UDAAN 2024

– FOR CLASS 10th STUDENTS

Lecture No.- 01

- Subject Name- Mathematics
- Chapter Name- Surface Area and Volume

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Topic to be Covered

Topic All the formulas

Topic Some Questions on surface area of combination of solids

Topic : Key Words

Surface Area:

The amount of space covering the outside of a three-dimensional shape.

Volume:

The amount of space occupied by a three-dimensional object.

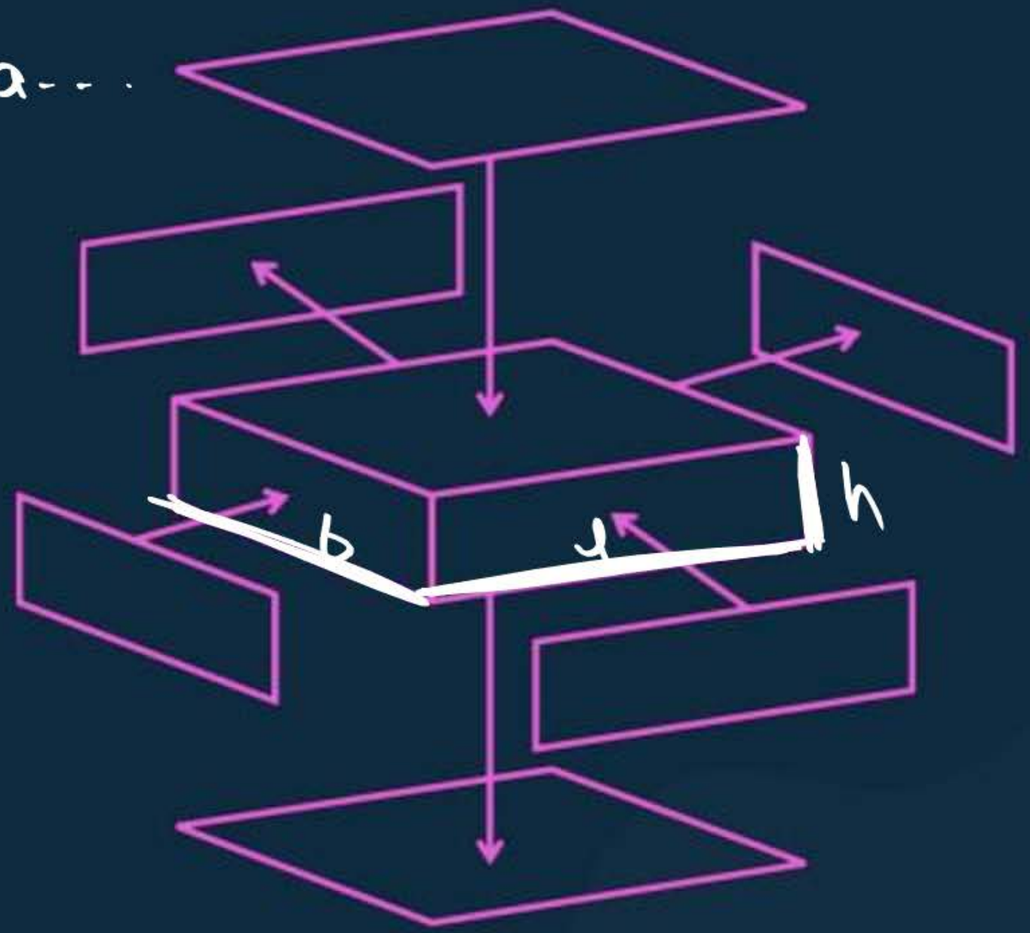
Cuboid → 6 Rectangular Faces

↳ T.S.A (S.A) → 6 Rectangle area...

$= lb + lb + lh + lh + bh + bh$

$= 2lb + 2lh + 2bh$

$= 2(lb + bh + hl)$



lateral surface area $= 2lh + 2bh$

$= 2h(l + b)$

upar vala / niche vala chhodkar.

Area of four walls...

Volume of cuboid = lbh

'1' '1' = lb

'10' '1' = 10 x lb

'20' '1' = 20 x lb

'100' '1' = 100 lb

'h' '1' = h x lb

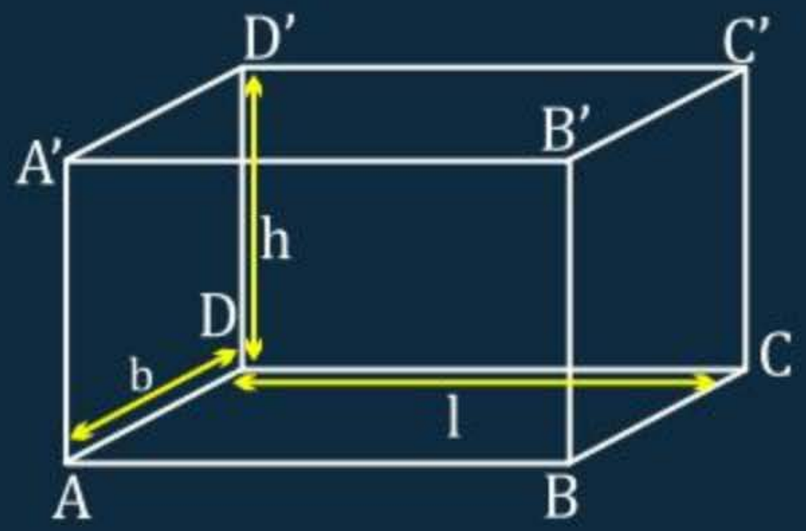
Topic : Cuboid

Let l, b and h denote the respectively the length, breadth and height of cuboid. Then,

(i) Total Surface Area of the cuboid

= $2(lb + bh + hl)$ squares units

m^2 m^2 m^2



(ii) Volume of the cuboid

= Area of the base × Height

= Length × Breadth × Height

= lbh cubic units

Topic : Cuboid

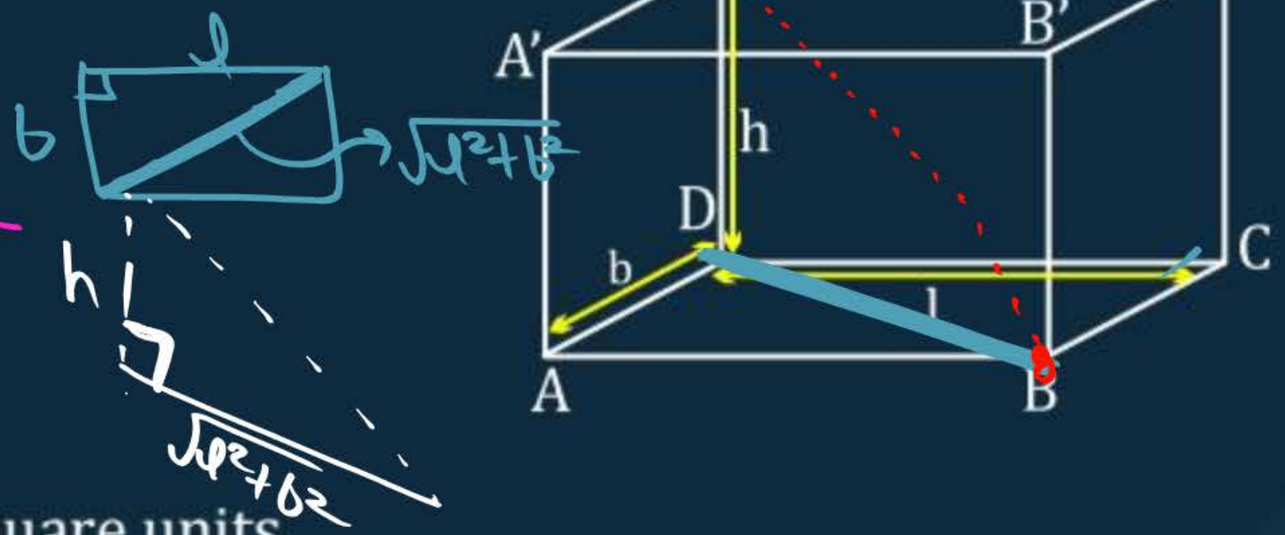
(iii) Diagonal of the cuboid

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

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

$d^2 = h^2 + l^2 + b^2$

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



(iv) Area of four wall of a room

$= lh + lh + bh + bh = \boxed{2(l + b)h}$ square units.

Cube → cuboid = $l = b = h = a$ = edge / side of cube

↳ T.S.A (S.A) = 6 squares.

$= 6a^2$.

↳ L.S.A = $4a^2$

↳ Volume = $1S = a^2$

$2S = 2a^2$

$3S = 3a^2$

$4S = 4a^2$

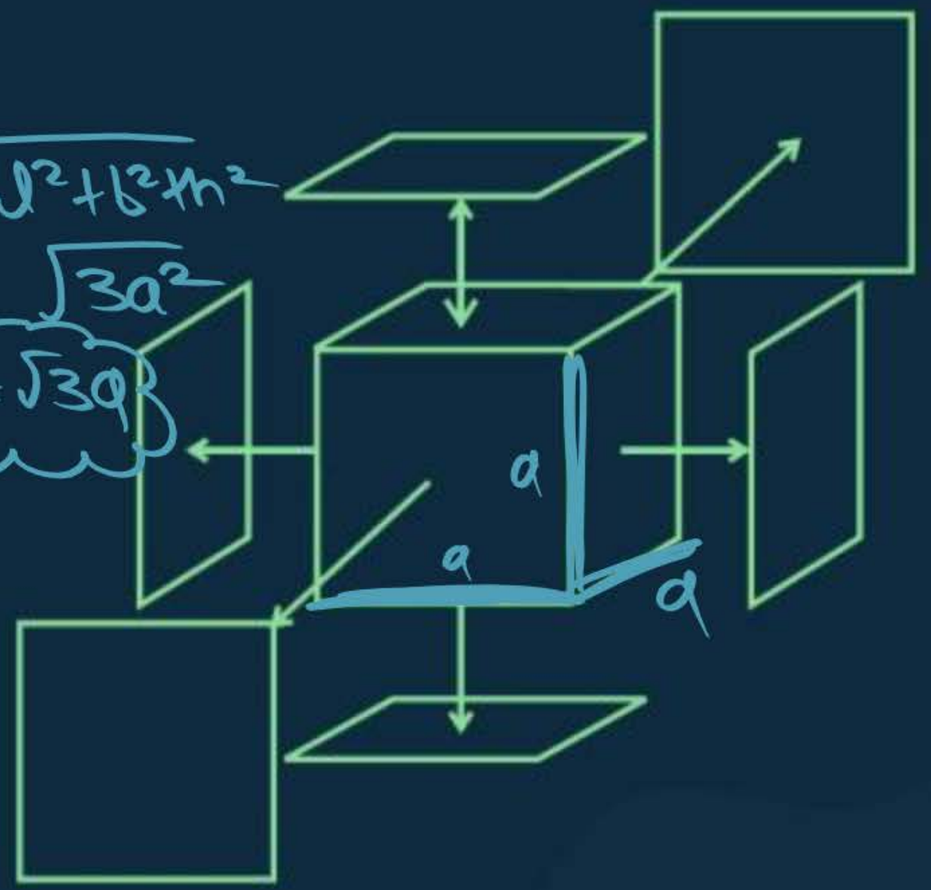
⋮

$aS = a \times a^2 = a^3$

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

$= \sqrt{3a^2}$

$d = \sqrt{3}a$



Topic : Cube

If the length of each edge of a cube is 'a' units, then

(i) Total Surface Area of the Cube

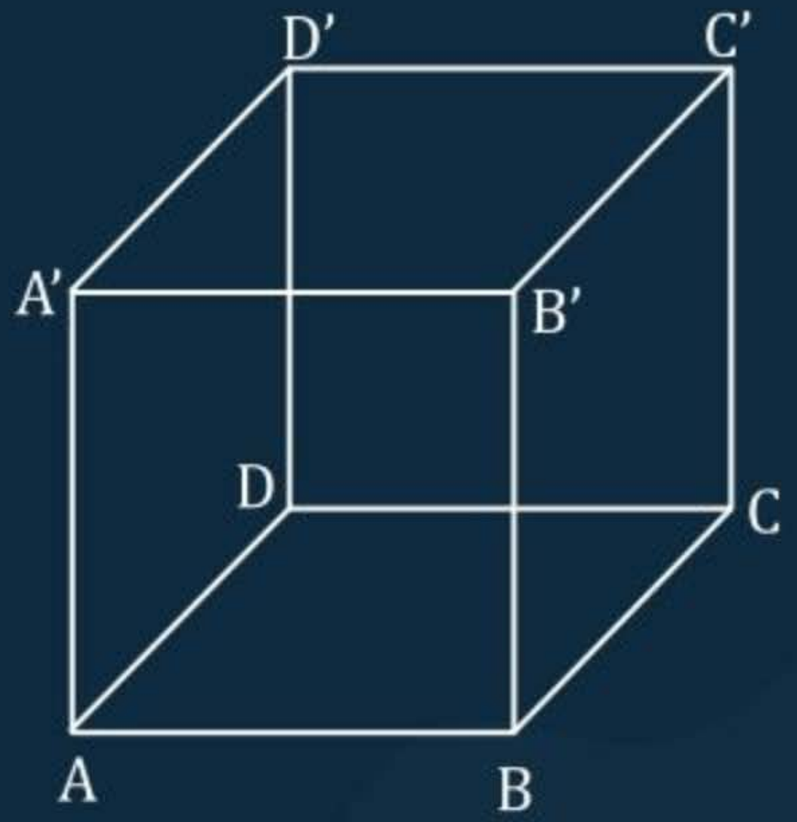
= $6a^2$ square units

(ii) Volume of the cube

= a^3 cubic units

(iii) Diagonal of the cube

= $\sqrt{3}\,a$ units



Cylinder = 3 surfaces

= 2 circle + C.S.A

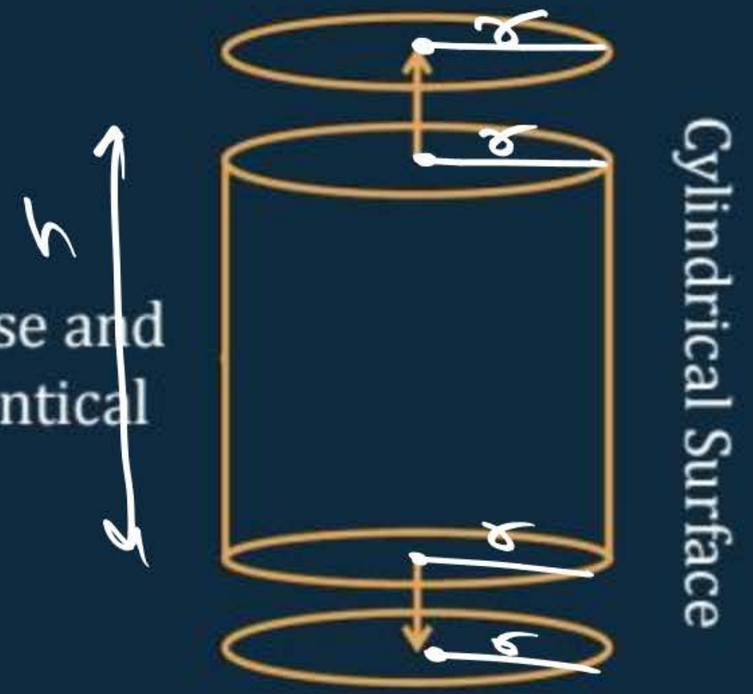
= $2\pi r^2 + 2\pi rh$

= $2\pi r[r+h]$

C.S.A = 

= $2\pi rh$

Volume = $\pi r^2 h$



Topic : Right Circular Cylinder

For a right circular cylinder of base radius and height (or length) h, we have

(i) Area of each end

= Area of base

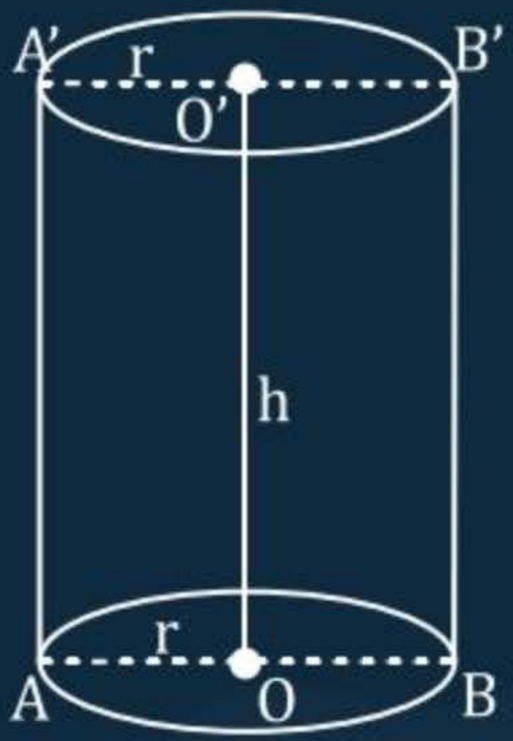
= πr^2

(ii) Curved Surface Area

= πrh

= $2\pi r \times h$

= Perimeter of base × Height



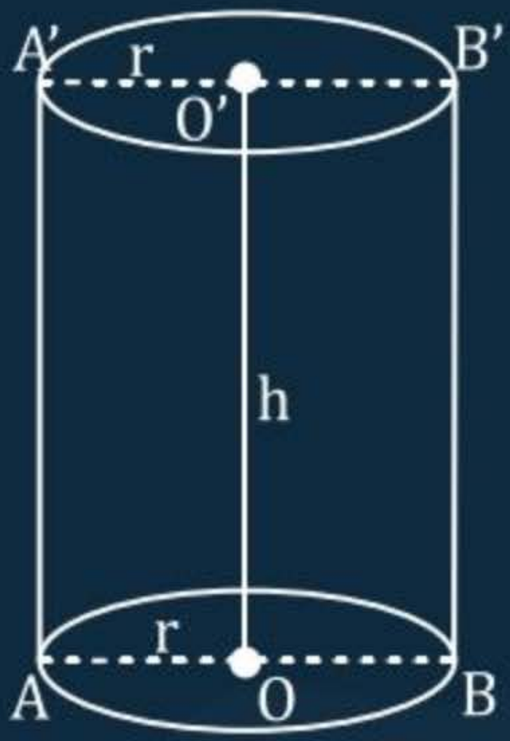
Topic : Right Circular Cylinder

(iii) Total Surface Area

= Curved Surface Area + Area of Circular ends

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

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

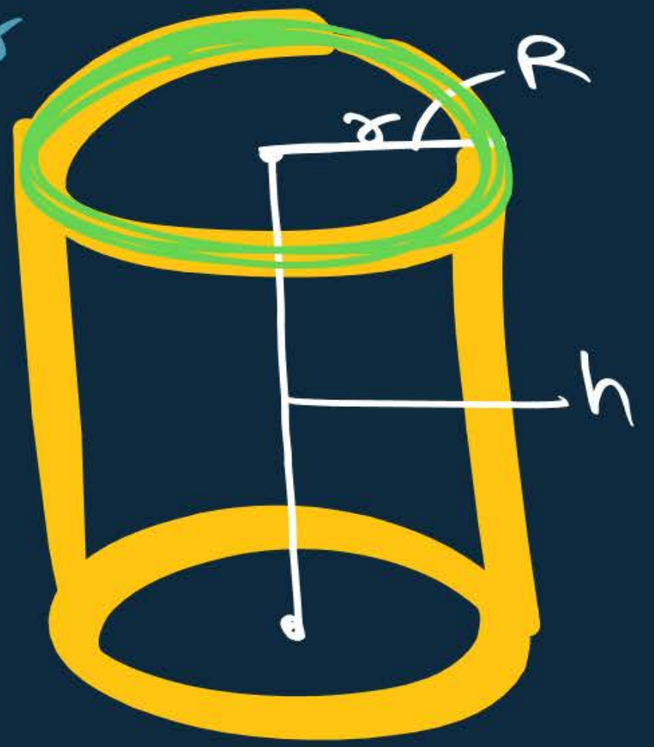


(iv) Volume

= $\boxed{\pi r^2 h}$

= Area of the base × Height

$$T.S.A = 2\pi Rh + 2\pi rh + 2(\pi R^2 - \pi r^2)$$



$$= 2\pi Rh + 2\pi rh + 2\pi(R^2 - r^2)$$

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

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

$$C.S.A = 2\pi Rh + 2\pi rh$$

$$= \boxed{2\pi h(R+r)}$$

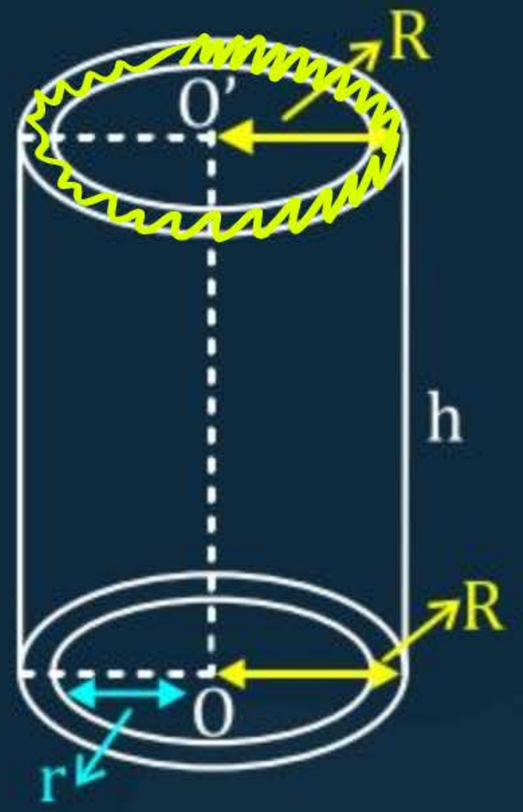
$$\text{Volume} = \pi R^2 h - \pi r^2 h \rightarrow \boxed{\pi h(R^2 - r^2)}$$

Topic : Right Circular Hollow Cylinder

Let R and r be the external and internal radii of a hollow cylinder of height h. Then

(i) Area of each end

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



(ii) Curved Surface Area of hollow cylinder

= External Surface area + Internal Surface area

$= 2\pi Rh + 2\pi rh$

$= \boxed{2\pi h(R + r)}$

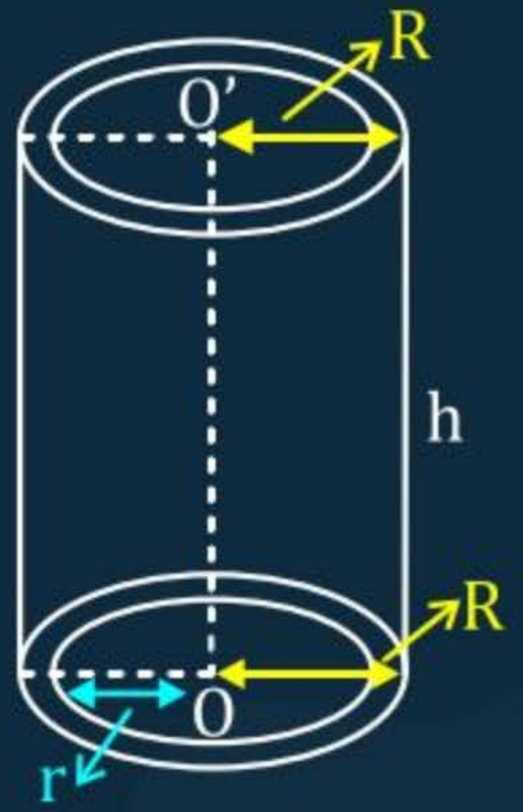
Topic : Right Circular Hollow Cylinder

(iii) Total Surface Area

$= 2\pi Rh + 2\pi rh + 2(\pi R^2 - \pi r^2)$

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

$= \boxed{2\pi (R + r)(R + h - r)}$



(iv) Volume of material

= External volume – Internal volume

$= \pi R^2 h - \pi r^2 h$

$= \boxed{\pi h(R^2 - r^2)}$

T.S.A = C.S.A + Area of base

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

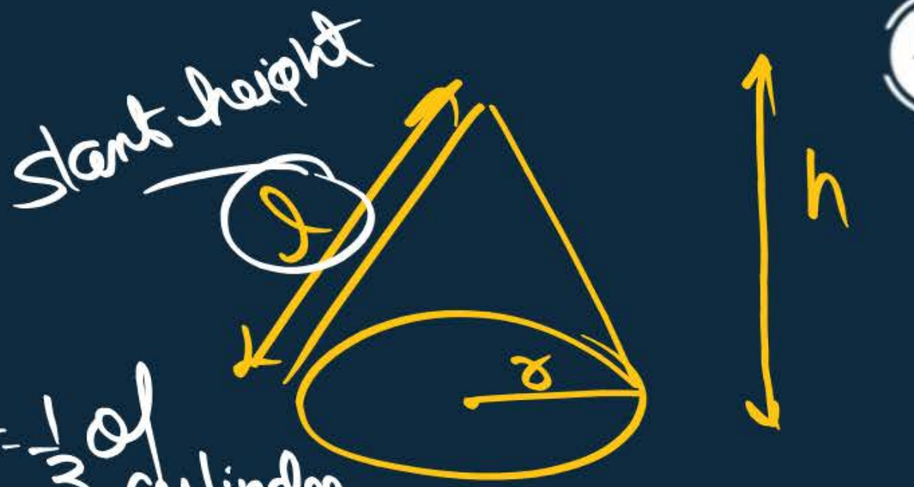
$= \boxed{\pi r(l + r)}$

C.S.A = Area of sector

$= \boxed{\frac{1}{2} \times \text{length of arc} \times \text{radius}}$

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

$= \boxed{\pi r l}$



Volume = $\frac{1}{3}$ of cylinder

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

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

Topic : Right Circular Cone

For a right circular cone of height h, slant height l and radius of base r, we have

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

(ii) Curved Surface Area

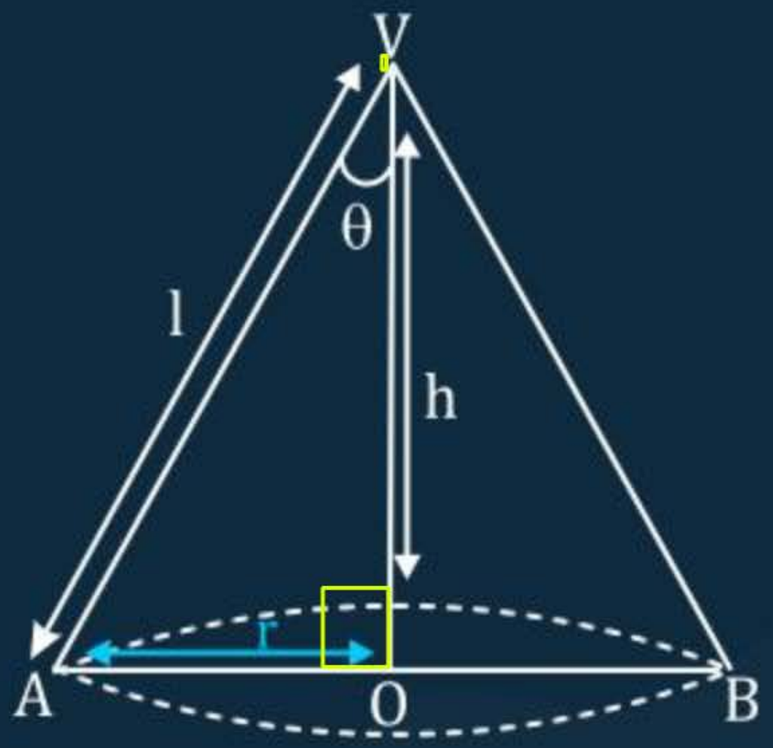
= πrl sq. units

(iii) Total Surface Area

= Curved surface area + Area of the base

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

= $\pi r(l + r)$ sq. units

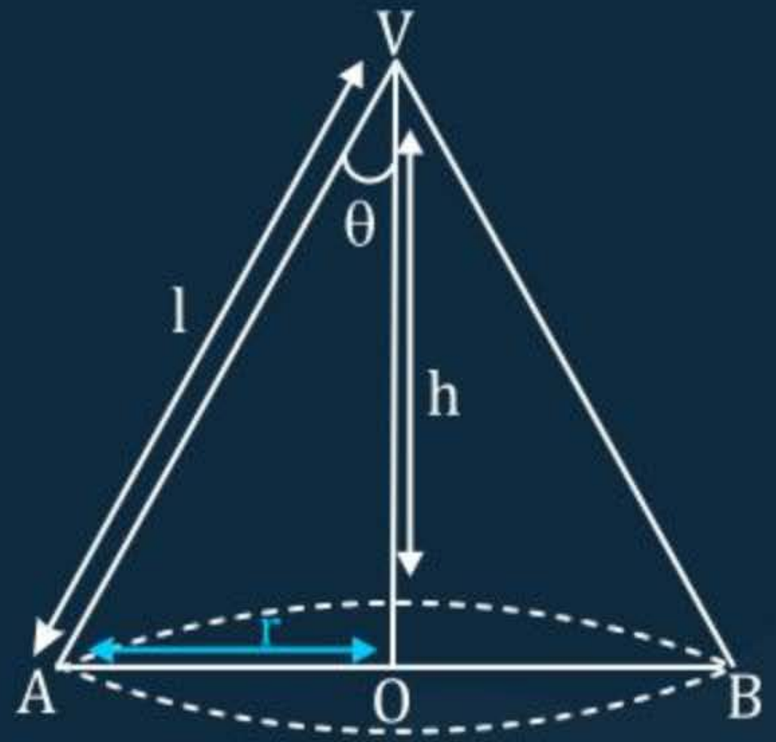


Topic : Right Circular Cone

(iv) Volume

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

$$= \frac{1}{3}(\text{Area of the base}) \times \text{Height}$$

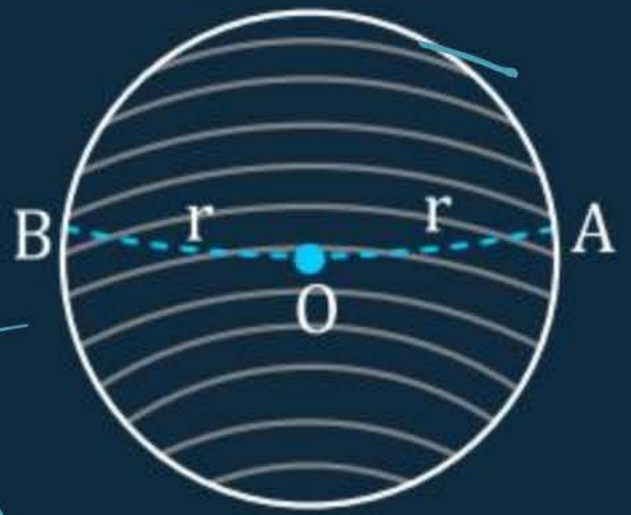


Topic : Sphere

For a sphere of radius r, we have

(i) Surface Area = $4\pi r^2$

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



For a hemisphere of radius r, we have

(i) Surface area = $2\pi r^2$

(ii) Total Surface Area = $2\pi r^2 + \pi r^2 = 3\pi r^2$

(iii) Volume = $\frac{2}{3}\pi r^3$

Name of Solid	Volume	Total Surface Area	Lateral Surface Area
Cube	$V = a^3$	$TSA = 6a^2$	$LSA = 4a^2$
Cuboid	$V = l \times b \times h$	$TSA = 2(lb + bh + hl)$	$LSA = 2h(l + b)$
Cylinder	$V = \pi r^2 h$	$TSA = 2\pi r(h + r)$	$CSA = 2\pi rh$
Hollow Cylinder ($R > r$)	$V = \pi(R^2 - r^2)h$	$TSA = 2\pi(R + r)(h + R - r)$	$2\pi(R + r)$
Cone	$V = \frac{1}{3}\pi r^2 h$	$TSA = \pi r(l + r)$	$CSA = \pi rl$
Sphere	$V = \frac{4}{3}\pi r^3$	$TSA = 4\pi r^2$	$CSA = 4\pi r^2$
Hemisphere	$V = \frac{2}{3}\pi r^3$	$TSA = 3\pi r^2$	$CSA = 2\pi r^2$

Topic : surface area of combination of solids

#Q. A solid right circular cone of radius r and height h is placed over a solid cylinder of same height and radius. The total surface area of the shape so formed is:

A $4\pi rh + 4\pi r^2$

B $4\pi rh + \pi r^2$

C $\pi r(\sqrt{r^2 + h^2} + 2h + r)$

D $\pi r^2(\sqrt{r^2 + h^2} + 2h + r)$

Cone + Cylinder + Area of base

C.S.A + C.S.A

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

$\pi r\sqrt{h^2+r^2} + 2\pi rh + \pi r^2$

$\pi r\left[\sqrt{h^2+r^2} + 2h + r\right]$

Topic : surface area of combination of solids

#Q. The shape of an ice-cream is a combination of

A Sphere + Cylinder

B Cylinder + Sphere

C Cone + Sphere

D Hemisphere + Cone

T.S.A = C.S.A of hemisphere + C.S.A of Cone

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

$= \pi r[2r + l]$

#Q. A circus tent is cylindrical upto a height of 3 m and conical above it. If the diameter of the base is 105 m and the slant height of the conical part is 53 m, find the total canvas used in making the tent. **[CBSE 2001]**

Kapda

Area of Canvas = C.S.A of cone + C.S.A of cylinder

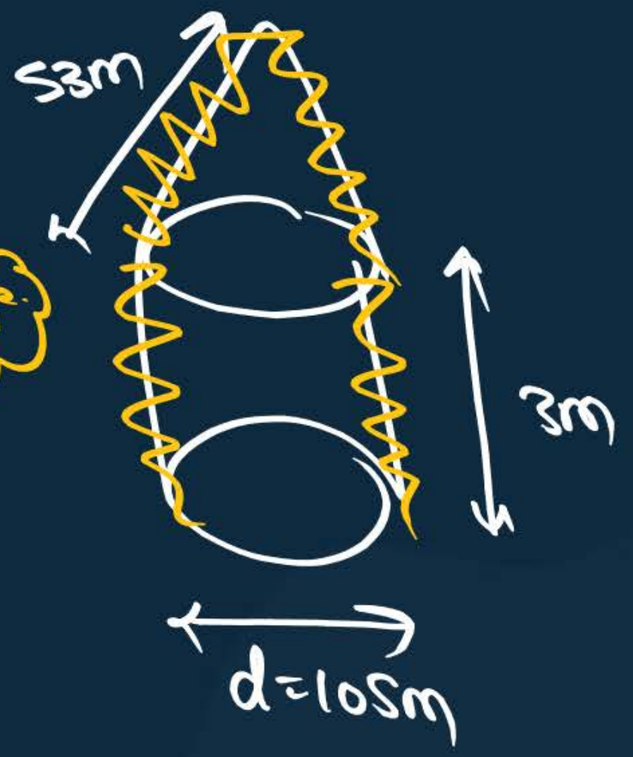
$= \pi rl + 2\pi rh$

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

$= \frac{22}{7} \times \frac{105}{2} \times (53 + 2(3))$

$= 165(59)$

$A = 9735 m^2$



#Q. A solid is the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the [redacted] and total surface area of the solid. (Use $\pi = 22/7$).

T.S.A of solid = C.S.A of 2 hemispheres + C.S.A of cylinder

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

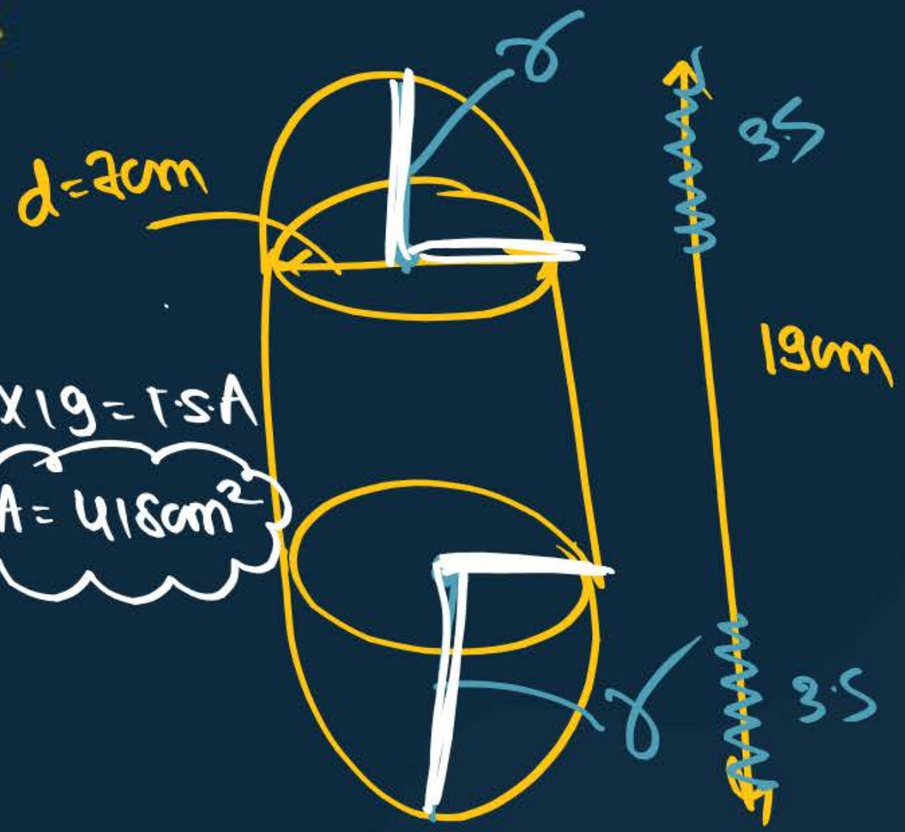
$= 4\pi r^2 + 2\pi rh$

$= 2\pi r[2r + h]$

$= 2 \times \frac{22}{7} \times \frac{7}{2} \times \left[2 \times \frac{7}{2} + 12\right]$

$22 \times 19 = \text{T.S.A}$

T.S.A = 418 cm²



Topic : surface area of combination of solids

#Q. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figures. If the height of the cylinder is 10cm and its base is of radius 3.5 cm, find the total surface area of the article.

[CBSE 2014, 2018, NCERT]

CHANGES

BIG

TO

LEAD

STEPS

SMALL


THANK
YOU