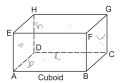
Any solid → 3D occupies solid

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 × b × h

Vol = a × a × a = a^3

Total Surface area : lb + lb + bh + bh + lh + lh

= 2lb + 2bh + 2lh

Total surface area = $a^2 + a^2 + a^2 + a^2 + a^2 + a^2$ (flow coil)

= $6a^2$

Lateral surface area = bh + lh + bh + lh

= 2bh + 2lh

= (2b + 2l) × h

= (2(l + b) × h)

Lateral surface area = ABEF + BFHC + CDGH + ADHE

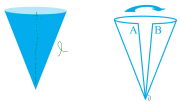
= $a^2 + a^2 + a^2 + a^2$

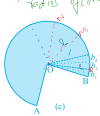
= $4a^2$

Area of four walls = [2(l + b) × 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





(c)

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

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

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

Curved surface area $A = \pi r l$

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

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

= $\pi r (l + r)$

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 = $\pi r l$

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

= 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 = 12 m

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

3. Curved surface area of a cone is 308 cm^2 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 × 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 m^2 canvas is ₹ 70.

$\pi r (R + l)$

(i) In ΔAOB By Pyt,

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

= 100 + 576

l^2 = 676

l = $\sqrt{676}$ = 26

(ii) CSA = $\pi r l$

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

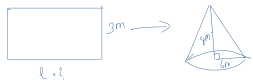
= $\frac{13728}{7}$ m^2

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 × 3 = $\pi r l$

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

= 3.14 × 6 (64 + 36)

= 3.14 × 6 × 10

l × 3 = 3.14 × 6 × 10

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

l = 62.8 m + 0.2 m

= 63 m

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 m^2, 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 × 0.2 × 1.02

= ____ m^2

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

= $\sqrt{1 + 0.04}$

= $\sqrt{1.04}$

= 1.02

Cost of 1 cone = ₹ 12 × ____

Cost of painting 50 cone = 50 × ____

Circle and sphere

2D 3D

Area = πR^2

Surface area of sphere = 4 × Area of circle

$= 4 \times \pi R^2$

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

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

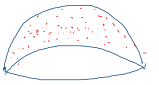
$= 2\pi R^2$

TSA of hemisphere = CSA + 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 cm^2.



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

CSA of hemisphere

$= 2\pi R^2$

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

$= 173.25 \text{ cm}^2$

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

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

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

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

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

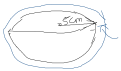
$\frac{A_{moon}}{A_{earth}} = \frac{4\pi R_m^2}{4\pi R_e^2}$

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

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

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.



$R = 5 + 0.25 \text{ cm}$

$= 5.25 \text{ cm}$

Outer radius = Inner radius + thickness

$R = 5 + 0.25 = 5.25 \text{ cm}$

Outer CSA = $2\pi R^2$

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

$= 173.25 \text{ cm}^2$

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

$2\pi rH$

(i) $4\pi r^2$

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

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

Volume of a Right circular Cone

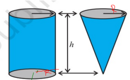


Fig. 13.28

1L mL cm^3 m^3

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

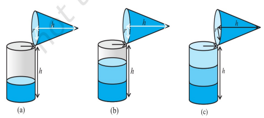


Fig. 13.29

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

$R = 7cm$ $l = 25 cm$

Ishanvi 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 $\pi = 3.14$)

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

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

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

$R = 10 cm$

$159423 cm^3$ into L

$1L = 1000 cm^3$

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

$4598 m^3$ into Litre — 4598000

$1m^3 = 1000L$

$4598 m^3$ into Kilolitre — 4598 KL

$1m^3 = 1KL$

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

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

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

$R^2 = \frac{48 \times 3}{9}$ $R = 4 cm$

$D = 2 \times R$

$D = 8 cm$

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

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

$V = \frac{1}{3}\pi R^2 H$
$= \frac{1}{3} \times \frac{22}{7} \times \left(\frac{3.5}{2}\right)^2 \times 12$
$= 38.5 m^3$

$1m^3 = 1KL$
$38.5 m^3 = 38.5 KL$

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

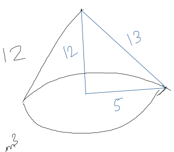
(i) $D = 28cm$ $R = 14cm$
$V = \frac{1}{3}\pi R^2 H$
$9856 = \frac{1}{3} \times \frac{22}{7} \times (14)^2 \times H$
$H = 48cm$

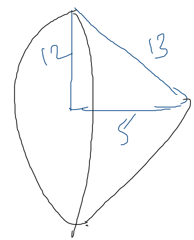
(ii) $l^2 = h^2 + r^2$
$= (48)^2 + (14)^2$
$l = \sqrt{2304 + 196}$
$= \sqrt{2500}$
$l = 50cm$

(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.

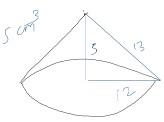
$Vol = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi \times 5 \times 5 \times 12$
$= \pi\ 100\ cm^3$
$= 100\pi\ cm^3$
$= 100 \times \frac{22}{7}\ cm^3$





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 $= \frac{100\pi cm^3}{240\pi cm^3}$
$= \frac{5}{12}$
$5 : 12$

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.

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

$CSA = \pi r l$