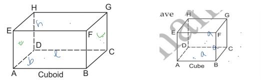
why solid?

it occupies solid

Find the volume, the total surface area and the lateral surface area of a cuboid which is 15 m long, 12 m wide and 4.5 m high.



$Vol = l \times b \times h$

$Vol = l \times b \times h = a \times a \times a = a^3$

Total Surface area $= lb + lb + bh + bh + lh + lh$

$= 2(lb + bh + lh)$

Lateral surface area $= bh + lh + bh + lh$

$= 2bh + 2lh$

$= (2b + 2l) \times h$

$= (2(l+b) \times h)$

Total Surface area $= a^2 + a^2 + a^2 + a^2 + a^2 + a^2$

floor ceil

$= 6a^2$

lateral Surface area $= ABEF + BFGC + CDGH + ADHE$

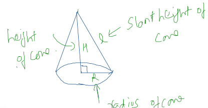
$= a^2 + a^2 + a^2 + a^2$

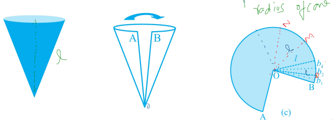
$= 4a^2$

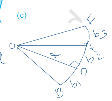
Area of four walls $= [2(l+b) \times h]$

How many bricks will be required to construct a wall 13.5 m long, 6 m high and 22.5 cm thick? It is being given that each brick measures (27 cm × 12.5 cm × 9 cm)?

13.4 Surface Area of a Right Circular Cone







$Area = \frac{1}{2} \times b_1 \times l + \frac{1}{2} \times b_2 \times l + \frac{1}{2} \times b_3 \times l \ldots$

$= \frac{1}{2} \times l (b_1 + b_2 + b_3 + \ldots)$

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

Curved Surface area $A = \pi r l$

$TSA = C.S.A$ of cone $+$ Area of circle.

$= \pi R l + \pi R^2$

$= \pi R (l + R)$

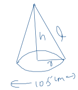
$\boxed{T.S.A = \pi R (R + l)}$

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

$CSA = \pi r l$

$= \frac{22}{7} \times \frac{10.5}{2} \times 10$

$\therefore 165\ cm^2$



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

$R = 12m$

$TSA = \pi R (R + l) = 1244.57\ m^2$

3. Curved surface area of a cone is 308 cm² and its slant height is 14 cm. Find (i) radius of the base and (ii) total surface area of the cone.

(i) $CSA = 308\ cm^2$ $l = 14\ cm$

$\pi r l = 308$

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

$r = \_\_\_\ cm$

(ii) $\pi R (R + l)$

$= \frac{22}{7} \times 7 (7 + 14)$

$= 22 \times 21$

$= 462\ cm^2$

4. A conical tent is 10 m high and the radius of its base is 24 m. Find
(i) slant height of the tent.
(ii) cost of the canvas required to make the tent, if the cost of 1 m² canvas is ₹ 70.

2 min

$3\ m^2$ canvas is ₹140

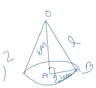
$\pi R (R + l)$

(i) In ΔAOB By PGT,

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

$= 100 + 576$

$l^2 = 676$, $l = \sqrt{676} = 26m$



(ii) $CSA = \pi r l$

$= \frac{22}{7} \times 24 \times 26$

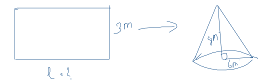
$= \frac{13728}{7}\ m^2$

$3\ m^2 = ₹140$

$1\ m^2 = ₹\frac{140}{3}$

$\frac{13728}{7}\ m^2 = \frac{140}{3} \times \frac{13728}{7}$

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



Area of tarpaulin = Area of cone

$l \times 3 = \pi r l$

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

$= 3.14 \times 6 (\sqrt{64 + 36})$

$= 3.14 \times 6 \times 10$

$l \times 3$

$l = \frac{3.14 \times 6 \times 10}{3} = 62.8\ m$

$l = 62.8m + 0.2m$

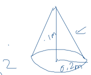
$= 63m$

8. 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 40 cm and height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is ₹ 12 per m², what will be the cost of painting all these cones? (Use π = 3.14 and take $\sqrt{1.04} = 1.02$)

$CSA = \pi R l$

$= 3.14 \times 0.2 \times 1.02$

$= \_\_\_\_\ m^2$



$\sqrt{(1)^2 + (0.2)^2}$

$= \sqrt{1 + 0.04}$

$= \sqrt{1.04}$

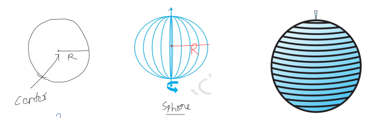
$= 1.02$

Cost of 1 cone $= ₹12 \times \_\_\_\_$

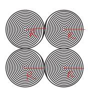
cost of painting 50 cone $= 50 \times$

Circle and sphere

2D 3D

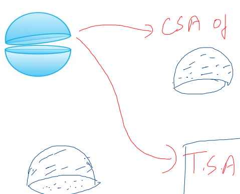


Area $= \pi R^2$



Surface area of sphere $= 4 \times$ Area of circle

$= 4 \times \pi R^2$



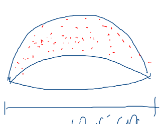
CSA of hemisphere $= \frac{1}{2} \times$ (surface area of sphere)

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

$= 2\pi r^2$

$\boxed{\text{T.S.A of hemisphere} = \text{CSA} + \text{Area of base} = 2\pi R^2 + \pi R^2 = 3\pi R^2}$

5. A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin-plating it on the inside at the rate of ₹ 16 per 100 cm².



$R = \frac{10.5}{2}$ cm.

CSA of hemisphere

$= 2\pi r^2$

$= 2 \times \frac{22}{7} \times \left(\frac{10.5}{2}\right)^2$

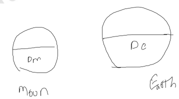
$= 173.25 \text{ cm}^2$.

$100 \text{ cm}^2 = \text{Rs } 16$

$173.25 \text{ cm}^2 = \frac{16}{100} \times 173.25 = \text{Rs } 27.72$

V. Imp

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



$D_m = \frac{1}{4} D_e$

$2 \times R_m = \frac{1}{4} \times 2 \times R_e$

$\boxed{R_m = \frac{1}{4} R_e}$

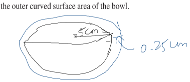
$\frac{A_{moon}}{A_{earth}} = \frac{\cancel{4\pi} R_m^2}{\cancel{4\pi} R_e^2}$

$= \frac{(R_m)^2}{(R_e)^2}$

$= \frac{(\frac{1}{4}R_e)^2}{R_e^2} = \frac{\frac{1}{16}\cancel{R_e^2}}{\cancel{R_e^2}}$

$1 : 16$

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



$R = 5 + 0.25$ cm

$= 5.25$ cm

Outer radius = Inner radius + thickness

$R = 5 + 0.25 = 5.25$ cm

Outer C.S.A $= 2\pi R^2$

$= 2 \times \frac{22}{7} \times (5.25)^2$

$= 173.25 \text{ cm}^2$

9. A right circular cylinder just encloses a sphere of radius r (see Fig. 13.22). Find

(i) surface area of the sphere,

(ii) curved surface area of the cylinder,

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

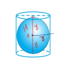


Fig. 13.22

$2\pi r H$

(i) $4\pi r^2$

(ii) CSA of cylinder $= 2\pi r H = 2\pi r(2r) = 4\pi r^2$

(iii) Ratio $= \frac{A_1}{A_2} = \frac{4\pi r^2}{4\pi r^2}$ $1 : 1$

Volume of a Right circular Cone

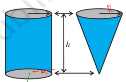


Fig. 13.28

L mL cm^3 m^3

Vol of a cylinder $= \pi R^2 H$

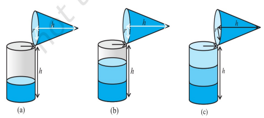


Fig. 13.29

$\boxed{\text{Volume of a Cone} = \frac{1}{3}\pi r^2 h}$

re r is the base radius and h is the height of the cone.

Assume $\pi = \frac{22}{7}$, unless stated otherwise.

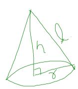
1. Find the volume of the right circular cone with
   (i) radius 6 cm, height 7 cm (ii) radius 3.5 cm, height 12 cm
2. Find the capacity in litres of a conical vessel with
   (i) radius 7 cm, slant height 25 cm (ii) height 12 cm, slant height 13 cm

$R = 7\,cm$ $l = 25\,cm$

Ishani / Shri Rama

What is slant ht?

3. The height of a cone is 15 cm. If its volume is 1570 cm^3, find the radius of the base. (Use $\pi = 3.14$)



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

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

$R^2 = \frac{1570 \times 3}{3.14 \times 5}$

$R = 10\,cm$

159423 cm^3 into L

$\boxed{1\,L = 1000\,cm^3}$

159423 / L

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

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

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

4598 m^3 into Litre 4598000

$\boxed{1\,m^3 = 1000\,L}$

4598 m^3 into Kilolitre 4598 KL

$\boxed{1\,m^3 = 1\,KL}$

4. If the volume of a right circular cone of height 9 cm is 48π cm^3, find the diameter of its base.

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

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

$R^2 = \frac{48 \times 3}{9}$

$R = 4\,cm$

$D = 2 \times R$

$\boxed{D = 8\,cm}$

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

$D = 3.5\,m$ $R = \frac{3.5}{2}\,m$

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

$= \frac{1}{3} \times \frac{22}{7} \times \left(\frac{3.5}{2}\right)^2 \times 12$

$= 38.5\,m^3$

$1\,m^3 = 1\,KL$

$38.5\,m^3 = \boxed{38.5\,KL}$

3 mins

6. The volume of a right circular cone is 9856 cm^3. If the diameter of the base is 28 cm, find
   (i) height of the cone (ii) slant height of the cone
   (iii) curved surface area of the cone

(i) $D = 28\,cm$ $R = 14\,cm$

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

$9856 = \frac{1}{3} \times \frac{22}{7} \times (14)^2 \times H$

$H = 48\,cm$

(ii) $l^2 = h^2 + r^2$

$= (48)^2 + (14)^2$

$l = \sqrt{2304 + 196}$

$= \sqrt{2500}$

$l = 50\,cm$

(iii) $CSA = \pi r l$

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

$= 2200\,cm^2$

7. A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

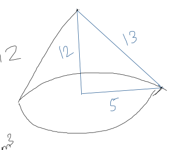
$Vol = \frac{1}{3}\pi r^2 h$

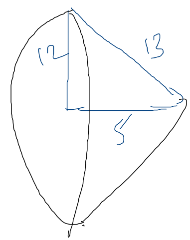
$= \frac{1}{3}\pi \times 5 \times 5 \times 12$

$= \pi\, 100\,cm^3$

$= 100\pi\,cm^3$

$= 100 \times \frac{22}{7}\,cm^3$





8. If the triangle ABC in the Question 7 above is revolved about the side 5 cm, then find the volume of the solid so obtained. Find also the ratio of the volumes of the two solids obtained in Questions 7 and 8.

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

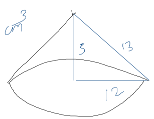
$= \frac{1}{3}\pi \times 12 \times 12 \times 5\,cm^3$

$= 240\pi\,cm^3$

Ratio $= \frac{100\pi\,cm^3}{240\pi\,cm^3}$

$= \frac{5}{12}$

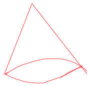
$\boxed{5:12}$



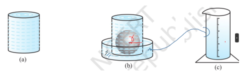
9. A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.

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

$CSA = \pi r l$



13.9 Volume of a Sphere



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

Volume of hemisphere $= \frac{4}{3\times 2}\pi r^3 = \frac{2}{3}\pi r^3$

(i) $R = 0.63\,m$

$V = \frac{4}{3}\pi R^3$

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

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

$= \frac{\quad}{1000000}$

(ii) $D = 0.21\,m$

$R = \frac{0.21}{2}\,m$

$V = \frac{4}{3}\pi R^3 = \frac{4}{3}\times\frac{22}{7}\times\left(\frac{0.21}{2}\right)^3$

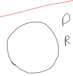
$= \frac{4}{3}\times\frac{22}{7}\times\frac{21}{1200}\times\frac{21}{1200}\times\frac{21}{1200}$

$= \frac{11\times 21\times 21}{100\times 100\times 100}$

$= \frac{4851}{10^6} = 0.004851\,m^3$

$21 \times 11 = 231$, $231 \times 21 = 4851$

3. The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm³?



$D = 4.2\,cm$

$R = 2.1\,cm$

$V = \frac{4}{3}\pi R^3$

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

$= \frac{4}{3}\times\frac{22}{7}\times\frac{21}{10}\times\frac{21}{10}\times\frac{21}{10}$

$= \frac{22\times 4\times 21\times 21}{1000}$

$V = 1\,cm^3$ $m = 8.9\,g$

$38.808\,cm^3$ mass $= 8.9\times 38.808$ g

$= \frac{38.808}{1000}\,cm^3$

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

$D_m = \frac{1}{4}D_e$

$2\pi R_m = \frac{1}{4}\times 2\pi\times R_e$

$R_m = \frac{1}{4}R_e$ (1)

$V_m = \frac{4}{3}\pi R_m^3$

$V_e = \frac{4}{3}\pi R_e^3$

$\frac{V_e}{V_m} = \frac{\frac{4}{3}\pi R_e^3}{\frac{4}{3}\pi R_m^3}$

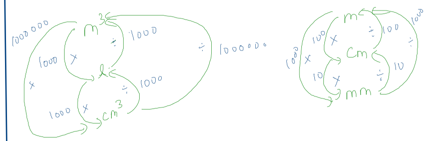
$\frac{V_e}{V_m} = \frac{R_e^3}{(R_m)^3}$

$\frac{V_e}{V_m} = \frac{R_e^3}{(\frac{1}{4}R_e)^3} = \frac{R_e^3}{\frac{1}{64}R_e^3} = \frac{64}{1}$ $\boxed{64:1}$

5. How many litres of milk can a hemispherical bowl of diameter 10.5 cm hold?

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

$= \quad cm^3 = \frac{\quad}{1000} = \quad l$



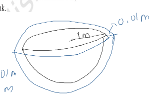
6. A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.

Inner radius $(r) = 1\,m$

Outer radius $(R) = r + t$

$= 1m + 0.01m$

$R = 1.01\,m$



Volume of iron used $= \frac{2}{3}\pi R^3 - \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi(R^3 - r^3)$

$= \frac{2}{3}\pi((1.01)^3 - (1)^3)$

$=$

7. Find the volume of a sphere whose surface area is 154 cm².

$V = \frac{4}{3}\pi R^3$

$A = 4\pi r^2$

$154 = 4\pi r^2$

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

$\frac{49}{4} = r^2$ $r = \frac{7}{2}$

8. A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of ₹ 4989.60. If the cost of white-washing is ₹ 20 per square metre, find the
(i) inside surface area of the dome, (ii) volume of the air inside the dome.

Total cost of whitewashing = Rs 4989.60

Rs 20 Area = 1 m²

(i) Rs 4989.60 $= \frac{1}{20}\times 4989.60$ m² $= \frac{24948}{100}$ m² $= 249.48\,m^2$

unitary method

(ii) $V = \frac{2}{3}\pi R^3$

$A = 2\pi R^2$

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

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

$R^2 = \frac{24948\times 7}{2\times 22\times 100}$ $= \frac{567\times 7}{100}$

$= \frac{3969}{100}$

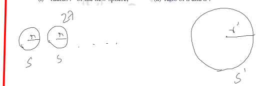
$R^2 = \frac{3969}{100}$

$R = \sqrt{\frac{3969}{100}}$

$R = \frac{63}{10} = 6.3\,m$

$\sqrt{3969} = 63$: $6 \mid 3969$, -36, $123 \mid 369$, -369, $\times\times$

9. 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, (ii) ratio of S and S′.



Volume of small 27 sphere = Volume of new sphere

(i) $27\times\frac{4}{3}\pi r^3 = \frac{4}{3}\pi(r')^3$

$27r^3 = (r')^3$

$(3r)^3 = (r')^3$

$3r = r'$

(ii) $S = 4\pi r^2$

$S' = 4\pi(r')^2$

$\frac{S}{S'} = \frac{4\pi r^2}{4\pi(r')^2} = \frac{r^2}{(3r)^2} = \frac{r^2}{9r^2}$

$\boxed{S:S' = 1:9}$

10. A capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in mm³) is needed to fill this capsule?

$V = \frac{4}{3}\pi r^3 = \quad mm^3$