ radius $= \left(\frac{28}{2}\right)\mathrm{cm} = 14\mathrm{cm}$ and height = 72cm.

Length of the tank = 66cm

Breadth of the tank = 28cm

$\therefore$ Volume of the tank = Volume of cylindrical bucket

$\Rightarrow \mathrm{l} \times \mathrm{b} \times \mathrm{h} = \pi \mathrm{r}^2\mathrm{h}$

$\Rightarrow 66 \times 28 \times \mathrm{h} = \frac{22}{7} \times 14 \times 14 \times 72$

$\Rightarrow \mathrm{h} = \left(\frac{22\times2\times14\times72}{66\times28}\right)\mathrm{cm}$

$\Rightarrow \mathrm{h} = 24\mathrm{cm}.$

$\therefore$ The height of the water level in the tank = 24cm.

138. A man uses a piece of canvas having an area of $551\mathrm{m}^2$, to make a conical tent of base radius 7m. Assuming that all the stitching margins and wastage incurred while cutting, amount to approximately $1\mathrm{m}^2$, find the volume of the tent that can be made with it. $\left(\text{Use } \pi = \frac{22}{7}\right)$.

Ans. : Radius of a conical tent, r = 7m

Area of 49 canvas used in making conical tent = (551 - 1)m^2 = 550m^2

⇒ Curved surface areaof a conical tent = 550m^2

$\Rightarrow \pi \mathrm{rl} = 550$

$\Rightarrow \frac{22}{7} \times 7 \times \mathrm{l}$

$\Rightarrow \mathrm{l} = \frac{550}{22} = 25\mathrm{m} = \text{slant height}$

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

⇒ $25^2 = 7^2 + h^2$

⇒ $h^2 = 25^2 - 7^2 = 625 - 49 = 576$

⇒ h = 24m = height

$\therefore$ Volume of conical tent $= \frac{1}{3}\pi \mathrm{r}^2\mathrm{h}$

$= \left(\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24\right)\mathrm{m}^3$

$= 1232\mathrm{m}^3$

*** Answer the following questions. [5 Marks Each]** **[30]**

139. The volume of a right circular cone is $9856\ cm^3$. If the diameter of the base if 28 cm, find:

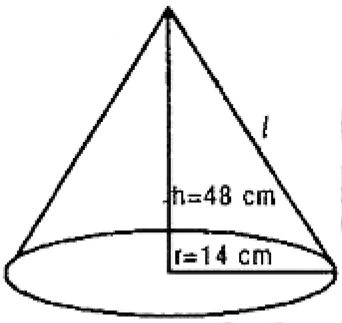
i. Height of the cone
ii. Slant height of the cone
iii. Curved surface area of the cone.

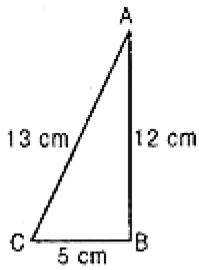
Ans. :

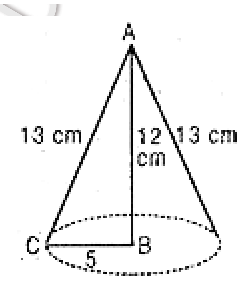
i. Diameter of cone = 28 cm

$\therefore$ Radius of cone = 14 cm

Volume of cone = $9856\ cm^3$







$\Rightarrow \frac{1}{3}\pi r^2 h$ = 9856

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times h = 9856$

$\Rightarrow h = \frac{9856 \times 3 \times 7}{22 \times 14 \times 14}$ = 48 cm

ii. Slant height of cone $(l) = \sqrt{r^2 + h^2}$

$= \sqrt{(14)^2 + (48)^2}$

$= \sqrt{196 + 2304}$

$= \sqrt{2500}$ = 50 cm

iii. Curved surface area of cone = $\pi r l = \frac{22}{7} \times 14 \times 50$=$2200\ cm^2$

140. Mary wants to decorate her Christmas tree. She wants to place the tree on a wooden block covered with coloured paper with picture of Santa Claus on it (see figure). She must know the exact quantity of paper to buy for this purpose. If the box has length, breadth and height as 80 cm, 40 cm and 20 cm respectively, then how many square sheets of paper of side 40 cm would she require?

Ans. : Since mary wants to paste the paper on the outer surface of the box; the quantity of paper required would be equal to the surface area of the box which is of the shape of a cuboid.

The dimensions of the box are:

Length, l = 80 cm, Breadth, b = 40 cm, Height, h = 20 cm.

The surface area of the box = 2(lb + bh + hl)

= 2[(80 $\times$ 40) + (40 $\times$ 20) + (20 $\times$ 80)]

= 2[3200 + 800 + 1600]

= 2 $\times$ 5600 cm^2 = 11200 cm^2

The area of each sheet of the paper = 40 $\times$ 40 = 1600 cm^2

Therefore, number of sheets required = $\frac{surface\ area\ of\ box}{area\ of\ one\ sheet\ of\ paper}$ = $\frac{11200}{1600}$ = 7

141. A sphere and a right circular cylinder of the same radius have equal volumes. By what percentage does the diameter of the cylinder exceed its height?

Ans. : Let the radius of sphere = r = Radius of a right circular cylinder

According to the question,

Volume of cylider = Volume of a sphere

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

$\because$ Diameter of the cylinder = 2r

$\therefore$ Increased diameter from hight of the cylinder $= 2r - \frac{4r}{3} = \frac{2r}{3}$

Now, percentage increase in diameter of the cylinder $= \frac{\frac{2r}{3} \times 100}{\frac{4}{3} r} 50\%$

Hence, the diameter of the cylinder exceeds its height by 50%.

142. A cloth having an area of 165m^2 is shaped into the form of a conical tent of radius 5m

i. How many students can sit in the tent if a student, on an average, occupies $\frac{5}{7}\mathrm{m}^2$ on the ground?

ii. Find the volume of the cone.

Ans. :

i. Given, radius of the base of a conical tent = 5m

And area needs to sit a student on the ground $=\frac{5}{7}\mathrm{m}^2$

$\therefore$ Area of the base of a conical tent $=\pi\mathrm{r}^2$

$=\frac{22}{7}\times 5\times 5\mathrm{m}^2$

Now, $\text{number of student}=\frac{\text{Area of the base of a conical tent}}{\text{Area needs to sit a student on ground}}$

$=\frac{\frac{22\times5\times5\mathrm{m}^2}{7}}{\frac{5}{7}}=\frac{22}{7}\times5\times5\times\frac{7}{5}=110$

Hence, 110 students can sit in the conical tent.

ii. Given, area of the cloth to from a conical tent = 165m^2

Radius of the base of a conical tent, r = 5m

Curved surface area of a conical tent = Area of cloth to from a conical tent

$\Rightarrow \pi\mathrm{rl}=165$

$\Rightarrow \frac{22}{7}\times5\times\mathrm{l}=165$

$\therefore \quad \mathrm{l}=\frac{165\times7}{22\times5}=\frac{33\times7}{22}=10.5\mathrm{m}$

Now, height of a conical tent $=\sqrt{\mathrm{l}^2-\mathrm{r}^2}=\sqrt{(10.5)^2-(5)^2}$

$=\sqrt{110.25-25}=\sqrt{8525}=9.23\mathrm{m}$

Volume of a cone (conical tent) $=\frac{1}{3}\pi\mathrm{r}^2\mathrm{h}=\frac{1}{3}\times\frac{22}{7}\times5\times5\times923$

$=\frac{1}{3}\times\frac{1550\times923}{7}=\frac{50765}{7\times3}=241.7\mathrm{m}^3$

Hence, the volume of the cone (conical tent) is 241.7m^3

143. The ratio between the curved surface area and the total surface area of a right circular cylinder is 1 : 2. Find the volume of the cylinder if its total surface area is 616cm^2.

Ans. : Curved surface area $=2\pi\mathrm{rh}$

Total surface area $=2\pi\mathrm{r}(\mathrm{h}+\mathrm{r})$

Since they are in the ratio of 1 : 2

$\therefore \frac{2\pi\mathrm{rh}}{2\pi\mathrm{r}(\mathrm{h}+\mathrm{r})}=\frac{1}{2}$

$\Rightarrow \frac{\mathrm{h}}{\mathrm{h}+\mathrm{r}}=\frac{1}{2}$

$\Rightarrow 2\mathrm{h}=\mathrm{h}+\mathrm{r}$

$\Rightarrow 2\mathrm{h}-\mathrm{h}=\mathrm{r}$

$\Rightarrow \mathrm{h}=\mathrm{r}$

$2\pi\mathrm{r}(\mathrm{h}+\mathrm{r})=616\mathrm{cm}^2$

$\Rightarrow 4\pi\mathrm{r}^2=616\mathrm{cm}^2$ [Putting = r]

$\Rightarrow 4\times\frac{22}{7}\times\mathrm{r}^2=616$

$\Rightarrow \mathrm{r}^2=\frac{616\times7}{88}=49$

$\Rightarrow \mathrm{r} = \sqrt{49} = 7\mathrm{cm}$

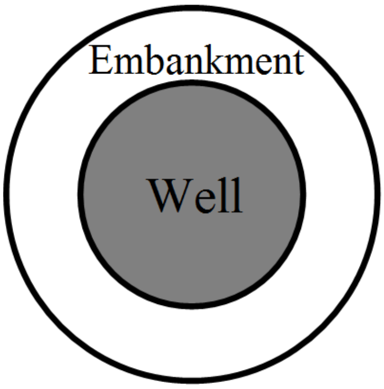
Then, r = 7cm and h = 7cm

$\therefore$ Volume $= \left(\pi \mathrm{r}^2 \mathrm{h}\right)$

$= \left(\frac{22}{7} \times 7 \times 7 \times 7\right)\mathrm{cm}^3 = 1078\mathrm{cm}^3$

$\therefore$ The volume of the cylinder = 1078cm^3.

144. A well with inside diameter 10m is dug 8.4m deep. Earth taken out of it is spread all around it to a width of 7.5m to form an embankment. Find the height of the embankment.



Ans. :

Radius of the well = 5m

Depth of the well = 8.4m

Volume of the earth dug out = Volume of well

$= \left(\frac{22}{7} \times 5 \times 5 \times 8.4\right)\mathrm{m}^3$

$= 660\mathrm{m}^2$

Width of the embankment = 7.5m

External radius of the embankment, R = (5 + 7.5)m = 12.5m

Internal radius of the embankment $= \pi(\mathrm{R}^2 - \mathrm{r}^2)$

$= \left[\frac{22}{7}(12.5^2 - 5^2)\right]\mathrm{m}^2$

$= \left[\frac{22}{7} \times (156.25 - 25)\right]\mathrm{m}^2$

$= \left[\frac{22}{7} \times 131.25\right]\mathrm{m}^2$

$= 412.5\mathrm{m}^2$

Volume of the embankment = Volume of the earth dug out = 660m^2

Height of the embankment $= \frac{\text{Volume of the embankment}}{\text{Area of the embankment}}$

$= \frac{660\mathrm{m}^3}{412.5\mathrm{m}^2}$

$= 1.6\mathrm{m}$

* Case study based questions. [24]

145. Read the passage given below and answer these questions:

Once four friends Rahul, Arun, Ajay and Vijay went for a picnic at a hill station. Due to peak season, they did not get a proper hotel in the city. The weather was fine so they decided to make a conical tent at a park. They were carrying 300m^2 cloth with them. As shown in the figure they made the tent with height 10m and diameter 14m. The remaining cloth was used for the floor.

i. How much Cloth was used for the floor?
   a. 31.6m^2
   b. 16m^2
   c. 10m^2
   d. 20m^2

ii. What was the volume of the tent?
   a. 300m^3
   b. 160m^3
   c. 513.3m^3
   d. 500m^3

iii. What was the area of the floor?
   a. 50m^2
   b. 100m^2
   c. 150m^2
   d. 154m^2

iv. What was the total surface area of the tent?
   a. 400m^2
   b. 422.4m^2
   c. 300m^2
   d. 400m^2

v. What was the latent height of the tent?
   a. 12m
   b. 12.2m
   c. 15m
   d. 17m

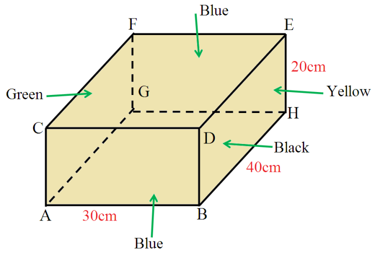
Ans. :

(i)	(a)	31.6m^2
(ii)	(c)	513.3m^3
(iii)	(d)	154m^2
(iv)	(b)	422.4m^2
(v)	(b)	12.2m

146. Read the Source/ Text given below and answer any four questions:

Veena planned to make a jewellery box to gift her friend Reeta on her marriage. She made the jewellery box of wood in the shape of a cuboid. The jewellery box has the dimensions as shown in the figure below. The rate of painting the exterior of the box is Rs. 2 per cm^2. After making the box she took help from his friends to decorate the box.

The blue colour was painted by Deepak, Black by Suresh, green by Harsh and the yellow was painted by Naresh.



i. What is the volume of the box?
   a. $24000cm^3$
   b. $1200cm^3$
   c. $800cm^3$
   d. $600cm^3$

ii. How much area did Suresh paint?
   a. $24000cm^2$
   b. $1200cm^2$
   c. $800cm^2$
   d. $600cm^2$

iii. How much area did Deepak paint?
   a. $24000cm^2$
   b. $600cm^2$
   c. $800cm^2$
   d. $1200cm^2$

iv. What amount did Harsh charge?
   a. Rs. 800
   b. Rs. 1200
   c. Rs. 1600
   d. Rs. 2000

v. What amount did Veena pay for painting:
   a. Rs. 2600
   b. Rs. 5200
   c. Rs. 5000
   d. Rs. 6000

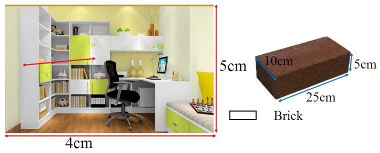
Ans. :

(i)	(a)	$24000cm^3$
(ii)	(b)	$1200cm^2$
(iii)	(d)	$1200cm^2$
(iv)	(c)	Rs. 1600
(v)	(b)	Rs. 5200

147. Read the passage given below and answer any four questions:

Sohan's house has one bedroom hall with kitchen. His son needed a separate room for study. Thus Sohan planned to construct a new room with length 4m, width 2m and the height 3m as shown in the following figure.

The room was separate at the roof of the house. The dimensions of the bricks used are: 25cm × 10cm × 5cm.



i. Total how many bricks will be required? ($1m^3 = 1000000cm^3$):
   a. 30000
   b. 40000
   c. 28800
   d. 27000

ii. How many bricks will be used on both walls along the length (length = 4m)?
   a. 19200
   b. 20200
   c. 18800
   d. 17000

iii. How many bricks will be used on both walls along the width (width = 3m)?
   a. 19200
   b. 9600
   c. 10000
   d. 15000

iv. What is the volume of the room?
   a. $24m^3$
   b. $12m^3$
   c. $20m^3$
   d. $15m^3$

v. What is the area of the floor?
   a. $10m^2$
   b. $12m^2$
   c. $8m^2$
   d. $8m^3$

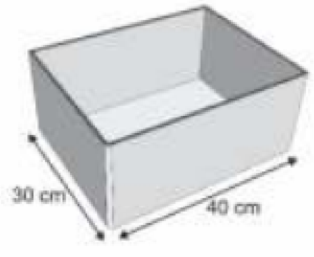
Ans. :

(i)	(c)	28800
(ii)	(a)	19200
(iii)	(b)	9600
(iv)	(a)	$24m^3$
(v)	(c)	$8m^2$

148. Raju designs a hut for homeless people. The hut is a combination of a cuboid and a right cone. The top of the hut is a cone with radius 4 m and height 1 m. It is made of economical material. The loor of the tent is covered with rugs.
The total height of the tent is 4.5 m. The cuboidal part of the tent is 6 m long and 5 m wide.
1. What is the outer surface area (in m^2) of the hut?
 A. 77
 B. $77+4\pi\sqrt{17}$
 C. $137+4\pi\sqrt{17}$
 D. $137+4\pi(4+\sqrt{17})$
2. The length and width of a rug used for the loor are 2.6 m and 2 m respectively.
What is the minimum number of rugs required to cover the loor of the tent house?

Ans. : 1. B. $77+4\pi\sqrt{17}$
2. 5
5 rugs
6
6 rugs

149. A company manufactures wooden boxes. Given below is the picture of an open wooden box.



The height of the box is 25 cm.

7. What is the surface area (in cm^2) of the box?

A. 3500
B. 4700
C. 5900
D. 30000

8. A shopkeeper store cubes in it.
The side length of one cube is 9 cm.
What would be the maximum number of cubes the shopkeeper can store in a box? (All cubes should be inside the box.)

9. Rajan packs a football into a cubical cardboard box. The radius of the football is 11 cm.
Rajan keeps a margin of 1 cm from all the sides of the box while packing.
What is the side length of the cardboard box?

A. 11 cm
B. 20 cm
C. 22 cm
D. 24 cm

Ans. : 7. B. 4700
8. 41 (30x40x25)/(9x9x9)= 41.15 . Exact answer = 41 as all cubes should it in it)
9. D. 24 cm

150. This is the picture of an ice-cream cone.

The radius of the cone is 4 cm and the height is 15 cm.

An ice-cream seller keeps 1/4of it empty.

10. What is the volume (in cm^3) of the empty part of the cone?

A. 12π

B. 15π

C. 19π

D. 20π

Ans. : 10. D. 20π

----- "Our greatest glory is not in never falling, but in rising every time we fall." -----