Important Questions for Class 9

Mathematics

Chapter 13 – Surface Areas and Volumes

Very Short Answer Questions. 1 Mark

1. If the perimeter of one of the faces of a cube is 40 cm, them its volume is

(a) 6000 cm^3

(b) 1600 cm^3

(c) 1000 cm^3

(d) 600 cm^3

Ans: (c) 1000 cm^3

The side of the one face of cube $=40\text{ cm}=4\text{a}$

$$\text{a}=\frac{40\text{ cm}}{4}=10\text{ cm}$$

Volume of the cube is $V=a^3$

$\text{V}=\text{a}\times\text{a}\times\text{a}$

$=10\times10\times10$

$=1000\text{ cm}^3$

2. A cuboid having surface areas of 3 adjacent faces as a, b and c has the volume

(a) $3\sqrt{abc}$

(b) $\sqrt{abc}$

(c) abc

(d) $a^3b^3c^3$

Ans: (b) $\sqrt{abc}$

Let length, width and height of cuboid be w and h respectively

Considering adjacent faces: AEHD, DHGC and EFGH

Let area of $\text{AEHD} = a$, area of $\text{DHGC} = b$ and area of $\text{EFGH} = c$

Also, area of $\text{AEHD} = lw$

Area of $\text{DHGC} = wh$

Area of $\text{EFGH} = lh$

Therefore, $lw = a, wh = b$ and $lh = c$

$\Rightarrow lw \times wh \times lh = a \times b \times c$

$\Rightarrow l^2w^2h^2 = abc$

$\Rightarrow (lwh)^2 = abc$

$\Rightarrow V^2 = abc$

$\Rightarrow V = \sqrt{abc}$

Volume of cuboid is $V = \sqrt{abc}$

3. The diameter of a right circular cylinder is $21\,\text{cm}$ and its height is $8\,\text{cm}$. The Volume of the cylinder is

(a) $528\ \text{cm}^3$

(b) $1056\ \text{cm}^3$

(c) $1386\ \text{cm}^3$

(d) $2772\ \text{cm}^3$

Ans: (d) 2772 cm^3

Diameter of Cylinder $= 21\text{ cm}$.

Height $= 8\text{ cm.}$

Radius of Sphere $= \frac{D}{2}$

Volume of Cylinder $= \left(\pi r^2 h\right)$

$$V = (\pi)(\frac{21}{2})^2 \times 8$$

$$= \pi \cdot \left(\frac{21}{2}\right)^2 \cdot 8$$

$$= 2770.88472\text{ cm}^3$$

$$V = 2772\text{ cm}^3$$

Volume of right circular cylinder is

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

(a) 40

(b) 96

(c) 160

(d) 240

Ans: (b) 96

Let the edge of the cube be equal to 'a' units.

Thus, the initial surface area $(A_1) = a^2 units^2$

Now, the edge of the cube increases by 40%

The new edge length $= a + 40\%$ of $a = 1.4a$.

Thus, the final surface area $(A_2) = (1.4a)^2 = 1.96a^2$ units ^{2}

Percentage change $= [(A_2 - A_1)/(A_1)] \times 100 = \left[\frac{\left(1.96a^2 - a^2\right)}{\left(a^2\right)}\right] \times 100$

$= 0.96 \times 100$

$= 96\%$

5. Find the curved (lateral) surface area of each of the following right circular cylinders:

(a) $2\pi rh$

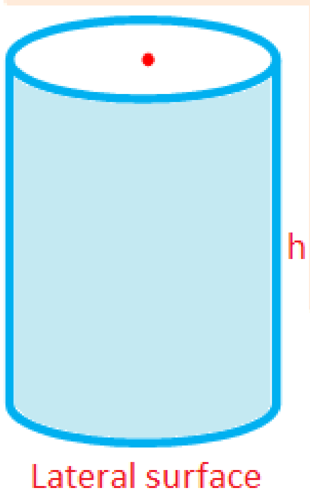
(b) πrh

(c) $2\pi r(r+h)$

(d) None of these

Ans: (a) $2\pi rh$

Lateral Surface Area or Curved Surface Area of a Right Circular Cylinder



= (Perimeter of the Cross Section) × Height

$= 2\pi rh$

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

(a) 20%

(b) 40%

(c) 54%

(d) 72.8%

Ans: (d) 72.8%

Volume $= \pi r^2 h$

new radius $= r + \frac{20}{100}\text{r}$

$= \frac{5}{6}\text{r}$

So

$= \text{h} + \frac{20}{100}\text{h} = \frac{6}{5}\text{h}$

Volume $= \pi \left(\frac{6\text{r}}{5}\right)^2 \left(\frac{6}{5}\text{h}\right)$

$= \frac{216}{125}\pi \text{r}^2 \text{ h}$

$\therefore$ Increase in

Volume $= \frac{216}{125}\pi \text{r}^2 \text{ h}$

$= 72.8\%$

7. A well of diameter 8 meters has been dug to the depth of $21\,\text{m}$. the volume of the earth dug out is

(a) $1056\,\text{cu m}$

(b) 352cum

(c) 1408cum

(d) 4224cum

Ans: (a) 1056m^3

Volume of the well is $V = \pi r^2 h$

$V = \pi \times 4 \times 4 \times 21$

$= 1056\text{m}^3$

8. The radius of a cylinder is doubled and the height remains the same. The ratio between the volumes of the new cylinder and the original cylinder is

(a) 1: 2

(b) **1: 3**

(c) **1: 4**

(d) **1: 8**

Ans: (c) 1: 4

The radius of a cylinder is doubled and the height remains the same. (Given)

Radius of original cylinder $= \text{r}$

Radius of new cylinder $= 2\text{r}$

Height remains the same.

We know that,

Volume of new cylinder $=\pi(2r)^2 h$

Volume of new cylinder $=4r^2\pi h$

Now

Let ratio of volume be " x ".

Ratio of volume = Volume of new cylinder / Volume of original cylinder

[Put the values]

$x=4r^2\pi h/r^2\pi h$

$\mathrm{x}=4r^2/\mathrm{r}^2$

$x=4/1$

The ratio between the volumes of the new cylinder and original cylinder is **[1:4.\]**

9. Length of diagonals of a cube of side a cm is

(i) $\sqrt{2}a$ cm

(ii) $\sqrt{3}a$ cm

(iii) $\sqrt{3a}$ cm

(iv) 1cm

Ans: (ii) $\sqrt{3}a$ cm

Diagonal of a Cube $=\sqrt{3}x$

Where is the cube side.

10. Surface area of sphere of diameter $14\,\text{cm}$ **is**

(i) $616\ \text{cm}^2$

(ii) $516\ \text{cm}^2$

(iii) 400Cm^2

(iv) $2244\ \text{cm}^2$

Ans: (i) $616\ \text{cm}^2$

Given Diameter of sphere $=14\ \text{cm}$ radius $=7\ \text{cm}$

Surface area of sphere $=4\pi \text{r}^2=4\pi(7)^2\ =4\times3.14\times49$

Surface area of sphere $=616\ \text{cm}^2$

11. Surface area of bowl of radius $\mathbf{r\ cm}$ is

(i) $4\pi r^2$

(ii) $2\pi r^2$

(iii) $3\pi r^2$

(iv) πr^2

Ans: (iii) $3\pi r^2$

The area of a circle of radius r is πr^2

Thus if the hemisphere is meant to include the base then the surface area is $2\pi \text{r}^2+\pi \text{r}^2=3\pi r^2$

12. Volume of a sphere whose radius $7\ \text{cm}$ is

(i) $1437\frac{1}{3}\ \text{cm}^3$

(ii) $1337\frac{1}{3}\ \text{cm}^3$

(iii) $1430\ \text{cm}^3$

(iv) $1447\ \text{cm}^3$

Ans: (i) $1437\frac{1}{3}\ \text{cm}^3$

Radius $= 7\ \text{cm}$

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

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

$= \left(\frac{4}{3} \times 22 \times 1 \times 7 \times 7\right) \text{cm}^3$

$= \frac{4312}{3}\ \text{cm}^3$

$= 1437.33\ \text{cm}^3$

13. The curved surface area of a right circular cylinder of height $14\ \text{cm}$ is $88\ \text{cm}^2$. find the diameter of the base of the cylinder

(i) $1\ \text{cm}$

(ii) $2\ \text{cm}$

(iii) $3\ \text{cm}$

(iv) $4\ \text{cm}$

Ans: (ii) $2\ \text{cm}$

Given, The height of cylinder $= 14\ \text{cm}$ and, the curved surface area of cylinder $= 88\ \text{cm}^2$

The curved surface area of cylinder $= 2\pi \text{rh}$ and $2\text{r} = \text{d}$

Here, $r =$ radius of cylinder, $d =$ diameter of cylinder and

$h =$ height of cylinder

So, the curved surface area of cylinder $= \pi dh = 88\ cm^2$

$\pi \times d \times 14 = 88$

$3.14 \times d \times 14 = 88$

$d = 2\ cm$

So, the diameter of the cylinder is $2\ cm$.

14. Volume of spherical shell

(i) $\frac{2}{3}\pi r^3$

(ii) $\frac{3}{4}\pi r^3$

(iii) $\frac{4}{3}\pi\left[R^3 - r^3\right]$

(iv) none of these

Ans: (iii) $\frac{4}{3}\pi\left[R^3 - r^3\right]$

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

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

Total net volume between both the spheres $= \frac{4}{3}\pi\left(R^3 - r^3\right)$

15. The area of the three adjacent faces of a cuboid are x, y, z. Its volume is V, then

(i) $V = xVZ$

(ii) $V^2 = xyz$

(iii) $V = x^2y^2z^2$

(iv) none of these

Ans: (ii) $V^2 = xyz$

Let the 3 dimensions of the cuboid be l, b and h so,

$x = lb$

$y = bh$

$z = hl$

Multiplying above three equations,

$xyz = lb \times bh \times hl$

$= l^2 \mathbf{b}^2 h^2$

As,

$V = lbh$

So,

$V^2 = l^2 b^2 h^2$

$V^2 = xyz$

16. A conical tent is $10\,m$ high and the radius of its base is $24\,m$ then slant height of the tent is

(i) 26

(ii) 27

(iii) 28

(iv) 29

Ans: (i) 26

Height (h) of conical tent $=10\text{ m}$

Radius (r) of conical tent $=24\text{ m}$

Let the slant height of the tent be l

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

$l^2 = (10)^2 + (24)^2$

$l^2 = 100 + 576$

$l^2 = 676$

$l = \sqrt{676}$

$l = \sqrt{26^2}$

$l = 26\text{ m}$

Therefore, the slant height of the tent is 26 m.

17. Volume of hollow cylinder

(i) $\pi\left(R^2 - r^2\right)h$

(ii) $\pi R^2 h$

(iii) $\pi r^2 h$

(iv) $\pi r^2\left(h_1 - h_2\right)$

Ans: (i) $\pi\left(R^2 - r^2\right)h$

The formula to calculate the volume of a hollow cylinder is given as,

Volume of hollow cylinder $=\pi\left(\mathbf{R}^2-\mathbf{r}^2\right)\mathbf{h}$ cubic units,

where, R is the outer radius, ' r ' is the inner radius, and, ' h ' is the height of the hollow cylinder.

18. Diameter of the base of a cone is $10.5\,\text{cm}$ and its slant height is $10\,\text{cm}$. then curved surface area.

(i) $155\,\text{cm}^2$

(ii) $165\,\text{cm}^2$

(iii) $150\,\text{cm}^2$

(iv) none of these

Ans: (ii) $165\,\text{cm}^2$

Diameter of the base of the cone is $10.5\,\text{cm}$ and slant height is $10\,\text{cm}$.

Curved surface area of a right circular cone of base radius, **\['r'\]**and slant height,

l

is πr.

Diameter, $d=10.5\,\text{cm}$

Radius, $r=10.5/2\,\text{cm}=5.25\,\text{cm}$

Slant height, $l=10\,\text{cm}$

Curved surface area $=\pi\text{rl}$

$=3.14\times5.25\times10=165\,\text{cm}^2$

Thus, curved surface area of the cone $=165\,\text{cm}^2$.

19. The surface area of a sphere of radius $5.6\,\text{cm}$ **is**

(i) $96.8\pi \text{cm}^2$

(ii) $94.08\pi \text{cm}^2$

(iii) $90.08\pi \text{cm}^2$

(iv) none of these

Ans: (ii) $94.08\pi \text{cm}^2$

Given radius of sphere $=5.6\,\text{cm}$

Surface area of sphere $=4\pi \text{r}^2$

$=4\times 3.14\times (5.6)^2$

Surface area of sphere $=393.88\,\text{cm}^2$

20. The height and the slant height of a cone are $21\,\text{cm}$ **and** $28\,\text{cm}$ **respectively then volume of cone**

(i) $7556\,\text{cm}^3$

(ii) $7646\,\text{cm}^3$

(iii) $7546\,\text{cm}^3$

(iv) None of these

Ans: (c) $7546\,\text{cm}^3$

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

Given

Slant height $=l=28\,\text{cm}$

Height of cone $=\text{h}=21\,\text{cm}$

Let radius of cone $= \text{r cm}$

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

$28^2 = 21^2 + r^2$

$28^2 - 21^2 = r^2$

$r^2 = 28^2 - 21^2$

$r^2 = (28-21)(28+21)$

$r^2 = (7)(49)$

$r = \sqrt{7(49)}$

$r = \sqrt{7(7)^2}$

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

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

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

$= 22 \times 7\sqrt{7} \times 7\sqrt{7}\text{ cm}^3$

$= 22 \times 7 \times 7 \times (\sqrt{7})^2\text{ cm}^3$

$= 22 \times 7 \times 7 \times 7\,\text{cm}^3$

$= 7546\,\text{cm}^3$

2. The length, breadth and height of a room are $5\text{m}, 4\text{m}$ **and** 3m **respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of Rs. 7.50 per** m^2

Ans. Given: Length $(l) = 5\text{m}$, Breadth $(b) = 4\text{m}$ and Height $(h) = 3\text{m}$

$\because$ Area of the four walls = Lateral surface area $= 2(bh + hl) = 2h(b + l)$

$= 2 \times 3(4 + 5)$

$= 2 \times 9 \times 3 = 54\,\text{m}^2$

Area of ceiling $= l \times b = 5 \times 4 = 20\,\text{m}^2$

$\therefore$ Total area of walls and ceiling of the room $= 54 + 20 = 74\,\text{m}^2$

Now cost of white washing for $1m^2 =$ Rs. 7.50

$\therefore$ Cost of white washing for $74\,\text{m}^2 = 74 \times 7.50 =$ Rs. 555

3. The floor of a rectangular hall has a perimeter $250\,\text{m}$. If the cost of painting the four walls at the rate of Rs. 10 per m^2 is Rs. 15000, find the height of the hall.

Ans. Given: Perimeter of rectangular wall $= 2(l + b) = 250\,\text{m}$. …….(i)

Now Area of the four walls of the room

$$= \frac{\text{Total cost to paint walls of the room}}{\text{Cost to paint } 1\text{m}^2 \text{ of the walls}}$$

$= \frac{15000}{10} = 1500\,\text{m}^2$……… (ii)

Area of the four walls = Lateral surface area $= 2(bh + hl) = 2h(b + l) = 1500$

$\Rightarrow 250 \times h = 1500$

$\Rightarrow h = \frac{1500}{250} = 6\,\text{m}$

Hence required height of the hall is $6\,\text{m}$.

4. The paint in a certain container is sufficient to paint an area equal to 9.375m^2. How many bricks of dimensions $22.5\text{cm}\times10\text{cm}\times7.5\text{cm}$ can be painted out of this container?

Ans. Given: Length of the brick $(l)=22.5\text{cm}$, Breadth $(b)=10\text{cm}$ and Height $(h)=7.5\text{m}$

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

$=2(22.5\times10+10\times7.5+7.5\times22.5)$

$=2(225+75+468.75)$

$=937.5\text{cm}^2$

$=0.09375m^2$

Now No. of bricks to be painted

$=\dfrac{\text{Total area to be painted}}{\text{Area of one brick}}$

$=\dfrac{9.375}{0.09375}=100$

Hence 100 bricks can be painted.

5. A cubical box has each edge 10cm and a cuboidal box is 10cm wide, 12.5cm long and 8cm high.

(i) Which box has the greater lateral surface area and by how much?

Ans. (i) Lateral surface area of a cube $=4(\text{ side })^2=4\times(10)^2=400\text{cm}^2$

Lateral surface area of a cuboid $=2h(l+b)=2\times8(12.5+10)$

$=16\times22.5=360\text{cm}^2$

$\therefore$ Lateral surface area of cubical box is greater by $(400-360)=40\,\text{cm}^2$

(ii) Which box has the smaller total surface area and how much?

(ii) Total surface area of a cube $=6(\text{ side })^2=6\times(10)^2=600\,\text{cm}^2$

Total surface area of cuboid $=2(lb+bh+hl)=2(12.5\times10+10\times8+8\times12.5)$

$=2(125+80+100)$

$=2\times305=610\,\text{cm}^2$

$\therefore$ Total surface area of cuboid box is greater by $(610-600)=10\,\text{cm}^2$

6. Praveen wanted to make a temporary shelter for her car, by making a box-like structure with tarpaulin that covers all the four sides and the top of the car (with the front face as a flap which can be rolled up). Assuming that the stitching margins are very small and therefore negligible, how much tarpaulin would be required to make the shelter of height 2.5m with base dimensions $4\text{m}\times3\text{m}$?

Ans. Given: Length of base $(l)=4\text{m}$, Breadth $(b)=3\text{m}$ and Height $(h)=2.5\text{m}$

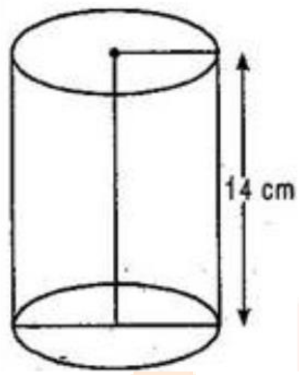
Tarpaulin required to make shelter = Surface area of 4 walls + Area of roof

$=2h(l+b)+lb=2(4+3)2.5+4\times3$

$=35+12=47m^2$

Hence $47\,\text{m}^2$ of the tarpaulin is required to make the shelter for the car.

7. The curved surface area of a right circular cylinder of height 14cm is 88cm^2. Find the diameter of the base of the cylinder.



Ans. Given: Height of cylinder $(h) = 14\,\text{cm}$, Curved Surface Area $= 88\,\text{cm}^2$

Let radius of base of right circular cylinder $= r\,\text{cm}$

$2\pi rh = 88$

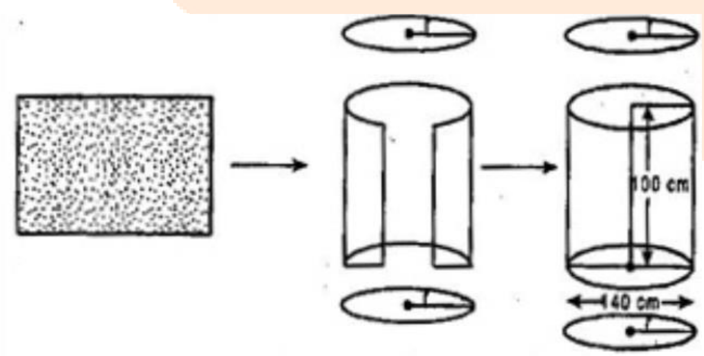
$\Rightarrow 2 \times \frac{22}{7} \times r \times 14 = 88$

$\Rightarrow r = 88 \times \frac{7}{22} \times \frac{1}{14} \times \frac{1}{2}$

$\Rightarrow r = 1\,\text{cm}$

Diameter of the base of the cylinder $= 2r = 2 \times 1 = 2\,\text{cm}$

8. It is required to make a closed cylindrical tank of height $1\,\text{m}$ and base diameter $140\,\text{cm}$ from a metal sheet. How many square meters of the sheet are required for the same?



Ans. Given: Diameter $=140\,\text{cm}$

$\Rightarrow$ Radius $(r)=70\,\text{cm}=0.7\,\text{m}$

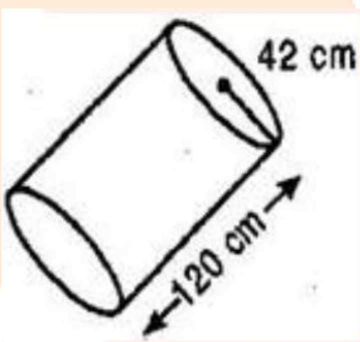
Height of the cylinder $(h)=1\text{m}$

Total surface Area of the cylinder $=2\pi r(r+h)=2\times\frac{22}{7}\times 0.7(0.7+1)$

$=2\times 22\times 0.1\times 1.7=7.48\,\text{m}^2$

Hence $7.48m^2$ metal sheet is required to make the close cylindrical tank.

9. The diameter of a roller is $84\,\text{cm}$ and its length is $120\,\text{cm}$. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in m^2



Ans. Diameter of roller $=84\,\text{cm}$

$\Rightarrow$ Radius of the roller $=42\,\text{cm}$

Length (Height) of the roller $=120\,\text{cm}$

Curved surface area of the roller $=2\pi rh$

$=2\times\frac{22}{7}\times 42\times 120=31680\,\text{cm}^2$

$\because$ Now area leveled by roller in one revolution $=31680\,\text{cm}^2$

$\therefore$ Area leveled by roller in 500 revolutions $= 3.1680 \times 500 = 1584.0000$

$= 1584\,\text{m}^2$

10. A cylindrical pillar is $50\,\text{cm}$ in diameter and $3.5\,\text{m}$ in height. Find the cost of white washing the curved surface of the pillar at the rate of Rs. 12.50 per m^2

Ans. Diameter of pillar = $50\,\text{cm}$

$\Rightarrow$ Radius of pillar $= 25\,\text{cm} = \frac{25}{100} = \frac{1}{4}\,\text{m}$

Height of the pillar $= 3.5\,\text{m}$

Now, Curved surface area of the pillar $= 2\pi rh = 2\frac{22}{7} \times \frac{1}{4} \times 3.5$

$= \frac{11}{2} m^2$

$\because$ Cost of white washing $1m^2 =$ Rs.12.50

$\therefore$ Cost of white washing $\frac{11}{2} m^2 = \frac{11}{2} \times 12.50$

$= Rs.68.75$

11. Curved surface area of a right circular cylinder is $4.4\,\text{m}^2$. If the radius of the base of the cylinder is $0.7\,\text{m}$, find its height.

Ans. Curved surface area of the cylinder $= 4.4\,\text{m}^2$,

Radius of cylinder $= 0.7\,\text{m}$

Let height of the cylinder $= h$

$\therefore 2\pi rh = 4.4$

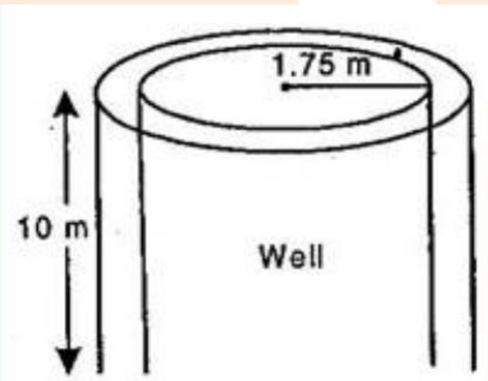
$\Rightarrow 2\times\frac{22}{7}\times 0.7\times h = 4.4$

$h = 4.4\times 7\times\frac{1}{22}\times\frac{1}{2}$

$\Rightarrow h = 1\text{m}$

12. The inner diameter of a circular well is 3.5m. It is 10m deep. Find:

(i) its inner curved surface area.



Ans. Inner diameter of circular well = 3.5m

$\therefore$ Inner radius of circular well $= \frac{3.5}{2} = 1.75\text{m}$

And Depth of the well $= 10\text{m}$

(i) Inner surface area of the well $= 2\pi rh$

$= 2\times\frac{22}{7}\times 1.75\times 10 = 110\text{m}^2$

(ii) the cost of plastering this curved surface at the rate of Rs. 40 per m^2.

Ans. Cost of plastering 1m^2 = Rs. 40

Cost of plastering $100\,\text{m}^2 = 40 \times 110 =$ Rs. 4400

13. In a hot water heating system, there is a cylindrical piping of length $28\,\text{m}$ and diameter $5\,\text{cm}$. Find the total radiating surface in the system.

Ans. The length (height) of the cylindrical pipe $= 28\,\text{m}$

Diameter $= 5\,\text{cm}$

$\Rightarrow$ Radius $= \dfrac{5}{2}\,\text{cm}$

Curved surface area of the pipe $= 2\pi rh = 2 \times \dfrac{22}{7} \times \dfrac{5}{2} \times 2800$

$= 44000\,\text{cm}^2 = \dfrac{44000}{10000} = 4.4\,\text{m}^2$

14. In the adjoining figure, you see the frame of a lampshade. It is to be covered with a decorative cloth. The frame has a base diameter of $20\,\text{cm}$ and height of $30\,\text{cm}$. A margin of $2.5\,\text{cm}$ is to be given for folding it over the top and bottom of the frame. Find how much cloth is required for covering the lampshade.

Ans. Height of each of the folding at the top and bottom $(h) = 2.5\,\text{cm}$

Height of the frame $(\text{H}) = 30\,\text{cm}$

Diameter $= 20\,\text{cm}$

$\Rightarrow$ Radius $= 10\,\text{cm}$

Now cloth required for covering the lampshade

$= \text{CSA of top part} + \text{CSA of middle part} + \text{CSA of bottom part}$

$= 2\pi rh + 2\pi r\text{H} + 2\pi rh$

$= 2\pi r(h + \text{H} + h)$

$= 2\pi r(\text{H} + 2h)$

$= 2\frac{22}{7} \times 10(30 + 2 \times 2.5)$

$= 2200\,\text{cm}^2$

15. The students of a Vidyalaya were asked to participate in a competition for making and decorating penholders in the shape of a cylinder with a base, using cardboard. Each penholder was to be of radius 3cm **and height** 10.5cm. **The Vidyalaya was to supply the competitors with cardboard. If there were 35 competitors, how much cardboard was required to be bought for the competition?**

Ans. Radius of a cylindrical pen holder $(r) = 3\text{cm}$

Height of the cylindrical pen holder $(h) = 10.5\text{cm}$

Cardboard required for pen holder = CSA of pen holder + Area of circular base

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

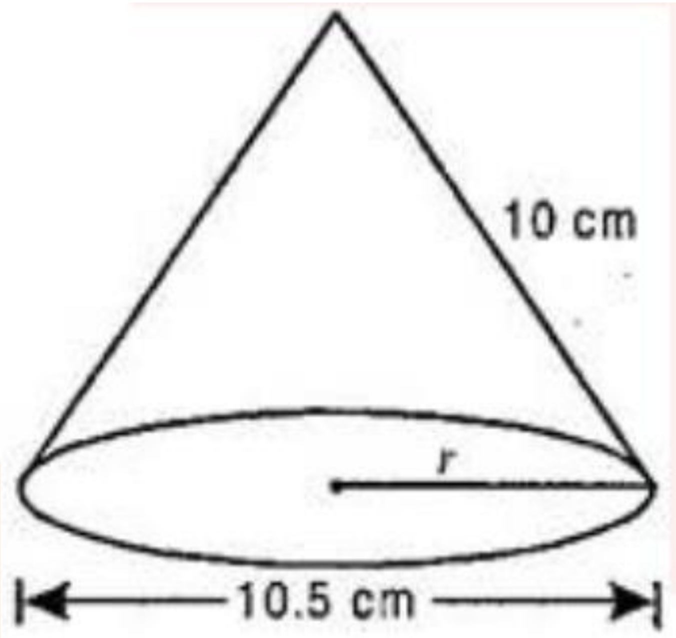
$= \frac{22}{7} \times 3(2 \times 10.5 + 3) = 226.28\,\text{cm}^2$

Since Cardboard required for making 1 pen holder $= 226.28\,\text{cm}^2$

$\therefore$ Cardboard required for making 35 pen holders $= 226.28 \times 35 = 7919.8\,\text{cm}^2$

$= 7920\,\text{cm}^2$ (approx.)

16. Diameter of the base of a cone is 10.5cm and its slant height is 10cm. Find its curved surface area and its total surface area.



Ans. Diameter $=10.5\text{cm}$

$\Rightarrow$ Radius $(r)=\frac{10.5}{2}=\frac{21}{4}\text{cm}$

Slant height of cone $(l)=10\text{cm}$

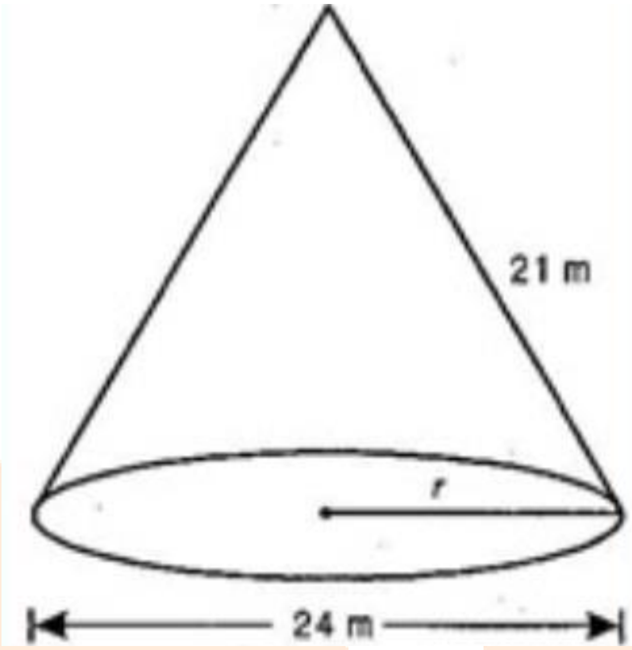
Curved surface area of cone $=\pi rl=\frac{22}{7}\times\frac{21}{4}\times 10$

$=165\text{cm}^2$

Total surface area of cone $=\pi r(l+r)=\frac{22}{7}\times\frac{21}{4}\left(10+\frac{21}{4}\right)$

$=\frac{22}{7}\times\frac{21}{4}\times\frac{61}{4}=251.625\text{cm}^2$

17. Find the total surface area of a cone, if its slant height is 21cm and diameter of the base is 24cm.



Ans. Slant height of cone $(l) = 21\text{m}$

Diameter of cone $= 24\text{m}$

$\Rightarrow$ Radius of cone $(r) = \frac{24}{2} = 12\text{m}$

Total surface area of cone $= \pi r(l + r)$

$= \frac{22}{7} \times 12(21 + 12)$

$= \frac{264}{7} \times 33 = 1244.57\text{m}^2$

18. The slant height and base diameter of a conical tomb are 25m and 14m respectively. Find the cost of whitewashing its curved surface at the rate of Rs. 210 per 100m^2

Ans. Slant height of conical tomb $(l) = 25\,\text{m}$, Diameter of tomb $= 14\,\text{m}$

$\therefore$ Radius of the tomb $(r) = \frac{14}{2} = 7\,\text{m}$

Curved surface are of tomb $= \pi rl = \frac{22}{7} \times 7 \times 25 = 550\,\text{m}^2$

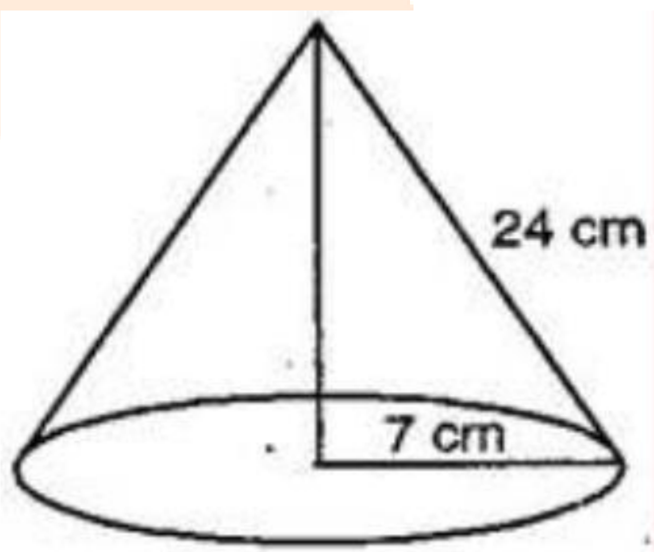
$\because$ Cost of white washing $100\,\text{m}^2 =$ Rs. 210

$\therefore$ Cost of white washing $1m^2 = \frac{210}{100}$

$\therefore$ Cost of white washing $550\,\text{m}^2 = \frac{210}{100} \times 550$

$= Rs.\,1155$

19. A Joker's cap is in the form of a right circular cone of base radius $7\,\text{cm}$ and height 24 cm. Find the area of the sheet required to make 10 such caps.



Ans. Radius of cap $(r) = 7\,\text{cm}$, Height of cap $(h) = 24\,\text{cm}$

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

$= \sqrt{49+576} = \sqrt{625} = 25\,\text{cm}$

Area of sheet required to make a cap = CSA of cone $= \pi rl$

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

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

20. Find the surface area of a sphere of radius:

(i) $10.5\,\text{cm}$

Ans. Radius of sphere $= 105\,\text{cm}$

Surface area of sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 10.5 \times 10.5$

$= 1386\,\text{cm}^2$

(ii) $5.6\,\text{cm}$

Ans. Radius of sphere $= 5.6\,\text{m}$

Surface area of sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 5.6 \times 5.6$

$= 3.94.84\,\text{m}^2$

(iii) $14\,\text{cm}$

Ans. Radius of sphere $= 14\,\text{cm}$

Surface area of sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 14 \times 14$

$= 2464\,\text{cm}^2$

21. Find the surface area of a sphere of diameter:

(i) 14cm

Ans. (i) Diameter of sphere $= 14\text{cm}$,

Therefore, Radius of sphere $= \frac{14}{2} = 7\text{cm}$

Surface area of sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 7 \times 7 = 616\text{cm}^2$

(ii) 21cm

Ans. Diameter of sphere $= 21\text{cm}$

$\therefore$ Radius of sphere $= \frac{21}{2}\text{cm}$

Surface area of sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$

$= 1386\text{cm}^2$

(iii) 3.5cm

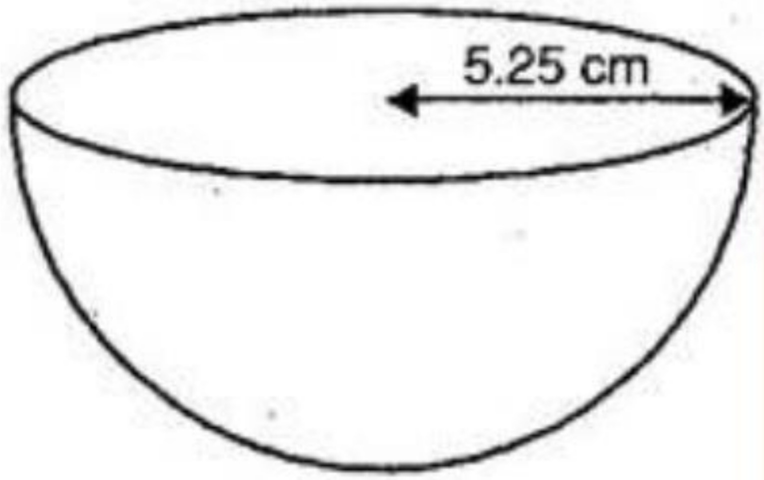
Ans. Diameter of sphere $= 3.5\text{cm}$

$\therefore$ Radius of sphere $= \frac{3.5}{2} = 1.75\text{cm}$

Surface area of sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 1.75 \times 1.75$

$= 38.5\text{cm}^2$

22. Find the total surface area of a hemisphere of radius 10cm**. (Use** $\pi = 3.14$ **)**



Ans. Radius of hemisphere $(r) = 10\,\text{cm}$

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

$= 3 \times 3.14 \times 10 \times 10$

$= 942\,\text{cm}^2$

Hence total surface area of hemisphere is $942\,\text{cm}^2$.

23. Find the radius of a sphere whose surface area is $154\,\text{cm}^2$.

Ans. Surface area of sphere $= 154\,\text{cm}^2$

$\Rightarrow 4\pi r^2 = 154$

$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22 \times 4}$

$\Rightarrow r^2 = \frac{49}{4}$

$\Rightarrow r = \frac{7}{2} = 3.5\,\text{cm}$

24. A hemispherical bowl is made of steel, 0.25cm thick. The inner radius of the bowl is 5cm. Find the outer curved surface area of the bowl.

Ans. Inner radius of bowl $(r) = 5\text{cm}$

Thickness of steel $(t) = 0.25\text{cm}$

$\therefore$ Outer radius of bowl $(\text{R}) = r + t = 5 + 0.25 = 5.25\text{cm}$

$\therefore$ Outer curved surface area of bowl $= 2\pi R^2 = 2\times\frac{22}{7}\times 5.25\times 5.25$

$= 2\times\frac{22}{7}\times\frac{21}{4}\times\frac{21}{4}$

$= \frac{693}{4} = 173.25\text{cm}^2$

25. A right circular cylinder just encloses a sphere of radius r (See figure). Find:

(i) Surface area of the sphere.

Ans. Radius of sphere $= r$

$\therefore$ Surface area of sphere $= 2\pi(\text{ radius })^2 = 2\pi r^2$

(ii) Curved surface area of the cylinder.

Ans. The cylinder just encloses the sphere in it.

$\therefore$ The height of cylinder will be equal to diameter of sphere.

And The radius of cylinder will be equal to radius of sphere.

$\therefore$ Curved surface area of cylinder $= 2\pi rh = 2\pi r\times\pi r$

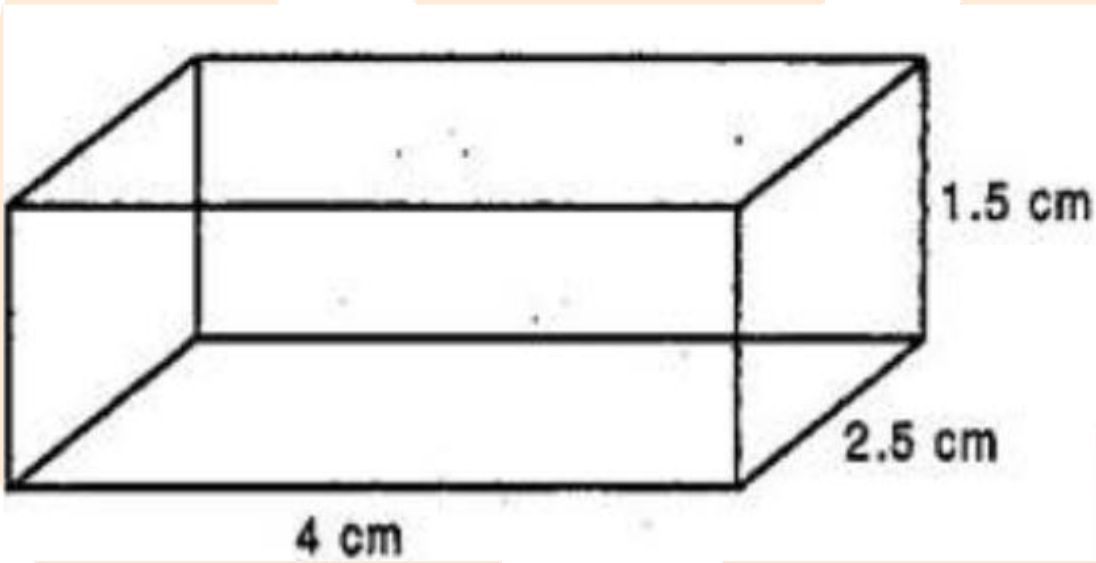
$= 4\pi r^2$

(iii) Ratio of the areas obtained in (i) and (ii).

Ans. $\dfrac{\text{Surface area of sphere}}{\text{Curved surface area of cylinder}} = \dfrac{4\pi r^2}{4\pi r^2} = \dfrac{1}{1}$

$\therefore$ Required ratio $= 1:1$

26. A matchbox $4\text{cm} \times 2.5\text{cm} \times 1.5\text{cm}$**. What will be the volume a packet containing 12 such boxes?**



Ans. Given: Length $(l) = 4\text{cm}$,

Breadth $(b) = 2.5\text{cm}$,

Height $(h) = 1.5\text{cm}$

Volume of a matchbox $= l \times b \times h$

$= 4 \times 2.5 \times 1.5$

$= 15\text{cm}^3$

$\therefore$ Volume of a packet containing 12 such matchboxes is $180\ cm^3$.

27. A cubical water tank is 6m long, 5m wide and 4.5m deep. How many litres of water can it hold?

Ans. Here $l=6\text{m}, \text{b}=5\text{m}$ and $\text{h}=4.5\text{m}$

$\therefore$ Volume of the $\text{tank}=l\times b\times h$

$=(6\times5\times4.5)\text{cm}^3$

$=135\text{m}^3$

$=135\times1\text{m}^3$

$=135\times1000$ litres

$=135000$ litres

So, the cuboidal water tank can hold 135000 litres of water.

28. A cuboidal vessel is 10m long and 8m wide. How high must it be to hold 380 cubic meters of a liquid?

Ans. Let height of cuboidal vessel $=h\text{m}$

Length $=10\text{m}$

Breadth $=8\text{m}$

Volume of liquid in cuboidal vessel $=380\text{m}^3$

$\Rightarrow l\times b\times h=380\text{m}^3$

$\Rightarrow 10m\times8m\times h=380$

$\Rightarrow h = \frac{380}{10 \times 8} = 4.75\text{m}$

Hence cuboidal vessel is 4.75m high.

29. Find the cost of digging a cuboidal pit 8m long. 6m broad and 3m deep at the rate of Rs. 30 perm^3.

Ans. Here, $l = 8\text{m}, \text{b} = 6\text{m}$ and $\text{h} = 3\text{m}$

Volume of the cuboidal pit $= lbh$

$= (8 \times 6 \times 3) m^3$

$= 144\text{m}^3$

Cost of digging $1\text{m}^3 =$ **Rs 30**

Cost of digging $144\text{m}^3 = \text{Rs}(144 \times 30)$

$= \text{Rs}\,4320$

Cost of digging the pit is $Rs\ 4320$

30. The capacity of a cuboidal tank is 50000 litres of water. Find the breadth of the tank, if its length and depth are respectively 2.5m and 10m.

Ans. Length $= 2.5\text{m}$

Height $= 10\text{m}$

Let Breadth be b m

Capacity of cuboidal tank $= 50000$ liters

$\Rightarrow l \times b \times h = 50000$ liters

$\Rightarrow 2.5\,\text{m} \times b \times 10\,\text{m} = \frac{50000}{1000}\,\text{m}^3$

$\Rightarrow 25 \times b = 50$

$\Rightarrow b = 2\,\text{m}$

Hence breadth of cuboidal tank is $2\,\text{m}$.

31. A river 3 m deep and $40\,\text{m}$ wide is flowing at the rate of $2\,\text{km}$ per hour. How much water eill fall into the sea in a minute?

Ans. Water flowing in river in 1 hour = $2\,\text{km}$

Water flowing in river in 1 hour $= 2000\,\text{m}$

Water flowing in river in 60 minutes $= 2000\,\text{m}$

Water flowing in river in 1 minute $= \frac{2000}{60}\,\text{m} = \frac{100}{3}\,\text{m}$

Now,

River is in shape of cuboid

Length $= \frac{100}{3}\,\text{m}$

Breadth $= 40\,\text{m}$

Height $= 3\,\text{m}$

Volume of water falling in the sea in 1 minute $=$ Volume of the cuboid

$=$Length $\times$ Breadth $\times$ Height

$= \left(\frac{100}{3} \times 40 \times 3\right)\text{m}^3$

$= (100 \times 40 \times 1)\text{m}^3$

$= 4000\,\text{m}^3$

32. Find the length of a wooden plank of width $2.5\,\text{m}$, thickness $0.025\,\text{m}$ and volume $0.25m^3$

Ans. Given: Volume of wooden plank $= 0.25\,\text{m}^3$

$\Rightarrow l \times 2.5 \times 0.025 = 0.25$

$$\Rightarrow l = \frac{0.25}{2.5 \times 0.025}$$

$\Rightarrow l = 4\,\text{m}$

Hence required length of wooden plank is $4\,\text{m}$.

33. If the lateral surface of a cylinder is $94.2\,\text{cm}^2$ and its height is $5\,\text{cm}$, then (i) radius of its base

Ans. Let radius of cylinder $= \text{r cm}$

Height $= \text{h} = 5\text{cm}$

Now it is given that

Lateral surface $= 94.2\,\text{cm}^2$

Curved surface area of cylinder $= 94.2\,\text{cm}^2$

$2\pi rh = 94.2$

$2 \times 3.14 \times r \times 5 = 94.2$

$$r = \frac{94.2}{2 \times 3.14 \times 5}$$

$r = 3\text{cm}$

(ii) volume of the cylinder.

Ans. $r = 3\text{cm},$

$\text{h} = 5\text{cm}$

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

$= 3.14 \times 3 \times 3 \times 5$

$= 141.3\text{cm}^3$

34. A bag of grain contains 2.8m^3 of grain. How many bags are needed to fill a drum of radius 4.2m and height 5m?

Ans. Given

Volume of grain inside the bag $= 2.8\text{m}^3$

Radius of the drum $= 4.2\text{m}$

Height of the drum $= 5\text{m}$

$\therefore$ Volume of the drum $= \pi r^2 h$

$= \frac{22}{7} \times (2.1)^2 \times 5$

The number of bag full of grains required

$= \frac{\text{Volume of the drum}}{\text{Volume of the bag}}$

$= \frac{\frac{22}{7} \times 2.1 \times 2.1 \times 5}{2.8} = 99 \text{ bags}$

Hence 99 bags are needed to fill the drum.

35. A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior. The diameter of the pencil is 7mm and diameter of graphite is 1mm. If the length of the pencil is 14cm, find the columns of the wood and that of the graphite.

Ans. Diameter of graphite $=1\text{mm}$

Volume of graphite $=\pi r^2 h=\frac{22}{7}\times(0.05)^2\times 14=0.11\text{cm}^3$

Diameter of pencil = 7mm

$\therefore$ Radius of pencil $(\text{R})=3.5\text{mm}=0.35\text{cm}$

Volume of pencil $=\pi\text{R}^2 h=\frac{22}{7}\times(0.35)^2\times 14=5.39\text{cm}^3$

Now, Volume of wood = Volume of pencil $-$Volume of graphite

$=5.39-0.11=5.28\text{cm}^3$

36. A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7cm. If the bowl is filled with soup to a height of 4cm, how much soup the hospital has to prepare daily to serve 250 patients?

Ans. Soup is in form of cylinder with

Radius $=r=\frac{\text{Diameter}}{2}=\frac{7}{2}\text{cm}$

Height $=\text{h}=4\text{cm}$

Volume of the soup in cylindrical bow $=\pi r^2 h$

$=\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times 4\text{cm}^3$

$=154\,\text{cm}^3$

Soup served to 1 patient $=154\,\text{cm}^3$

Soup served to 250 patients $=250\times154\,\text{cm}^3$

$=38500\,\text{cm}^3$

$=38500\times\frac{1}{1000}$ litres

$=38.5$ litres

37. Find the volume of the right circular cone with:

(i) Radius $6\,\text{cm}$**, Height** $7\,\text{cm}$

Ans. Given: $r=6\,\text{cm}, h=7\,\text{cm}$

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

$=\frac{1}{3}\times\frac{22}{7}\times6\times6\times7$

$=264\,\text{cm}^3$

(ii) Radius $3.5\,\text{cm}$**, Height** $12\,\text{cm}$

Ans. Given: $r=3.5\,\text{cm}, h=12\,\text{cm}$

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

$=\frac{1}{3}\times\frac{22}{7}\times3.5\times3.5\times12$

$=154\,\text{cm}^3$

38. The height of a cone is 15cm. If its volume is 1570cm^3, find the radius of the base.

Ans. Height of cone $=\text{h}=15\text{cm}$

Let radius of cone $=\text{rcm}$

Given

Volume of cone $=1570\text{cm}^3$

$\frac{1}{3}\times 3.14\times r^2\times 15=1570$

$1\times 3.14\times r^2\times 5=1570$

$r^2=\frac{1570}{3.14\times 5}$

$r^2=100r$

$=\sqrt{100}r=\sqrt{(10)^2}$

$r=10\text{cm}$

Hence required radius of the base is 10 cm.

39. If the volume of a right circular cone of height 9cm is $48\pi\text{cm}^3$, find the diameter of the base.

Ans. Height of the cone $(h)=9\text{cm}$

Let radius of cone $=\text{rcm}$

Given Volume of cone $=48\pi\text{cm}^3$

$\frac{1}{3}\pi r^2 h = 48\pi$

$\Rightarrow \frac{1}{3}\pi r^2 h = 48\pi$

$\Rightarrow \frac{1}{3}\pi r^2 \times 9 = 48\pi$

$\Rightarrow 3r^2 = 48$

$\Rightarrow r^2 = \frac{48}{3} = 16$

$\Rightarrow r = 4\text{cm}$

$\therefore$ Diameter of base $= 2r = 2\times 4 = 8\text{cm}$

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

Ans. Height of conical pit $= \text{h} = 12\text{m}$

Radius of conical pit $= r = \frac{\text{Diameter}}{2} = \frac{3.5}{2}\text{m} = 1.75\text{m}$

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

$= \left(\frac{1}{3}\times\frac{22}{7}\times 1.75\times 1.75\times 12\right)\text{m}^3$

$= 38.5\text{m}^3$

$= 38.5$ kiloliters

Capacity of pit $= 38.5$ kiloliters.

41. A right triangle ABC with sides $5\text{cm}, 12\text{cm}$ and 13cm is revolved about the side 12 cm. Find the volume of the solid so obtained. (Use $\pi = 3.14$)

Ans. When right angled triangle ABC is revolved about side 12cm, then the solid formed is a cone.

In that cone, Height $(h) = 12\text{cm}$

And radius $(r) = 5\text{cm}$

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

$= \frac{1}{3}\pi \times 5 \times 5 \times 12$

$= 100\pi \text{cm}^3$

42. Find the volume of the largest right circular cone that can be fitted in a cube whose edge is 14cm.

Ans. For largest circular cone radius of the base of the cone $= \frac{1}{2}$ edge of cube

$= \frac{1}{2} \times 14 = 7cm$

And height of the cone $= 14\text{cm}$

Volume of cone $= \frac{1}{3} \times 3.14 \times 7 \times 7 \times 14$

$= 718.666\text{cm}^3$

43. Find the volume of a sphere whose radius is

(i) 7cm

Ans. Radius of sphere $(r) = 7\text{cm}$

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

$= \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$

$= \frac{4312}{3} = 1437\frac{1}{3}\text{cm}^3$

(ii) 0.63cm

Ans. Radius of sphere $(r) = 0.63\text{m}$

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

$= \frac{4}{3} \times \frac{22}{7} \times 0.63 \times 0.63 \times 0.63$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{63}{100} \times \frac{63}{100} \times \frac{63}{100}$

$= 1.047816m^3 = 1.05m^3$ (approx.)

44. Find the amount of water displaced by a solid spherical ball of diameter:

(i) 28cm

Ans. Diameter of spherical ball = 28cm

$\therefore$ Radius of spherical ball $(r) = \frac{28}{2} = 14\text{cm}$

According to question, Volume of water replaced = Volume of spherical ball

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

$= \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14$

$= \frac{34496}{3} = 11498\frac{2}{3}\text{cm}^3$

(ii) 0.21m

Ans. Diameter of spherical ball $= 0.21\text{m}$

$\therefore$ Radius of spherical ball $(r) = \frac{0.21}{2}\text{m}$

According to question,

Volume of water replaced = Volume of spherical ball $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{0.21}{2} \times \frac{0.21}{2} \times \frac{0.21}{2}$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{200} \times \frac{21}{200} \times \frac{21}{200}$

$= 11 \times \frac{441}{100 \times 100 \times 100} = 0.004851\text{m}^3$

45. The diameter of a metallic ball is 4.2cm**. What is the mass of the ball, if the metal weighs** 8.9g **per** cm^3?

Ans. Diameter of metallic ball $= 4.2\text{cm}$

$\therefore$ Radius of metallic ball $(r) = \frac{4.2}{2} = 2.1\text{cm}$

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

$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{10} \times \frac{21}{10} \times \frac{21}{10} = 38.808\,\text{cm}^3$

Density of metal $= 8.9\text{g per cm}^3$

Mass of $38.808\,\text{cm}^3 = 8.9 \times 38.808$

$= 345.3912\,\text{g} = 345.39\,\text{g}$

46. A hemispherical tank is made up of an iron sheet 1cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.

Ans. Inner radius $= r_1 = 1\text{m}$

Outer radius $= r_2 = 1\text{m} + 1\text{cm}$

$= 1\text{m} + \frac{1}{100}\text{m}$

$= 1\text{m} + 0.01\text{m}$

$= 1.01\text{m}$

Volume of iron used $=$ Volume of outer hemisphere $-$ Volume of inner hemisphere

Volume of iron of hemisphere $= \frac{2}{3}\pi\left[\text{R}^3 - r^3\right]$

$= \frac{2}{3} \times \frac{22}{7} \times \left[(101)^3 - (100)^3\right]$

$= \frac{44}{21}[1030301 - 1000000]$

$= 0.06348\,\text{m}^3$

47. A dome of a building is in the form of a hemisphere. From inside, it was whitewashed at the cost of Rs. 498.96. If the cost of white-washing is at the rate of Rs. 2.00 per square meter, find:

(i) the inner surface area of the dome.

Ans. Cost of white washing from inside $= Rs.498.96$

Rate of white washing $= Rs.2$

Area white washed $= \frac{498.96}{2} = 249.48\,\text{cm}^2$

Therefore, inner surface area of dome $= 249.48\,\text{m}^2$

(ii) the volume of the air inside the dome.

Ans. Volume of air inside dome = Volume of hemisphere $= \frac{2}{3}\pi r^3$

Let the radius of dome $= r\,\text{m}$

First we find radius using surface area

Surface area of dome $= 249.48\,\text{m}^2$

$2\pi r^2 = 249.48$

$2 \times \frac{22}{7} \times r^2 = 249.48$

$r^2 = \frac{249.48 \times 7}{2 \times 22}$

$r^2 = 39.69$

$r = \sqrt{39.69}$

$\therefore r = 6.3\text{m}$

Volume of the air inside the dome $=$ volume of hemisphere

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

$$=\frac{2}{3}\times\frac{22}{7}\times 6.3\times 6.3\times 6.3\,\text{m}^3$$

$$=523.908\,\text{m}^3$$

48. Twenty-seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S '. Find the:

(i) radius r ' of the new sphere.

Ans. Volume of 1 sphere, $V=\frac{4}{3}\pi r^3$

Volume of **27** solid sphere

$$=27\times\frac{4}{3}\pi r^3$$

Let r_1 is the radius of the new sphere.

Volume of new sphere $=$ Volume of **27** solid sphere

$$\frac{4}{3}\pi r_1^3=27\times\frac{4}{3}\pi r^3$$

$$\frac{r_1^3}{r^3}=27$$

$$\frac{r_1}{r}=\sqrt[3]{27}$$

$\frac{r_1}{r} = \frac{3}{1}$

$r_1 = 3r$

(ii) ratio of S and S '.

Ans. $\frac{\textbf{Surface area of new sphere } S_1}{\textbf{Surface area of old sphere S}}$

$\frac{S_1}{S} = \frac{4\pi r_1^2}{4\pi r^2}$

$\frac{S_1}{S} = \frac{(3r)^2}{r^2}$

$\frac{S_1}{S} = \frac{(3r)^2}{r^2}$

$\frac{S_1}{S} = \frac{9r^2}{r^2}$

$\frac{S_1}{S} = \frac{9}{1}$

$S_1 : s = 9:1$

$s : S_1 = 1:9$

49. A capsule of medicine is in the shape of a sphere of diameter 3.5mm. How much medicine (in mm^3) is needed to fill this capsule?

Ans. Diameter of spherical capsule = 3.5mm

$\therefore$ Radius of spherical capsule $(r) = \frac{3.5}{2} = \frac{35}{20} = \frac{7}{4}\text{mm}$

Medicine needed to fill the capsule = Volume of sphere

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

$= \frac{11\times7\times7}{3\times2\times4} = \frac{539}{34}\text{mm}^3$

$= 22.46\,\text{mm}^3$

50. Sameera wants to celebrate the fifth birthday of her daughter with a party. She bought thick paper to make the conical party caps. Each cap is to have a base diameter of $10\,\text{cm}$ and height $12\,\text{cm}$. A sheet of the paper is $25\,\text{cm}$ by $40\,\text{cm}$ and approximately 82% of the sheet can be effectively used for making the caps after cutting. What is the minimum number of sheets of paper that Sameera would need to buy, if there are to be 15 children at the party? (Use $\pi = 3.14$)

Ans. Diameter of base of conical cap = $10\,\text{cm}$

$\therefore$ Radius of conical cap $(r) = 5\text{cm}$

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

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

$= \sqrt{25+144} = \sqrt{169}$

$= 13\text{cm}$

Curved surface area of a cap $= \pi rl$

$= 3.14\times5\times13 = 204.1\text{cm}^2$

Curved surface area of a cap $= \pi rl$

$= 3.14\times5\times13 = 204.1\text{cm}^2$

Curved surface area of 15 caps $= 15\times204.1 = 3061.5\text{cm}^2$

Area of a sheet of paper used for making caps $= 25 \times 40 = 1000\,\text{cm}^2$

82% of sheet is used after cutting $= 82\%$ of $1000\,\text{cm}^2$

$= \frac{82}{100} \times 1000 = 820\,\text{cm}^2$

Number of sheet $= \frac{3061.5}{820} = 3.73$

Hence 4 sheets area needed.

51. Curved surface area of a right circular cylinder is $4.4\ sqm$. if the radius of the base of the cylinder is $0.7\,\text{m}$ find its height.

Ans. Let the height of the circular cylinder be h.

Radius (r) of the base of cylinder $= 0.7\,\text{m}$

Curved Surface Area of cylinder $= 2\pi rh$

$4.4\,\text{m}^2 = 2\pi rh$

$4.4\,\text{m}^2 = \left(2 \times \frac{22}{7} \times 0.7 \times h\right)\text{m}$

$\frac{44}{10}\,\text{m} = \left(2 \times \frac{22}{7} \times \frac{7}{10} \times h\right)$

$44\,\text{m} = (2 \times 22 \times h)$

$\text{h} = \frac{44}{2 \times 22}$

$\text{h} = 1\,\text{m}$

Therefore, the height of the cylinder is $1\,\text{m}$.

52. The circumference of the trunk of a tree (cylindrical), is 44dm. Find the volume of the timber obtained from the trunk if the length of the trunk is 5m.

Ans. Let r be the radius of the cylindrical Trunk

Circumference of the trunk $=44\text{dm}$

Converting dm into m,

$44dm=4.4\text{m}$

The circumference is $C=2\pi r$

$4.4=2\times 3.14\times r$

$r=\frac{4.4}{2\times 3.14}$

$r=0.7$

The height is $h=5\text{m}$

The volume of the cylinder is

$V=\pi r^2h$

$V=3.14\times 0.7^2\times 5$

$V=7.693\text{m}^3$

Therefore, the volume of the trunk is 7.693cubic meter.

53. If the areas of three adjacent faces of a cuboids are X,Y and Z. If its volume is V, prove that $\mathbf{V^2=XYZ}$

Ans. Areas of three faces of cuboid as x, y, z

So, Let length of cuboid be $=l$

Breadth of cuboid be $=b$

Height of cuboid be $=\text{h}$

Let, $x=l\times b$

$y=b\times h$

$z=h\times l$

Else write as

$xyz=l^2b^2h^2$ ….. (i)

If ' $\mathbf{V}'$ is volume of cuboid $=\mathbf{V}=lbh$

$V^2=l^2b^2h^2=xyz$…… from (i)

$\therefore \text{V}^2=\text{xyz}$

Hence proved.

54. Find the volume of an iron bar has in the shape of cuboids whose length, breadth and height measure 25cm. 18cm and 6cm respectively. Find also its weight in kilograms if 1 cu cm of iron weight 100 grams.

Ans. Length of the bar $=25\text{cm}$

Breadth of the bar $=18\text{cm}$

Height of the $bar=6\text{cm}$

$\therefore$ Volume of the iron bar $=l\times b\times h$ cu unit

$=(25\times 18\times 6)\text{cu cm}$

$=2700\text{cu cm}$

Weight of the bar $=(2700\times100)\text{gm}$

$=270000\text{gm}$

$=270\,\text{kg}$

55. A rectangular piece of paper is $22\,\text{cm}$ long and $12\,\text{cm}$ wide. A cylinder is formed by rolling the paper along its length. Find the volume of the cylinder.

Ans. It is clear that circumference of the base of the cylinder = length of the paper Let $r\text{cm}$ be the radius of the base of the cylinder and its height as $h\text{cm}$.

$\therefore 2\pi r=22$ and $h=12\,\text{cm}$

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

$$\text{r}=\frac{7}{2}\text{cm}$$

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

$$=\frac{22}{7}\times\left(\frac{7}{2}\right)^2\times12\text{cu cm}$$

$$=\frac{22\times7\times7\times12}{7\times2\times2}\text{cu cm}$$

$=462\text{cu cm.}$

56. If the radius of the base of a right circular cylinder is halved, keeping the height same, find the ratio of the volume of the reduced cylinder to that of original cylinder.

Ans. Let the radius of the original cylinder $=r$ units

Height of the original cylinder $= \text{h}$ units

$\therefore$ volume of the cylinder $= \pi \text{r}^2 h$ cu units $\rightarrow$ (i)

Radius of the reduced cylinder $= \frac{r}{2}$ units

Height of the reduced cylinder $= \text{h}$ units

$\therefore$ volume of the cylinder $= \pi \left(\frac{r}{2}\right)^2 h$ cu units

$= \frac{\pi r^2 h}{4}$ cu units $\rightarrow (2)$

From (i) and (ii) we get

$$\frac{\text{volume of cylinder (reduced)}}{\text{volume of the original cylinder}} = \frac{\pi r^2 h}{\pi r^2 h}$$

$= \frac{1}{4}$

Thus, there required ratio $= 1:4$

57. A rectangle tank measuring 5m by 4.5m by 2.1m is dug in the centre of a field 25m by 13.5m. The earth dug out is spread evenly over the remaining portion of the field. How much is the level of the field raised?

Ans. Volume of the tank $= 5 \times 4.5 \times 2.1 \text{cum}$

$= 47.25 \text{cm}$

$\therefore$ Volume of the earth $\text{dug} = 47.25 \text{cum}$

Area of the field $= 25 \times 13.5$

$= 337.5 \text{sqm}$

$\therefore$ Remaining area of the field $=(337.5-22.5)$

$=315\text{sq m}$

$\therefore$ Level of the field raised $=\dfrac{\text{volume of the earth dug out}}{\text{remaining area of the field}}$

$=\dfrac{47.25}{315}\text{m}=\dfrac{4725}{315}\text{cm}$

$=15\text{cm}$

58. A village having a population of 4000 requires 150 litres of water per head per day. It has a water tank measuring $20\text{m}\times 15\text{m}\times 6\text{m}$ which is full of water. For how many days will the water tank last?

Ans. Number of days water will last

$=\dfrac{\text{Volume of tank}}{\text{Total water required per day}}$

Here, $l=20\text{m}, \text{b}=15\text{m}$ and $\text{h}=6\text{m}$

Volume of the tank $=l\times \text{b}\times \text{h}$

$=(20\times 15\times 6)\text{m}^3$

$=1800\text{m}^3$

Water required per person per day $=150$ litres

Water required for 4000 person per day $=(4000\times 150)$ litres

$=4000\times 150\times \left(\dfrac{1}{1000}\right)\text{m}^3$

$=600\,m^3$

Number of days water will last $=\dfrac{\text{Volume of tank}}{\text{Total water required per day}}$

$=\left(\dfrac{1800\,m^3}{600\,m^3}\right)$

$=3$

Thus, the water will last for 3 days.

59. Find the curved surface area of a right circular cone whose slant height is $10\,cm$ and base radius is 7cm

Ans. Curved surface area $=\pi rl$

$=\dfrac{22}{7}\times 7\times 10\,cm^2$

$=220\,cm^2$

60. Find (i) the curved surface area

Ans. The curved πrl surface area of hemisphere of radius $21\,cm$ would be $=2\pi r^2$

$=2\times\dfrac{22}{7}\times 21\times 21\,cm^2$

$=2772\,cm^2$

(ii) Total surface area of a hemisphere of radius $21\,cm$

Ans. The total surface area of the hemisphere $=3\pi r^2$

$=3\times\dfrac{22}{7}\times 21\times 21\,cm^2$

$= 4158\,\text{cm}^2$

61. The circumference of the base of a cylindrical vessel is $132\,\text{cm}$ and its height is 25 cm How many litres of water can it hold? $\left[1000\,\text{cm}^3 = 1l\right]$

Ans. Given circumference of base of cylindrical vessel $= 132\,\text{cm}$

$2\pi r = 132\,\text{cm}$

$r = \frac{132}{2\pi} = \frac{66^3}{22} \times 7 = 21\,\text{cm}$

Number of liters of water $= \pi r^2\,\text{h}$

$= \frac{22}{7} \times 21 \times 21 \times 25\,\text{cm}^3$

$= 22 \times 3 \times 21 \times 25\,\text{cm}^3$

$= 34650\,\text{cm}^3$

$= 34650 \times \left(\frac{1}{1000}\right)$ litres

$= 34.65$ litres

Vessel can hold 34.65 litres.

62. A cubical box has each edge $10\,\text{cm}$ and another cuboidal box is $12.5\,\text{cm}$ long, $10\,\text{cm}$ wide and $8\,\text{cm}$ high. Which box has the greater lateral surface area and by how much?

Ans. Side of cubical box $= 10\,\text{cm}$

Lateral surface area of cube $= 4a^2$

$4\times10^2 = 400\,\text{cm}^2$

Length of cuboidal box $=12.5\,\text{cm}$.

Breadth $=10\,\text{cm}$

Height $=8\,\text{cm}$

Lateral surface area $=2[l+b]h$

$=2[12.5+10]8$

$=16\times22.5=360\,\text{cm}^2$

Difference $=400-360=40\,\text{cm}^2$

Lateral surface area of cuboidal box is greater by $40\,\text{cm}^2$

63. A hemi spherical bowl has a radius of $3.5\,\text{cm}$. What would be the volume of water it would contain?

Ans. The volume of water the bowl contain $=\frac{2}{3}\pi r^3$

Radius of hemisphere $=r=3.5\,\text{cm}$

The volume of water the bowl can contain $=\frac{2}{3}\pi r^3$

$=\frac{2}{3}\times\frac{22}{7}\times3.5\times3.5\times3.5\,\text{cm}^3$

$=89.8\,\text{cm}^3$

64. A conical pit of top diameter $3.5\,\text{m}$ is $12\,\text{m}$ deep. What is its capacity in kiloliters

Ans. Diameter of conical Pit $=3.5\,\text{m}$

Height of conical pit $=\text{h}=12\,\text{m}$

Radius of conical pit $=r=\dfrac{\text{Diameter}}{2}$

$=\dfrac{3.5}{2}\,\text{m}=1.75\,\text{m}$

Capacity of pit $=$Volume of cone

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

$=\left(\dfrac{1}{3}\times\dfrac{22}{7}\times 1.75\times 1.75\times 12\right)\text{m}^3$

$=38.5\,\text{m}^3$

$=38.5$ kiloliters

Capacity of pit $=38.5$ kiloliters.

65. The diagonals of a cube is $30\,\text{cm}$, find its volume

Ans. Let side of cube be a cm

Diagonal $=\sqrt{3}a$

$\sqrt{3}a=30$

$a=\dfrac{30}{\sqrt{3}}$

Volume of cube $=a^3=\left(\dfrac{30}{\sqrt{3}}\right)^3$

$$= \frac{27000}{3\sqrt{3}} = \frac{9000}{\sqrt{3}}\text{cm}^3$$

66. A cylindrical tank has a capacity of $6160\,\text{m}^3$ find its depth if the diameter of the base is 28m

Ans. Diameter of the base = $28\,\text{m}$

Radius $r = \frac{28}{2} = 14m$

Volume $= \pi r^2 h = 6160$

$$\frac{22}{7} \times 14 \times 14 \times h = 6160$$

$$h = \frac{6160 \times 7}{22 \times 14 \times 14} = 10m$$

Hence depth of tank $= 10\,\text{m}$

67. Find the volume of a sphere whose surface area is $154\,\text{cm}^2$

Ans. Given surface area of sphere $= 154\,\text{cm}^2$

Let radius of the sphere $=$ r cm

$$4\pi r^2 = 1544 \times \frac{22}{7} \times r^2$$

$$= 154 r^2$$

$$= \frac{154 \times 7}{4 \times 22} r^2$$

$$= 12.25 r$$

$=\sqrt{12.25}r$

$=3.5\text{cm}$

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

$=\left(\frac{4}{3}\times\frac{22}{7}\times 3.5\times 3.5\times 3.5\right)\text{cm}^3$

$=179.67\,\text{cm}^3$

68. If the volume of a right circular cone of height 9cm is $48\pi\text{cm}^3$ Find the diameter of its base

Ans. Given volume of cone $=48\pi\text{cm}^3$ and height $=9\text{cm}$

Volume of cone $=48\pi\text{cm}^3$

$\frac{1}{3}\pi r^2 h=48\pi$

$\frac{1}{3}\pi r^2\times(9)=48\pi$

$\pi r^2 3=48\pi$

$r^2=\frac{48\pi}{3\pi}$

$r^2=16$

$r=\sqrt{16}$

$r=\sqrt{(4)^2}$

$r=4\text{cm}$

Diameter $=2\times$ Radius

$= 2 \times 4 = 8\text{cm}$

Thus, the diameter of the base of cone is 8cm.

69. The volume of a cylinder is 69300cm^3 and its height is 50cm. Find its curved surface area

Ans. Volume $= \pi r^2 h = 69300$ and $\text{h} = 50\text{cm}$

$\Rightarrow \frac{22}{7} \times r^2 \times 50 = 69300$

$r^2 = \frac{69300 \times 7}{22 \times 50} = 441$

$r = \sqrt{441} = 21\text{cm}$

$\therefore$ Curved surface area $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 21 \times 50 = 6600\text{cm}^2$

70. The volume of a cube is 1000cm^3, Find its total surface area.

Ans. Volume $= a^3 = 1000\text{cm}^3$

$a = 10\text{cm}$

Total surface area $= 6a^2 = 6 \times 100$

$= 600\text{cm}^2$.

Short Answer Questions **3 Mark**

1. A small indoor green house (herbarium) is made entirely of glass panes (including base) held together with tape. It is 30cm long, 25cm wide and 25cm high.

(i) What is the surface area of the glass?

Ans. Length (l) of green house $= 30\text{cm}$

Breadth (b) of green house $= 25\text{cm}$

Height (h) of green house $= 25\text{cm}$

The green house is cuboid and Glass is on the all 6 sides of cuboid greenhouse

Area of glass = Surface area of green house

$= 2[lb + lh + bh]$

$= [2(30 \times 25 + 30 \times 25 + 25 \times 25)]\text{cm}^2$

$= [2(750 + 750 + 625)]\text{cm}^2$

$= (2 \times 2125)\text{cm}^2$

$= 4250\text{cm}^2$

Hence 4250cm^2 of the glass is required to make a herbarium.

(ii) How much of tape is needed for all the 12 edges?

Ans. Tape is used at 12 edges.

$\Rightarrow$ Tape is used at 4 lengths, 4 breadths and 4 heights.

$\Rightarrow$ Total length of the tape $= 4(l + b + h)$

$= 2(30 + 25 + 25)$

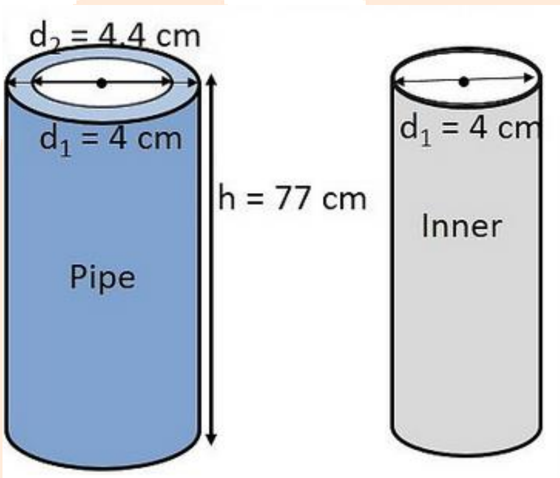
$= 320\text{cm}$

Hence 320cm of the tape if needed to fix 12 edges of herbarium.

2. A metal pipe is 77cm long. The inner diameter of a cross section is 4cm, the outer diameter being 4.4cm. [See fig.]. Find its:

(i) Inner curved surface area

Ans.



Inner diameter of cross-section $= 4\text{cm}$

Inner radius of cylindrical pipe $= r_1 = \dfrac{\text{Inner diameter}}{2}$

$= \left(\dfrac{4}{2}\right)\text{cm} = 2\text{cm}$

Height (h) of cylindrical pipe $= 77\text{cm}$

Curved Surface Area of inner surface of pipe $= 2\pi r_1 h$

$= \left(2 \times \dfrac{22}{7} \times 2 \times 77\right)\text{cm}^2$

$= 968\text{cm}^2$

Inner curved surface area is $968\,\text{cm}^2$

(ii) Outer curved surface area

Ans. Outer diameter of pipe $= 4.4\,\text{cm}$

Outer radius of cylindrical pipe $= r_2 = \dfrac{\text{Outer diameter}}{2}$

$$= \left(\frac{4.4}{2}\right)\text{cm} = 2.2\,\text{cm}$$

Height of cylinder $= \text{h} = 77\,\text{cm}$

Curved Surface Area of outer surface of pipe $= 2\pi r_2 h$

$$= \left(2 \times \frac{22}{7} \times 2.2 \times 77\right)\text{cm}^2$$

$$= (2 \times 22 \times 2.2 \times 11)\text{cm}^2$$

$$= 1064.8\,\text{cm}^2$$

Outer curved surface area is $1064.8\,\text{cm}^2$

(iii) Total surface area

Ans. $r_1 = 2\,\text{cm}$

$r_2 = 2.2\,\text{cm}$

$h = 77\,\text{cm}$

Total surface area $=$ Curved Surface Area of inner cylinder $+$ Curved Surface Area of outer cylinder $+\ 2\times$ Area of base

Area of base $=$ Area of circle with radius $2.2\,\text{cm} -$ Area of circle with radius $2\,\text{cm}$

$$= \pi r_2^2 - \pi r_1^2$$

$$= \frac{22}{7} \times \left((2.2)^2 - (2)^2 \right)$$

$$= \frac{22}{7} \times (4.84 - 4)$$

$$= \frac{22}{7} \times (0.84)$$

$$= 2.64 \text{cm}^2$$

Total surface area = Curved Surface Area of inner cylinder $+$ Curved Surface Area of outer cylinder $+ 2\times$ Area of base

$$= 968 + 1064.8 + 2 \times 2.64$$

$$= 2032.8 + 5.28$$

$$= 2038.08 \text{cm}^2$$

Therefore, the total surface area of the cylindrical pipe is 2038.08cm^2

3. Curved surface area of a cone is 308cm^2 and its slant height is 14cm. Find

(i) radius of the base

Ans. Slant height of cone $(l) = 14 \text{cm}$

Curved surface area of cone $= 308 \text{cm}^2$

$$\pi r l = 308$$

$$\frac{22}{7} \times r \times 14 = 308$$

$$22 \times r \times 2 = 308$$

$$r = \left(\frac{308}{2 \times 22} \right) \text{cm}$$

$\therefore r = 7\,\text{cm}$

Therefore, the radius of the circular end of the cone is $7\,\text{cm}$.

(ii) total surface area of the cone.

Ans. Total surface area of the cone = Curved surface area + Area of circular base

$= 308 + \pi r^2$

$= 308 + \frac{22}{7} \times (7)^2$

$= 462\,\text{cm}^2$

Therefore, the total surface area of the cone is $462\,\text{cm}^2$.

4. A conical tent is $10\,\text{m}$ high and the radius of its base is $24\,\text{m}$. Find:

(i) slant height of the tent.

Ans. Height of the conical tent $(h) = 10\,\text{m}$

Radius of the conical tent $(r) = 24\,\text{m}$

Let the slant height of the tent be l

Slant height of the tent $l^2 = h^2 + r^2$

$l^2 = (10)^2 + (24)^2$

$l^2 = 100 + 576$

$l^2 = 676$

$l = \sqrt{676}$

$l = \sqrt{26^2}$

$l = 26\text{m}$

Therefore, the slant height of the tent is 26m.

(ii) cost of the canvas required to make the tent, if the cost of a m^2 canvas is Rs. 70 .

Ans. Here the tent does not cover the base, So, find curved surface area of tent
Curved surface area of tent $= \pi rl$

Here, $r = 24m,\ l = 26m$

Curved surface area of tent $= \pi rl$

$= \left(\frac{22}{7} \times 24 \times 26\right) \text{m}^2$

$= \frac{13728}{7} \text{m}^2$

Cost of 1m^2 canvas $=$ Rs 70

Cost of $\frac{13728}{7}\text{m}^2$ canvas $= \text{Rs}\left(\frac{13728}{7} \times 70\right)$

$= \text{Rs}137280$

Therefore, the cost of the canvas required to make the tent is $Rs\ 137280$.

5. What length of tarpaulin 3m wide will be required to make conical tent of height 8m and base radius 6m ? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20cm. (Use $\pi = 3.14$)

Ans. Height of the conical tent $(h) = 8\text{m}$ and Radius of the conical tent $(r) = 6\text{m}$

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

$= \sqrt{(6)^2 + (8)^2}$

$= \sqrt{36 + 64}$

$= \sqrt{100} = 10\text{m}$

Area of tarpaulin $=$Curved surface area of tent $= \pi rl$

$= 3.14 \times 6 \times 10 = 188.4\text{m}^2$

Width of tarpaulin $= 3\text{m}$

Let Length of $\text{tarpaulin} = \text{L}$

$\therefore$ Area of tarpaulin $=$ Length $\times$ Breadth

$= L \times 3 = 3\text{L}$

Now, According to question, $3\text{L} = 188.4$

$\Rightarrow \text{L} = \dfrac{1884.4}{3} = 62.8\text{m}$

The extra length of the material required for stitching margins and cutting is $20\text{cm} = 0.2\text{m}$.

So, the total length of tarpaulin bought is $(62.8 + 0.2)\text{m} = 63\text{m}$

6. A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40cm and height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m^2, what will be the cost of painting all these cones? (Use $\pi = 3.14$ and take $\sqrt{1.04} = 1.02$)

Ans. Curved surface area of cone will be painted $= \pi\text{rl}$

$h = 1m; \quad radius \ = \frac{40}{2} = 20\,cm = 0.2\,m$

and let 1 be the slant height,

$\therefore 1^2 = h^2 + r^2 = 1^2 + 0.2^2$

$\Rightarrow 1 = \sqrt{1+0.04} = \sqrt{1.04} = 1.02\,m$

$\Rightarrow$ Curved surface area of 1 cone $= \pi rl$

$= (3.14 \times 0.2 \times 1.02) m^2 = 0.64046\,m^2$

$\Rightarrow$ Curved surface area of 50 cones $= 50 \times 0.64046 = 32.028\,m^2$

Cost of painting $1m^2 =$ Rs. 12

$\therefore$ Cost of painting $32.028\,m^2 = (12 \times 32.028)$

$= 384.336\,m^2 \approx 384.34$

$\therefore$ Cost of painting 50 cones is Rs. 384.84.

7. The radius of a spherical balloon increases from $7\,cm$ to $14\,cm$ as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.

Ans. I case: Radius of balloon $(r) = 7\,cm$

Surface area of balloon $= 4\pi r^2 = 4\pi \times 7 \times 7\,cm^2$ ……….. (i)

II case: Radius of balloon (R) = $14\,cm$

Surface area of balloon $= 4\pi R^2 = 4\pi \times 14 \times 14\,cm^2$ ……….. (ii)

Now, Ratio [from eq. (i) and (ii)],

$$\frac{\text{CSA in first case}}{\text{CSA in second case}} = \frac{4\pi \times 7 \times 7}{4\pi \times 14 \times 14} = \frac{1}{4}$$

Hence, required ratio $=1:4$

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

Ans. Capacity of cuboidal tank $=l\times b\times h=20m\times 15m\times 6m$

$=1800\text{m}^3$

$=1800\times 1000$ liters

$=1800000$ liters

Water required by her head per day $=150$ liters

Water required by 4000 persons per day $=150\times 4000=600000$ liters

Number of days the water will last $=\dfrac{\text{Capacity of tank (in liter)}}{\text{Total water required per day (in liters)}}$

$=\dfrac{1800000}{600000}=3$

Hence water of the given tank will last for 3 days.

9. A godown measures $40\text{m}\times 25\text{m}\times 15\text{m}$. Find the maximum number of wooden crates each measuring $1.5\text{m}\times 1.25\text{m}\times 0.5\text{m}$ that can be stored in the godown.

Ans. Capacity of cuboidal godown $=40m\times 25m\times 15m=15000m^3$

Capacity of wooden crate $=1.5\text{m}\times 1.25\text{m}\times 0.5\text{m}=0.9375\text{m}^3$

Maximum number of crates that can be stored in the godown $=\dfrac{\text{Volume of godown}}{\text{Volume of one crate}}$

$=\frac{15000}{0.9375}=16000$

Hence maximum 16000 crates can be stored in the godown.

10. Find the minimum number of bricks each measuring $22.5\text{cm}\times 11.5\text{cm}\times 7.5\text{cm}$ required to construct a wall 10m long, 6m high and 1.5m thick.

Ans. Volume of one cuboidal brick $=l\times b\times h$

$=22.5\text{cm}\times 11.5\text{cm}\times 7.5\text{cm}^3$

$=1940.625\text{cm}^3$

$=0.001940625\text{m}^3$

Volume of cuboidal wall $=10\text{m}\times 6\text{m}\times 1.5\text{m}$

$=90\text{m}^3$

$\text{Minimum number of bricks required }=\frac{\text{Volume of wall}}{\text{Volume of a brick}}$

$=\frac{90}{0.001940625}$

$=\frac{90}{\frac{1940625}{1000000000}}$

$=\frac{90000000000}{1940625}=46376.81$

$=46377$ [Since bricks cannot be in fraction]

11. The circumference of the base of a cylindrical vessel is 132cm and its height is $25cm$ How many litres of water can it hold?

Ans. Height of vessel $=(h)=25\text{cm}$

Circumference of base of vessel = 132cm

$\Rightarrow 2\pi r=132$

$\Rightarrow 2\times\frac{22}{7}\times r=132$

$r=\frac{132\times 7}{2\times 22}=21\text{cm}$

Now, Volume of cylindrical vessel $=\pi r^2 h$

$=\frac{22}{7}\times 21\times 21\times 35=34650\,\text{cm}^3$

$=\frac{34650}{1000}$ liters

$=34.65$ liters

12. The inner diameter of a cylindrical wooden pipe is 24cm and its out diameter is $28\,\text{cm}$. The length of the pipe is 35cm. Find the mass of the pipe, if 1cm^3 of wood has a mass of 0.5g

Ans. Inner diameter of pipe $=28\text{cm}$

$\therefore$ Inner radius of pipe $(r)=\frac{24}{2}=12\,\text{cm}$

And Outer diameter of pipe $=28\text{cm}$

$\therefore$ Outer radius of pipe $(\text{R})=\frac{28}{2}=14\,\text{m}$

Length of pipe $(h)=35\text{cm}$

Volume of wood $=$ Volume of outer cylinder $-$Volume of inner cylinder

$=\pi R^2h-\pi r^2h=\pi h\left(R^2-r^2\right)$

$=\frac{22}{7}\times 35\left[(14)^2-(12)^2\right]$

$=110[196-144]=110\times 52=5720\,\text{cm}^3$

$\because$ Weight of 1cm^3 of wood $=0.6\text{g}$

$\therefore$ Weight of 5720cm^3 of wood $=0.6\times 5720$

$=3432\,\text{g}=3.432\,\text{kg}$

Therefore, mass of pipe is $3.432\,\text{kg}$

13. A soft drink is available in two packs (i) a tin can with a rectangular base of length 5cm and width 4cm, having height of 15cm

Ans. Given, Length $=5\text{cm}$

Width $=4\text{cm}$

Height $=15\text{cm}$

Volume of the tin can $V=l\times b\times h$

$=5\times 4\times 15=300\,\text{cm}^3$

(ii) a plastic cylinder with circular base of diameter 7cm and height 10cm. Which container has greater capacity and how much?

Ans. Given, Diameter $=7\text{cm}$, Height $=10\text{cm}$ $\pi=\frac{7}{2}$ Volume $=\pi r^2 h$

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

Difference $=385\text{cm}^3-300\text{cm}^3=85\text{cm}^3$

Hence, Cylinder container has greater capacity by 85 cubic cm.

14. It costs $\text{Rs. } 2200$ to paint the inner curved surface of a cylindrical vessel $10\,\text{m}$ deep. If the cost of painting is at the rate of Rs. 20 per m^2, find:

(i) inner curved surface area of the vessel.

Ans. Total cost to paint inner curved surface area of the vessel $= \text{Rs. } 2200$

Rate $= Rs.\ 20$ per square meter

Inner curved surface area of vessel $= \dfrac{\text{Total cost}}{\text{Rate}}$

$= \dfrac{2200}{20} = 110\,\text{m}^2$

(ii) radius of the base.

Ans. Depth of the vessel $(h) = 10\,\text{m}$

Now, Inner surface area of vessel $= 110\,\text{m}^2$

$\Rightarrow 2\pi rh = 110$

$\Rightarrow 2 \times \dfrac{22}{7} \times r \times 10 = 110$

$\Rightarrow r = \dfrac{110 \times 7}{2 \times 22 \times 10} = 1.75\,\text{m}$

(iii) capacity of the vessel.

Ans. Since $r = 1.75\,\text{m}$ and $h = 10\,\text{m}$

$\therefore$ Capacity of vessel $=$ Volume of cylinder $= \pi r^2 h$

$= \dfrac{22}{7} \times 1.75 \times 1.75 \times 10 = 96.25\,\text{m}^3$

$= 96.25\text{kl}$

15. The capacity of a closed cylindrical vessel of height 1m is 15.4 litres. How many square meters of metal sheet would be needed to make it?

Ans. Height of the vessel $(h) = 1\text{m}$

Capacity of vessel $= 15.4$ liters

$= \frac{15.4}{1000}$ kilo liters

$= 0.0154 m^3$

$\Rightarrow \pi r^2 h = 0.0154$

$\Rightarrow \frac{22}{7} \times r^2 \times 1 = 0.0154$

$\Rightarrow r^2 = \frac{0.0154 \times 7}{22}$

$\Rightarrow r^2 = 0.0007 \times 7 = 0.0048$

$\Rightarrow r = 0.07\text{m}$

Now, Area of metal sheet required $=$ TSA of cylindrical vessel

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

$= 2 \times \frac{22}{7} \times 0.07(1 + 0.07)$

$= \frac{44}{7} \times 0.07 \times 1.07$

$= 0.4708\text{m}^2$

16. Find the capacity of a conical vessel with:

(i) Radius 7cm**, Slant height** 25cm

Ans. Given: $r=7\text{cm},\ l=25\text{cm}$

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

$=\sqrt{(25)^2-(7)^2}$

$=\sqrt{625-49}$

$=\sqrt{576}=24\text{cm}$

Capacity of conical vessel $=\frac{1}{3}\pi r^2 h$

$=\frac{1}{3}\times\frac{22}{7}\times7\times7\times24=1232\text{cm}^3$

$=1.232$ liters

(ii) Height $12\textbf{cm}$**, Slant height** 13cm

Ans. Given: $h=12\text{cm},\ l=13\text{cm}$

$r=\sqrt{l^2-h^2}=\sqrt{(13)^2-(12)^2}$

$=\sqrt{169-144}$

$=\sqrt{25}=5\text{cm}$

Capacity of conical vessel $=\frac{1}{3}\pi r^2 h$

$=\frac{1}{3}\times\frac{22}{7}\times5\times5\times12=\frac{2200}{7}\text{cm}^3$

$=\frac{2200}{7}\times\frac{1}{1000}$ liters

$= \frac{11}{35}$ liter

17. If the triangle ABC in question 7 above is revolved about the side 5cm, then find the volume of the solid so obtained. Find, also, the ratio of the volume of the two solids obtained.

Ans. When right angled triangle ABC is revolved about side 5cm, then the solid formed is a cone.

In that cone, Height $(h) = 5\text{cm}$

And radius $(r) = 12\text{cm}$

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

$= \frac{1}{3}\pi \times 12 \times 12 \times 5$

$= 240\pi \text{cm}^3$

Now, $\frac{\text{Volume of cone in Q. No. 7}}{\text{Volume of vone in Q. No. 8}} = \frac{100\pi}{240\pi} = \frac{5}{12}$

$\therefore$ Required ratio $= 5:12$

18. 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 $=\frac{4}{3}\pi r^3$

$=\frac{4}{3}\times\pi\times\frac{x}{2}\times\frac{x}{2}\times\frac{x}{2}=\frac{1}{8}\times\frac{4}{3}\pi x^3$

According to question,

Diameter of moon $=\frac{1}{4}\times$ Diameter of earth

$=\frac{1}{4}\times x=\frac{x}{4}$

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

Now, Volume of Moon $=\frac{4}{3}\pi R^3$

$=\frac{4}{3}\times\pi\times\frac{x}{8}\times\frac{x}{8}\times\frac{x}{8}=\frac{1}{512}\times\frac{4}{3}\pi x^3$

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

$=\frac{1}{64}\times\text{Volume of Earth}$

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

19. How many litres of milk can a hemispherical bowl of diameter 10.5 hold?

Ans. Diameter of hemispherical bowl = $10.5\,\text{cm}$

$\therefore$ Radius of hemispherical bowl $(r)=\frac{10.5}{2}=5.25\,\text{cm}$

Volume of milk in hemispherical bowl $=\frac{2}{3}\pi r^3$

$=\frac{2}{3}\times\frac{22}{7}\times 5.25\times 5.25\times 5.25$

$=\frac{2}{3}\times\frac{22}{7}\times\frac{525}{100}\times\frac{525}{100}\times\frac{525}{100}$

$=11\times\frac{21}{4}\times\frac{21}{4}=303.187\,\text{cm}^3$

$=\frac{303.187}{1000}$ liters

$=0.303187$ liters $=0.303$ liters

20. Find the volume of a sphere whose surface area is $154\,\text{cm}^2$.

Ans. Surface area of sphere $=154\,\text{cm}^2$

$\Rightarrow 4\pi r^2=154$

$\Rightarrow 4\times\frac{22}{7}\times r^2=154$

$\Rightarrow r^2=\frac{154\times 7}{4\times 22}=\frac{49}{4}$

$\Rightarrow r=\frac{7}{2}\text{cm}$

Now, Volume of sphere $=\frac{4}{3}\pi r^3=\frac{4}{3}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times\frac{7}{2}$

$=\frac{1}{3}\times 11\times 49=\frac{539}{3}$

$=179\frac{2}{3}\text{cm}^3$

21. A wooden bookshelf has external dimensions as follows: Height $=110\text{cm}$, Depth $=25$cm, Breadth $=85\text{cm}$. The thickness of the planks is 5cm everywhere. The external faces are to be polished and the inner faces are to be painted. If the rate of polishing is 20 paise per cm^2 and the rate of painting is 10 paise per cm^2, find the total expenses required for polishing and painting the surface of the bookshelf

Ans. External faces to be polished

$=$Area of six faces of cuboidal bookshelf -3(Area of open portion ABCD)

$=2(110\times25+25\times85+85\times110)-3(75\times30)$

$=2(2750+2125+9350)-3\times2250$

$=2\times14225-6750$

$=28450-6750$

Now, cost of painting outer faces of wodden bookshelf at the rate of 20 paise.

$=$ Rs. 0.20 per cm^2

$=$ Rs. $0.20\times21700=$ Rs. 4340

Here, three equal five sides inner faces.

Therefore, total surface area $=3[2(30+75)20+30\times75]$ [Depth $=25-5=20\text{cm}$]

$=3[2\times105\times20+2250]=3[4200+2250]$

$=3\times6450=19350\text{cm}^2$

Now, cost of painting inner faces at the rate of 10 paise i.e. Rs. 0.10 per cm^2.

$=Rs\ 0.10\times19350=$ Rs. 1935

22. If diameter of a sphere is decreased by 25% then what percent does its curved surface area decrease?

Ans. Diameter of original sphere $= D = 2R$

$\Rightarrow R = \frac{D}{2}$

Curved surface area of original sphere $= 4\pi R^2$

$= 4\pi\left(\frac{D}{2}\right)^2 = \pi D^2$

According to the question, Decreased diameter $= 25\%$ of $D = \frac{25}{100}D$

$= \frac{D}{4}$

$\therefore$ Diameter of new sphere $= D - \frac{D}{4} = \frac{3D}{4}$

$\therefore$ Radius of new sphere $= \frac{3D}{8}$

Now, curved surface area of new sphere $= 4\pi r^2 = 4\pi\left(\frac{3D}{8}\right)^2$

$= \frac{9\pi}{16}D^2$

Change in curved surface area $= \pi D^2 - \frac{9\pi}{16}D^2$

$= \frac{7}{16}\pi D^2$

Percent change in the curved surface area $= \frac{\text{Change in curved surface area}}{\text{Curved surface area of origianal sphere}}$

$\times 100 \ = \frac{7}{\frac{7}{16}\pi D^2}\pi D^2 \times 100$

$= \frac{7}{16} \times 100 = 43.75\%$

23. The surface area of cuboids is $3328\,\text{m}^2$; its dimensions are in the ratio $4:3:2$. Find the volume of the cuboid.

Ans. Let the dimensions of the cuboid be $4x, 3x$ and $2x$ meters

Surface area of the cuboid $= 2(4x \times 3x + 3x \times 2x + 2x \times 4x)\, sq\ m$

$= 2\left(12x^2 + 6x^2 + 8x^2\right) sq\ m$

$= 52x^2 sqm \rightarrow (i)$

Given surface area $= 3328\,\text{sq m}$

From (i) and (ii) we get

$52x^2 = 3328$

or $x^2 = \frac{3328}{52} = 64$

or $x = 8$

$\therefore 4x = 32, 3x = 24$ and $2x = 16$

Thus, the dimensions of the cuboid are $32\text{m}, 24\text{m}$ and 16m

$\therefore$ Volume of the cuboid $= (32 \times 24 \times 16)m^3$

$= 12288\,\text{cu m}$

24. The volume of a rectangular slower of stone is 10368dm^3 and is dimensions are in the ratio of 3:2:1. (i) Find the dimensions (ii) Find the cost of polishing its entire surface @ Rs. 2 per dm^2.

Ans. Let the length of the block be $3x\ dm$

Width $= 2\times dm$ and height $= \text{x dm}$

Volume of the block $= 10368\text{dm}^3$

$\therefore 3x\times 2x\times x = 10368$

or $x^3 = \frac{10368}{6}$

$= 1728$

$\therefore x = \sqrt[3]{1728}$

$= \sqrt[3]{12\times 12\times 12}$ $= 12$

also $2x = 24$ and $3x = 36$

Thus, dimensions of the block are $36\,\text{dm}$, $24\,\text{dm}$ and $12\ \text{dm}$

Surface area of the block $= 2(36\times 24 + 24\times 12 + 36\times 12)\ dm^2$

$= 2(864 + 288 + 432)dm^2$

$= 2\times 1584 dm^2$

$= 3168\text{dm}^2$

Cost of polishing the surface $= Rs(2\times 3168)$

$=$ Rs. 6336

25. In a cylindrical drum of radius 4.2m and height 3.5m, how many full bags of wheat can be emptied if the space required for each bag is 2.1cum.

Ans. Radius of the drum $= 4.2\,\text{m} = \frac{42}{10}m$

Height of the drum $= 3.5\,\text{m} = \frac{35}{10}m$

$\therefore$ Volume of the drum $= \pi r^2 h$ cu units

$= \left(\frac{22}{7}\times\frac{42}{10}\times\frac{42}{10}\times\frac{35}{10}\right)$ cu m …..(i)

Volume of wheat in each bags $= 2.1\text{cu m} = \frac{21}{10}\text{cu m}$

$$= \frac{\text{volume of drum}}{\text{volume of wheat in each bag}}$$

$$= \frac{\frac{22}{7}\times\frac{42}{10}\times\frac{42}{10}\times\frac{35}{10}}{\frac{21}{10}}$$

$$= \frac{924}{10} = 92.4$$

$= 92$

Hence the number of full bags is 92.

26. The inner diameter of a cylindrical wooden tripe is 24cm. and its outer diameter is 28cm. the length of wooden tripe is 35cm. find the mass of the tripe, if $1\,\text{cu cm}$ of wood has a mass of 0.6g.

Ans. Inside diameter of the pipe $= 24\text{cm}$

Outside diameter of the pipe $= 28\text{cm}$

Length of the pipe $=35\text{cm}=\text{h}$

Outside radius of the pipe $=\frac{28}{2}\text{cm}=14\text{cm}=R$

Volume of the wood = External volume – Internal volume

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

$=\pi\times 35\left(14^2-12^2\right)\text{ cu cm}$

$=\frac{22}{7}\times 35(14+12)(14-12)\text{ cu cm}$

$=5720\text{ cu cm}$

Mass of $1\text{ cu cm}=0.6\text{g}$

$\therefore$ Mass of the pipe $=(0.6\times 5720)g$

$=3432\text{g}$

$=3.432\text{kg}$

27. A patient in a hospital is given soup daily in a cylindrical bowl of a diameter 7cm. If the bowl is filled with soup to height of 4cm. How much soup the hospital has to prepare daily to serve 250 patients?

Ans. Diameter of the bowl $=7\text{cm}$.

Radius of the bowl $=\frac{7}{2}\text{cm}$

Height up to which soup is filled $(\text{h})=4\text{cm}$.

Volume of the soup in one bowl $=\pi r^2 h$

$=\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times 4\text{ cu cm}$

$=154$ cu cm

$\therefore$ soup given to one patient $=154$ cu cm.

Soup given to 250 patients $=250\times154$ cu cm

$=38500$ cu cm

$=\frac{38500}{1000}$ ltrs

$=38.5$ ltrs.

Hence the hospital has to prepare 38.5 litre daily to serve 250 patients.

28. The diameter of a roller is 84cm and its length is 120cm. It takes 500 complete revolutions to move once over to level a playground.

(a) Find the area of playground in sq m.

Ans. $R=$ Radius of the roller $=\frac{84}{2}$

Area $=42\text{cm}=0.42m$

$H=$ length of the roller $=120\text{cm.}=1.2\text{m}$.

Area covered in the revolution $=2\pi rh\, sq$ unit

$=\frac{2\times22\times0.42\times1.2}{7}$

$=3.168$ sq m

$\therefore$ Area covered in 500 revolutions $=500\times3.168$ sq m

$=1584$ sq m

Thus, area of playground $=1584$sqm.

(b) Determine the cost of leveling the playground at the rate of Rs 1.75 per sq m.

Ans. cost of leveling 1 sq m. of playground $= Rs\ 1.75$

Cost of total leveling $= \mathrm{Rs}(1584 \times 1.75)$

$= \mathrm{Rs}\ 2772$

29. A metal cube of edge $12\,\mathrm{cm}$ is melted and formed into three similar cubes. If the edge of two smaller cubes is $6\,\mathrm{cm}$ and $8\,\mathrm{cm}$, find the edge of the third smaller cube (Assuming that there is no loss of metal during melting).

Ans. Volume of cube with edge $12\,\mathrm{cm} = (12)^3$ cu cm.

$= 1728$ cu cm ....(1)

Volume of the first smaller cube with edge $6\,\mathrm{cm} = (6)^3$ cu cm

$= 216$ cu cm ....(2)

Volume of the second smaller cube with edge $8\,\mathrm{cm.} = (8)^3$ cu cm

$= 512$cu cm…....(3)

Let the edge of the third smaller cube be a cm.

$\therefore$ Volume of the third smaller cube $= 9^2\ \mathrm{cm}^3$........(4)

$216 + 512 + a^3 = 1728$ [using (1) and (2)]

By the given condition.

area $728a^3 = 1728$

Area $a^3 = 1728 - 728 = 1000 = (10)^3$

$\therefore a = 10$

Thus, the edge of the third required cube is 10cm.

30. How many bricks, each measuring 18cm by 12cm by 10cm will be required to build a wall 15m long 6dm wide and 6.5m high when $\frac{1}{10}$ of its volumes occupied by mastar? Please find the cost of the bricks to the nearest rupees, at Rs 1100 per 1000 bricks.

Ans. Length of the wall $= 15\text{m.} = 1500\text{cm}$.

Width of the wall $= 6\text{ dm.} = 60\text{cm}$.

Height of the wall $= 6.5\text{m.} = 650\text{cm}$.

$\therefore$ Volume of the wall $= (1500 \times 60 \times 650)$ cu cm

$= 58500000$ cu cm. $\rightarrow$ (I)

Volume occupied by master $= \left(\frac{1}{10} \times 58500000\right)$ cu cm

$= 5850000$ cu cm. $\rightarrow$ (ii)

$\therefore$ Volume occupied by bricks $= (i) - (ii)$

$= (58500000 - 5850000)$ cu cm

$= 52650000$ cu cm. $\rightarrow$ (iii)

Volume of a brick $= (18 \times 12 \times 10)$ cu cm

$= 2160$ cu cm. $\rightarrow$ (iv)

$\therefore$ No of brick required

$= \frac{52650000}{2160}$

$= 24375$

cost of 1000 bricks = Rs 1100

Total cost $= \text{Rs} \frac{24375 \times 1100}{1000}$

$= Rs\ 26812.50$

31. A river 3m deep and 40m wide is flowing at the rate of 2km per hour. How much will fall into the sea in a minute?

Ans. Depth of river $= 3\text{m}$

Water of the river $= 40\text{m}$

Rate of flow of water $= 2\text{km/hr} = 2000\text{m/hr}$

$\therefore$ Volume of water flowing in one hour

$= 2000 \times 40 \times 3$

$= 240000 m^3$

Hence, Volume of water flowing in one minute $= \frac{240000}{60} = 4000\text{m}^3$

32. If the lateral surface of a cylinder is 94.2cm^2 and its height is 5cm. then find

(i) radius of its base

Ans. Given lateral surface of cylinder $= 94.2\text{cm}^2$

$2\pi rh = 94.2\text{cm}^2$

$\text{H} = 5\text{cm}$

$2\pi r \times 5 = 94.2$

$r = \frac{94.2}{10\pi} = \frac{94.2}{10 \times 3.14}\text{cm}$

$\text{R} = 3\text{cm}$

(ii) its volume $[\pi = 3.14]$

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

$= 3.14 \times 3^2 \times 5$

$= 141.3\text{cm}^3$

33. A shot put is a metallic sphere of radius 4.9cm **If the density of the metal is** 7.8g **per** cm^3 **Find the mass of the shot put.**

Ans. Volume of sphere $= \frac{4}{3}\pi r^3$ and radius $\text{r} = 4.9\text{cm}$

$= \frac{4}{3} \times \frac{22}{7} \times 4.9 \times 4.9 \times 4.9\text{cm}^3$

$= 493\text{cm}^3$

Mass of 1cm^3 of metal is 7.8g

Mass of the shot put = volume × density

$= 7.8 \times 493 g$

$= 3845.44 g = 3.85\text{kg}$

34. The capacity of a hemispherical tank is $155.232 l$. **Find its radius.**

Ans. Capacity of tank $=$ Its Volume $=\frac{2}{3}\pi r^3$

$\frac{2}{3}\pi r^3 = 155.232l$

$= 155.232 \times 1000\,\text{cm}^3$

$= 155232\,\text{cm}^3$

$\frac{2}{3}\times\frac{22}{7}\times r^3 = 155232,$

$r^3 = \frac{155232\times3\times7}{2\times22}$

$r^3 = 3528\times3\times7$

$r^3 = (2\times3\times7)^3$

$r = 2\times3\times7 = 42\,\text{cm}$

Hence radius of tank $= 42\,\text{cm}$

35. What length of tarpaulin 3m wide will required to make conical tent of height 8m and base radius 6m ? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately $20\,\text{cm}$

Ans. Here $\text{h} = 8\text{m}$ and $\text{r} = 6\text{m}$

$l = \sqrt{r^2 + h^2} = \sqrt{36+64} = 10\,\text{m}$

Curved surface area $= \pi rl$

$= 3.14\times6\times10 = 188.4\,\text{m}^2$

Length of tarpaulin required $= \frac{\text{area}}{\text{width}} = \frac{188.4}{3}$

$= 62.8m$

Extra length required for wastage $= 20\text{cm} = 0.2\text{m}$

Hence, total length required $= 62.8 + 0.2$

$= 63\text{m}$

36. A capsule of medicine is in the shape of a sphere of diameter 3.5mm How much medicine $(\text{in} \text{mm}^3)$ is needed to fill this capsule?

Ans. Given radius of capsule $= \frac{3.5}{2}\text{mm}$

Amount of medicine = Volume of capsule $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{(3.5)^3}{2}\text{mm}^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2} \times \frac{3.5}{2}$

$= 22.46\text{mm}^3(\text{ approx })$

37. A wall of length 10m was to be built across an open ground. The height of wall is 4m and thickness of the wall is 34cm. If this wall is to be built up with bricks whose dimensions are $24\text{cm} \times 12\text{cm} \times 8\text{cm}$. How many bricks would be required

Ans. Length of wall $= 10\text{m} = 1000\text{cm}$

Thickness $= 24\text{cm}$

Height $= 4\text{m} = 400\text{cm}$

Volume of wall $=$ length $\times$ thickness $\times$ height $= 1000 \times 24 \times 400 \, \text{cm}^3$

Now each brick is a cuboid with length $= 24 \text{cm}$

Breadth $= 12 \text{cm}$ and height $= 8 \text{cm}$

Volume of each brick $= 1 \times b \times h = 24 \times 12 \times 8 \, \text{cm}^3$

Number of bricks required $= \dfrac{\text{volume of the wall}}{\text{volume of each brick}}$

$$= \frac{1000 \times 24 \times 400}{24 \times 12 \times 8} = 4166.6$$

The wall requires 4167 bricks.

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

Ans. Radius of base of cylinder $= 20 \text{cm}$

Height of pillar $= 10 \text{m} = 1000 \text{cm}$

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

$$= \frac{22}{7} \times 20 \times 20 \times 1000 \, \text{cm}^3$$

$$= \frac{8800000}{7} \text{cm}^3$$

$$= \frac{8.8}{7} m^3$$

$\therefore$ Volume of 14 pillars $=$ volume of each cylinder $\times 14$

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

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

39. A right triangle ABC with sides $5\text{cm}, 12\text{cm}$, and 13cm is revolved about the side 12 cm, find the volume of the solid so obtained

Ans. The solid obtained by revolving the given right triangle is a right circular cone with radius $= 5\text{cm}$

And height $= 12\text{cm}$

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

$= \frac{1}{3}\pi \times 5^2 \times 12 = 100\pi\text{ cm}^3$

40. The inner diameter of a circular well is 3.5cm. It is 10m deep find.

(i) Its inner curved surface area.

Ans. Given Inner diameter of well $= 3.5\text{m}$

$\therefore$ Inner radius $= \frac{3.5}{2} = \frac{7}{4}m$

$r = \frac{7}{4}m$ and depth $h = 10m$

(i) $\therefore$ Inner surface area $= 2\pi rh$

$= \left(2 \times \frac{22}{7} \times 1.75 \times 10\right)\text{m}^2$

$= \left(2 \times \frac{22}{7} \times \frac{175}{100} \times 10\right)\text{m}^2$

$= \left(2 \times 22 \times \frac{25}{10}\right) \mathrm{m}^2$

$= 110\,\mathrm{m}^2$

(ii) the cost of plastering this curved surface at the rate of Rs 40 per

Ans. The cost of plastering is Rs 40 per m^2

$\therefore$ Cost of plastering this surface area $= Rs\ 40 \times 110$

$= Rs\ 4400$

41. A Godown measures $40m \times 25m \times 10m$. Find the maximum number of wooden crates each measuring $10m \times 1.25m \times 0.5m$ that can be stored in the go down

Ans. Dimensions of Godown

$= 40m \times 25m \times 10m$

Volume of Godown $= 40m \times 25m \times 10m = 10000m^3$

volume of wooden carts $= 10m \times 1.25m \times 0.5m = 6.25m^3$

No. of wooden crates $= \frac{10,000}{6.25}$

$= 800$

Hence, 800 wooden crates are required.

42. The volume of a right circular cylinder is $576\pi \mathrm{cm}^3$ and radius of its base is $8\,\mathrm{cm}$. Find the total surface area of the cylinder.

Ans. Volume of cylinder $= 576\pi \mathrm{cm}^3$

$r = 8\text{cm}$

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

$\pi r^2 h = 576\pi$

$h = \frac{576}{r^2} = \frac{576}{8^2} = 9$

$\text{H} = 9\text{cm}$

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

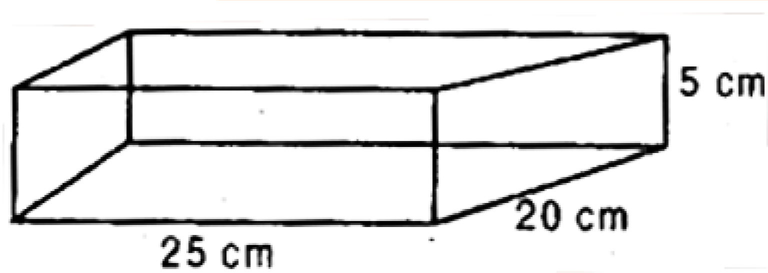
$= 2 \times \frac{22}{7} \times (8+9)\text{cm}^2$

$= \frac{16 \times 22 \times 17}{7}\text{cm}^2$

$= 854.989\text{cm}$

Long Answer Questions **4 Mark**

1. Shanti Sweets Stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions 25cm **by** 20 cm **by** 5cm **and the smaller of dimensions** 15cm **by** 12cm **by** 5cm. 5% **of the total surface area is required extra, for all the overlaps. If the cost of the card board is** Rs. 4 **for** 1000cm^2**, find the cost of cardboard required for supplying** 250 **boxes of each kind.**



Ans. Given, Length of bigger cardboard box $(L) = 25\text{cm}$

Breadth $(B) = 20\text{cm}$ and Height $(H) = 5\text{cm}$

Total surface area of bigger cardboard box

$= 2(LB + BH + HL)$

Substitute values

$= 2(25 \times 20 + 20 \times 5 + 5 \times 25)$

$= 2(500 + 100 + 125)$

$= 1450\text{cm}^2$

5% extra surface of total surface area is required for all the overlaps.

$\Rightarrow 5\%$ of $1450 = \frac{5}{100} \times 1450 = 72.5\text{cm}^2$

Now, total surface area of bigger cardboard box with extra overlaps

$= 1450 + 72.5 = 1522.5\text{cm}^2$

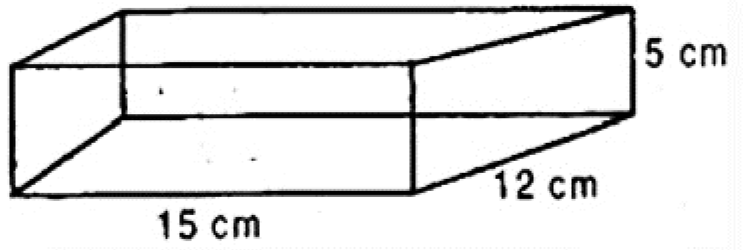
$\Rightarrow$ Total surface area with extra overlaps of 250 such boxes

$= 250 \times 1522.5 = 380625\text{cm}^2$

Since, Cost of the cardboard for $1000\text{cm}^2 =$ Rs. 4

Now, Cost of the cardboard for $1\text{cm}^2 =$ Rs. $\frac{4}{1000}$

Cost of the cardboard for $380625\text{cm}^2 =$ Rs. $\frac{4}{1000} \times 380625 =$ Rs. 1522.50



Now length of the smaller box $(l) = 15\text{cm}$,

Breadth $(b) = 12\text{cm}$ and Height $(h) = 5\text{cm}$

Total surface area of the smaller cardboard box

$= 2(lb + bh + hl)$

Substitute values

$= 2(15 \times 12 + 12 \times 5 + 5 \times 15)$

$= 2(180 + 60 + 75)$

$= 2 \times 315 = 630\text{cm}^2$

5% of extra surface of total surface area is required for all the overlaps.

Thus, $5\% \text{ of } 630 = \frac{5}{100} \times 630 = 31.5\text{cm}^2$

Total surface area with extra overlaps $= 630 + 31.5 = 661.5\text{cm}^2$

Now Total surface area with extra overlaps of 250 such smaller boxes

$= 661.5 \times 250 = 165375\text{cm}^2$

Cost of the cardboard for $1000\text{cm}^2 =$ Rs. 4

Cost of the cardboard for $1\text{cm}^2 =$ Rs. $\frac{4}{1000}$

Cost of the cardboard for $165375\text{cm}^2 =$ Rs. $\frac{4}{1000} \times 165375 =$ Rs. 661.50

Therefore, Total cost of the cardboard required for supplying 250 boxes of each kind

$=$Total cost of bigger boxes $+$ Total cost of smaller boxes

$=$ Rs. $1522.50+$ Rs. 661.50

$=$ Rs. 2184

2. Find

(i) the lateral or curved surface area of a petrol storage tank that is 4.2m in diameter and 4.5m high.

Ans. Diameter of cylindrical petrol tank $=4.2\text{m}$

Thus, Radius of the cylindrical petrol tank $=\frac{4.2}{2}=2.1\text{m}$

And Height of the $\text{tank}=4.5\text{m}$

Therefore, Curved surface area of the cylindrical tank

$=2\pi rh=2\times\frac{22}{7}\times 2.1\times 1.45=59.4\text{m}^2$

(ii) how much steel was actually used if $\frac{1}{12}$ of the steel actually used was wasted in making the tank?

Ans. Let the actual area of steel used be x meters

Since $\frac{1}{12}$ of the actual steel used was wasted, the area of steel which has gone into the tank.

$$x-\frac{1}{12}x=\frac{11}{12}x$$

$$\frac{11}{12}x = 59.4$$

$$\Rightarrow x = 59.4 \times \frac{12}{11} = 64.8\,\text{m}^2$$

Hence, the steel actually used is $64.8\,\text{m}^2$.

3. A hemispherical bowl made of brass has inner diameter $10.5\,\text{cm}$. Find the cost of tinplating it on the inside at the rate of Rs. 16 per $100\,\text{cm}^2$.

Ans. Inner diameter of bowl $= 10.5\,\text{cm}$

Thus, Inner radius of bowl $(r) = \frac{10.5}{2} = 5.25\,\text{cm}$

Now, Inner surface area of bowl $= 2\pi r^2$

$$= 2 \times \frac{22}{7} \times 5.25 \times 5.25$$

$$= 2 \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} = \frac{693}{4}\,\text{cm}^2$$

$\because$ cost of tin-plating per $100\,\text{cm}^2 =$ Rs. 16

Then, Cost of tin-plating per $1\,\text{cm}^2 = \frac{16}{100}$

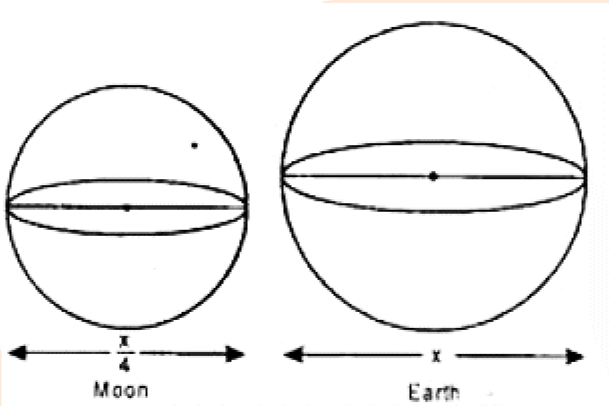
Therefore, Cost of tin-plating per $\frac{693}{4}\,\text{cm}^2 = \frac{16}{100} \times \frac{693}{4} =$ Rs. 27.72

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

Ans. Let diameter of Earth $= x$

Thus, Radius of Earth $(r)=\frac{x}{2}$

Surface area of Earth $=4\pi r^2=4\pi\times\frac{x}{2}\times\frac{x}{2}=\pi x^2$



Now, Diameter of Moon $=\frac{1}{4}th$ of diameter of Earth $=\frac{x}{4}$

Thus, Radius of Moon$(r)=\frac{x}{8}$

Surface area of Moon $=4\pi r^2=4\pi\times\frac{x}{8}\times\frac{x}{8}=\frac{\pi x^2}{16}$

Now, Ratio $=\frac{\text{Surface area of Moon}}{\text{Surface area of Earth}}=\frac{\frac{\pi x^2}{16}}{\pi x^2}=\frac{\pi x^2}{16}\times\frac{1}{\pi x^2}=\frac{1}{16}$

Therefore, required ratio $=1:16$

5. A solid cube of side 12cm is cut into eight cubes of equal volume. What will be the side of the new cube? Also, find the ratio between their surface areas.

Ans. Volume of solid cube $=(\text{ side })^3=(12)^3=1728\text{cm}^3$

Volume of each new cube $=\frac{1}{8}$ (Volume of original cube)

$=\frac{1}{8}\times 1728=216\text{cm}^3$

Side of new cube $=\sqrt[3]{216}=6\text{cm}$

Now, Surface area of original solid cube $=6(\text{ side })^2$

$=6\times 12\times 12=864\text{cm}^2$

Now, Surface area of original solid cube $=6\ (\text{side})^2$

$=6\times 6\times 6=216\text{cm}^3$

Now according to the question,

$$\frac{\text{Surface area of original cube}}{\text{Surface area of new cube}}=\frac{864}{216}=\frac{4}{1}$$

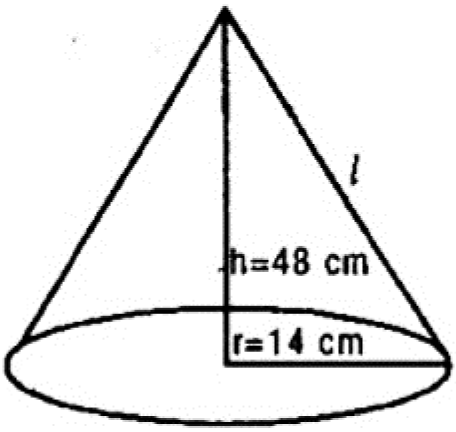
Hence, required ration between surface area of original cube to that of new cube $=4:1$.

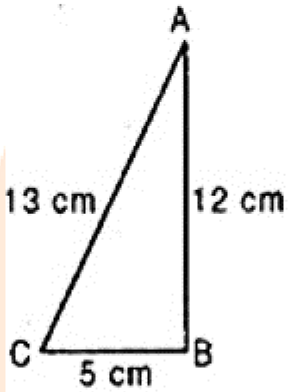
6. The volume of a right circular cone is 9856cm^3. If the diameter of the base if 28cm, find:

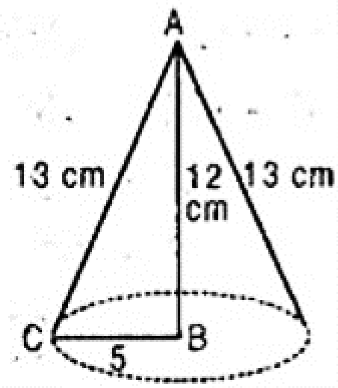
(i) Height of the cone

Ans. Diameter of cone $=28\text{cm}$

Radius of cone $=14\text{cm}$







Volume of cone $= 9856\,\text{cm}^3$

$$\Rightarrow \frac{1}{3}\pi r^2 h = 9856$$

$$\Rightarrow \frac{1}{3}\times\frac{22}{7}\times 14\times 14\times h = 9856$$

$$\Rightarrow h = \frac{9856\times 3\times 7}{22\times 14\times 14} = 48\,\text{cm}$$

(ii) Slant height of the cone

Ans. Slant height of cone $(l) = \sqrt{r^2 + h^2}$

$$= \sqrt{(14)^2 + (48)^2} = \sqrt{196 + 2304}$$

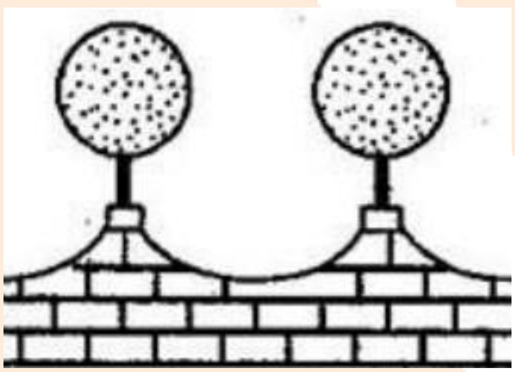
$$= \sqrt{2500} = 50\,\text{cm}$$

(iii) Curved surface area of the cone.

Ans. Curved surface area of cone $= \pi rl$

$$= \frac{22}{7} \times 14 \times 50 = 2200\,\text{cm}^2$$

7. The front compound wall of a house is decorated by wooden spheres of diameter 21cm, placed on small supports as shown in figure. 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 he cost of paint required if silver paint costs 25 paise per cm^2 and black paint costs 5 paise per cm^2



Ans. Diameter of a wooden sphere $= 21\text{cm}$.

Then, Radius of wooden sphere $(R) = \frac{21}{2}\text{cm}$

And Radius of the cylinder $(r) = 1.5\text{cm}$

Surface area of silver painted part = Surface area of sphere - Upper part of cylinder for support

$$= 4\pi R^2 - \pi r^2$$

$$= \pi\left(4R^2 - r^2\right)$$

Substitute values

$$=\frac{22}{7}\times\left[4\times\left(\frac{21}{2}\right)^2-\left(\frac{15}{10}\right)^2\right]$$

$$=\frac{22}{7}\times\left[\frac{4\times441}{4}-\frac{9}{4}\right]$$

$$=\frac{22}{7}\left[\frac{1764-9}{4}\right]$$

$$=\frac{22}{7}\times\frac{1755}{4}=1378.928\,\text{cm}^2$$

Surface area of such type of 8 spherical part $=8\times1378.928$

$=11031.424\,\text{cm}^2$

Since, Cost of silver paint over $1\text{cm}^2=$ Rs. 0.25

Therefore, Cost of silver paint over $11031.928\,\text{cm}^2=0.25\times11031.928=$ Rs. 2757.85

Now, curved surface area of a cylindrical support $=2\pi rh$

$$=2\times\frac{22}{7}\times\frac{15}{10}\times7=66\,\text{cm}^2$$

Curved surface area of 8 such cylindrical supports $=66\times8=528\,\text{cm}^2$

Since, Cost of black paint over 1cm^2 of cylindrical support = Rs. 0.50

Therefore, Cost of black paint over $528\,\text{cm}^2$ of cylindrical support $=0.50\times528$

$=$ Rs. 26.40

Therefore, Total cost of paint required = Rs. $2757.85+$ Rs. $26.4=\text{Rs.}2784.25$

8. The difference between outside and inside surface of a cylindrical metallic tripe 14 cm long is 44sqcm. If the tripe is made of 99cucm of metal, find the outer and inner radius of the tripe.

Ans. Let $\text{r}_1\text{ cm}$ and $\text{r}_2\text{ cm}$ can be the inner and outer radii respectively of the pipe

Area of the outside surface $=2\pi r_2 h$ sq unit

Area of the inside surface $=2\pi r_1 h$ unit

By the given condition

$2\pi r_2 h - 2\pi r_1 h = 44$

or $2\pi h\left(r_2 - r_1\right) = 44$

$\therefore 2\times\frac{22}{7}\times 14\times\left(r_2 - r_1\right) = 44(\because h = 14\text{cm})$

Or, $88\left(r_2 - r_1\right) = 44$

$\left(r_2 - r_1\right) = \frac{1}{2} \rightarrow (2)$

Again volume of the metal used in the pipe $== \pi\left(r_2^2 - r_1^2\right)h$ cu units

$\frac{22}{7}\left(r_2^2 - r_1^2\right)\times 14 = 99$

or, $44\left(r_2^2 - r_1^2\right) = \frac{99}{44} = \frac{9}{4} \rightarrow (2)$

Divide (1) by (2)

$\frac{\left(r_2^2 - r_1^2\right)}{r_2 - r_1} = \frac{9}{4}\div\frac{1}{2}$

Or, $r\frac{(r_2-r_1)(r_2+r_1)}{(r_2-r_1)}=\frac{9}{4}\times\frac{2}{1}$ $\quad \therefore (r_2+r_1)=\frac{9}{2}$

Also, $(r_2-r_1)=\frac{1}{2}[\text{ From}(1)]$

$2r_2=5$

Adding

$r_2=\frac{5}{2}$

And, $\frac{5}{2}+r_1=\frac{9}{2}$

Therefore, $r_1=\frac{9}{2}-\frac{5}{2}$

Or, $r_1=2$

Thus, outer radius $=2.5\text{cm}$ and inner radius $=2\text{cm}$.

9. The ratio between the radius of the base and height of a cylinder is $2:3$. **Find the total surface area of the cylinder if its volume is** 1617cm^3

Ans. Let the radius of the base of the cylinder be 2xcm.

Thus, Height of the cylinder $=3x\text{cm}$.

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

$=\frac{22}{7}\times(2x)^2\times 3x$ cu cm.

$=\frac{22}{7}\times 4x^2\times 3x$ cu cm.

$= \frac{264}{7} x^3 \text{cucm}$

By the given condition

$\frac{264}{7} x^3 = 1617$

$x^3 = \frac{1617 \times 7}{264} = \frac{49 \times 7}{8} = \left(\frac{7}{2}\right)^3$

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

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

Total surface area $= 2\pi r(r+h)$ sq units

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

$= 44 \times \frac{35}{2} \text{sq cm}$

$= 770 \text{sq cm.}$

Thus total surface area of the cylinder is 770sq cm.

10. Twenty-seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S' find the

(i) radius r' ' of the new sphere

Ans. Total volume of 27 iron spheres $=$ Volume of new sphere

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

Volume of 27 spheres $=27\times\frac{4}{3}\pi r^3=\frac{108}{3}\pi r^3$

Volume of new sphere $=\frac{108}{3}\pi r^3$

$\frac{4}{3}\pi\left(r'\right)^3=\frac{108}{3}\pi r^3$

$\left(r'\right)^3=\frac{108}{3}\pi r^3\times\frac{3}{4\pi}$

$=27r^3$

Therefore, $r'=3r$.

(ii) ratio of S and S'

Ans. Surface area of original sphere $(S)=4\pi r^2$

Surface area of new sphere $\left(S'\right)=4\pi\left(r'\right)^2$

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

$=36\pi r^2$

Therefore, Ratio of S and $S'=\frac{4\pi r^2}{36\pi r^2}=\frac{1}{9}=1:9.$

11. Shanti sweets stall was placing an order for making cardboard boxes for packing their sweets two sizes of boxes were required. The bigger of dimensions and the smaller of dimensions $15\text{cm}\times12\text{cm}\times5\text{cm}$ for all the overlaps, 5% of the total surface area is required extra. If the cost of cardboard is Rs 4 for 1000cm^2. Find the cost of cardboard required for supplying 250 boxes of each kind.

Ans. Given dimensions of bigger box

$= 25\text{cm} \times 20\text{cm} \times 5\text{cm}$

Total surface area of bigger box

$= 2[25 \times 20 + 20 \times 5 + 25 \times 5]\text{cm}^2$

$= 2[500 + 100 + 125]\text{cm}^2 = 2 \times 725 = 1450\text{cm}^2$

Extra cardboard for packing $= 5\%$ of 1450cm^2

$= \frac{5}{100} \times 1450 = 72.5\text{cm}^2$

Cardboard used for making box $= 1450 + 72.5 = 1522.5\text{cm}^2$

Dimensions of smaller box $= 15\text{cm} \times 12\text{cm} \times 5\text{cm}$

Total surface area of smaller box $= 2[15 \times 12 + 12 \times 15 + 15 \times 5]\text{cm}^2$

$= 2[180 + 60 + 75]\text{cm}^2$

$= 2 \times 315\text{cm}^2 = 630\text{cm}^2$

Extra cardboard for packing $= 5\%$ of 630

$= \frac{5}{100} \times 630 = 31.5\text{cm}^2$

Total area of cardboard $= 630 + 31.5 = 661.5\text{cm}^2$

Total cardboard used for making 2 boxes

$= (1522.5 + 661.5)\text{cm}^2 = 2184\text{cm}^2$

Cardboard used for making 250 boxes $= 250 \times 2184 = 546000\text{cm}^2$

Cost of cardboard $= \frac{4}{1000} \times 546000 = \text{Rs.}2184$

12. A hollow spherical shell is made of a metal of density $9.6\,\text{g}/\text{cm}^3$. The external diameter of the shell is $10\,\text{cm}$ and its internal diameter is $9\,\text{cm}$. Find

(i) Volume of the metal contained in the shell

Ans. External diameter of the spherical shell= $10\,\text{cm}$

External radius $R = 5\,\text{cm}$

Internal diameter $= 9\,\text{cm}$

Internal radius $= \frac{9}{2}\text{cm} \quad r = \frac{9}{2}\text{cm}$

Volume of the metal $= \frac{4}{3}\pi\left[R^3 - r^3\right]\text{cm}^3$

Substitute values

$$= \frac{4}{3}\pi\left[5^3 - \left(\frac{9}{2}\right)^3\right]\text{cm}^3$$

$$= \frac{4}{3}\times\frac{22}{7}\left[125 - \frac{729}{8}\right]\text{cm}^3$$

$$= \frac{88}{21}\times\frac{271}{8}\text{cm}^3 = 141.95\,\text{cm}^3$$

(ii) Weight of the shell.

Ans. Weight of the shell = Volume $\times$ Density

$= 141.95\,\text{cm}^3 \times 9.6\,\text{gm}/\text{cm}^3$

$= 1363\,\text{gm}$

$= 1.363\,\text{kg}$

(iii) Outer surface area of the shell.

Ans. Outer surface area $=4\pi r^2$

$=4\pi(5)^2$

$=4\times\frac{22}{7}\times 25$

$=\frac{2200}{7}=314.389\,\text{cm}^2$