MATHEMATICS

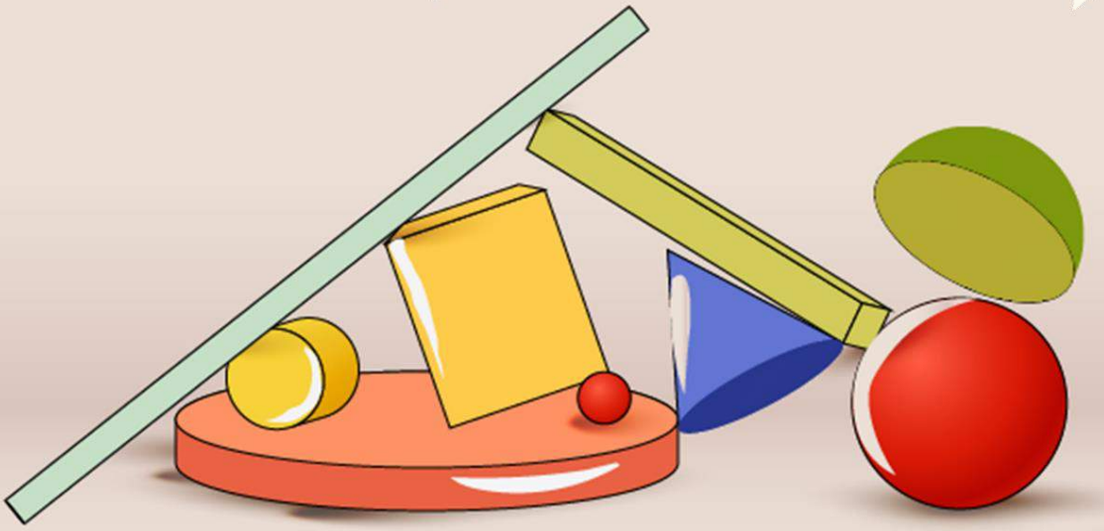
BYJU'S

POST CLASS NOTES

Surface Areas and Volumes

Topics

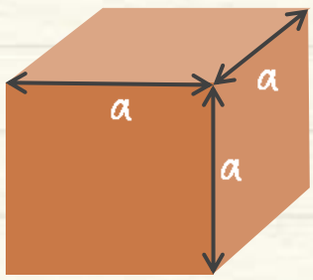
1. Formulae of Solids
2. Combination of Solids
3. Surface Area of Combined Solids
4. Volume of Combined Solids
5. Conversion of Solids
6. Frustum of a Cone



1. Formulae of Solids

Here are surface areas and volumes of few solids before we look at combined solids.

Cube



$4a^2$: Lateral surface area

$6a^2$: Total surface area

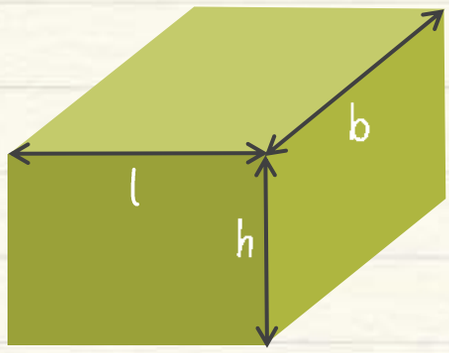
a^3 : Volume

Cuboid

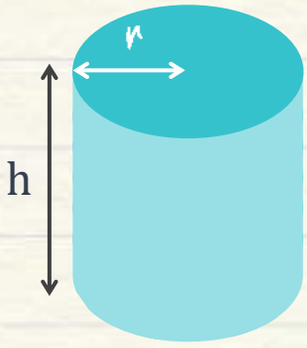
Lateral surface area : $2h(l + b)$

Total surface area : $2(lb + bh + hl)$

Volume : lbh



Cylinder



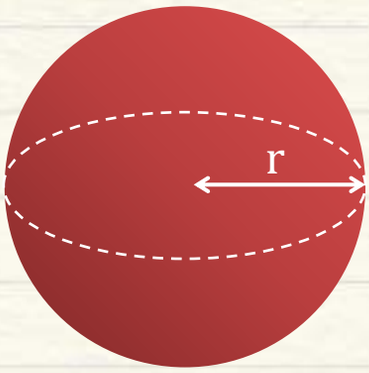
$2\pi rh$: Curved surface area

$2\pi rh + 2\pi r^2$: Total surface area

$\pi r^2 h$: Volume

B

Sphere



$4\pi r^2$: Curved surface area

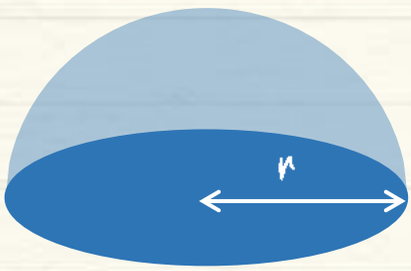
$\frac{4}{3}\pi r^3$: Volume

Hemisphere

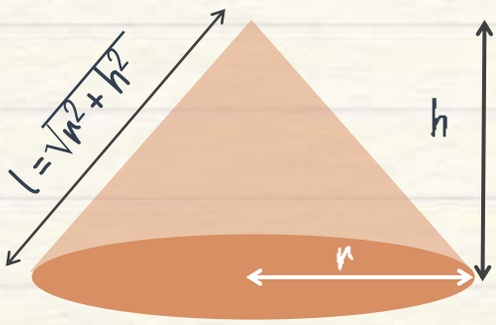
Curved surface area : $2\pi r^2$

Total surface area : $3\pi r^2$

Volume : $\frac{2}{3}\pi r^3$



Cone



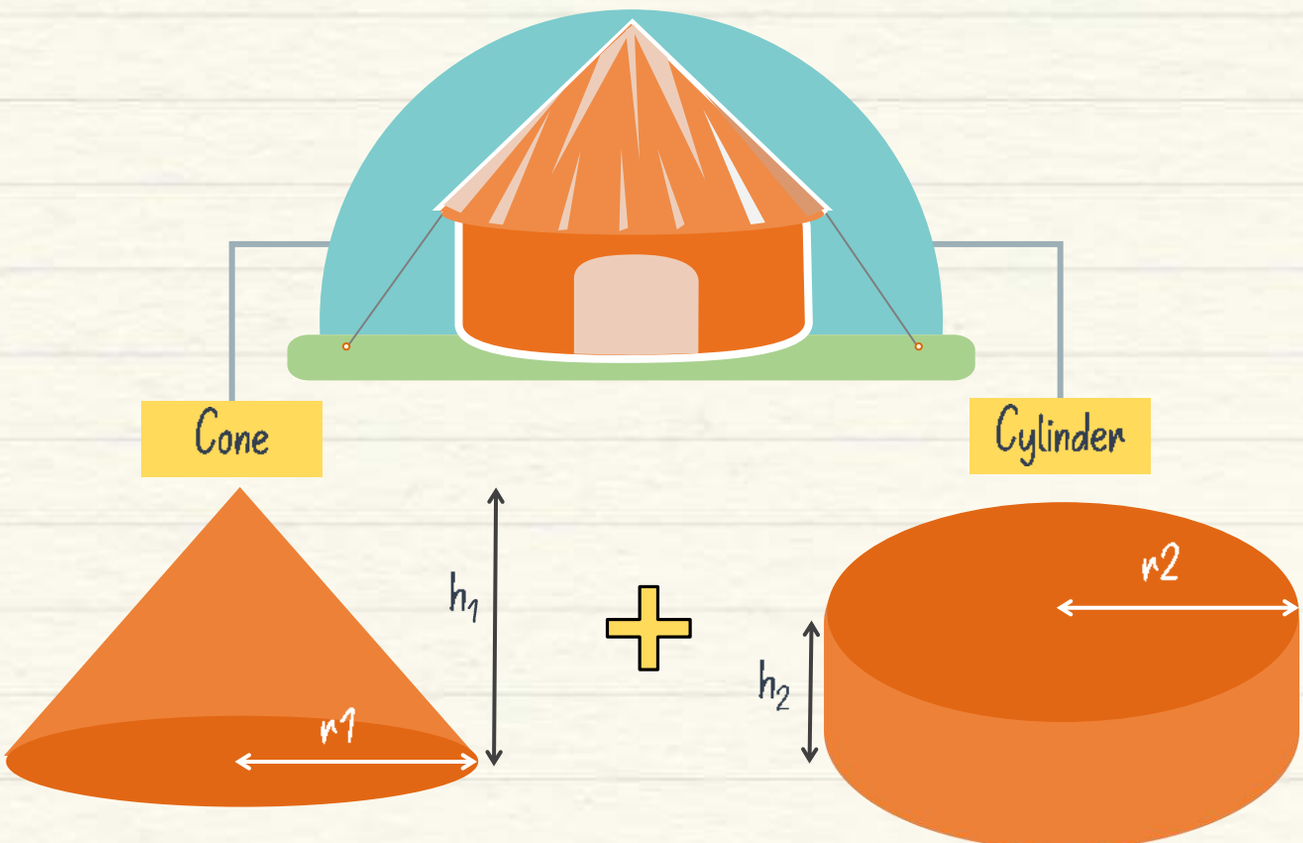
πrl : Curved surface area

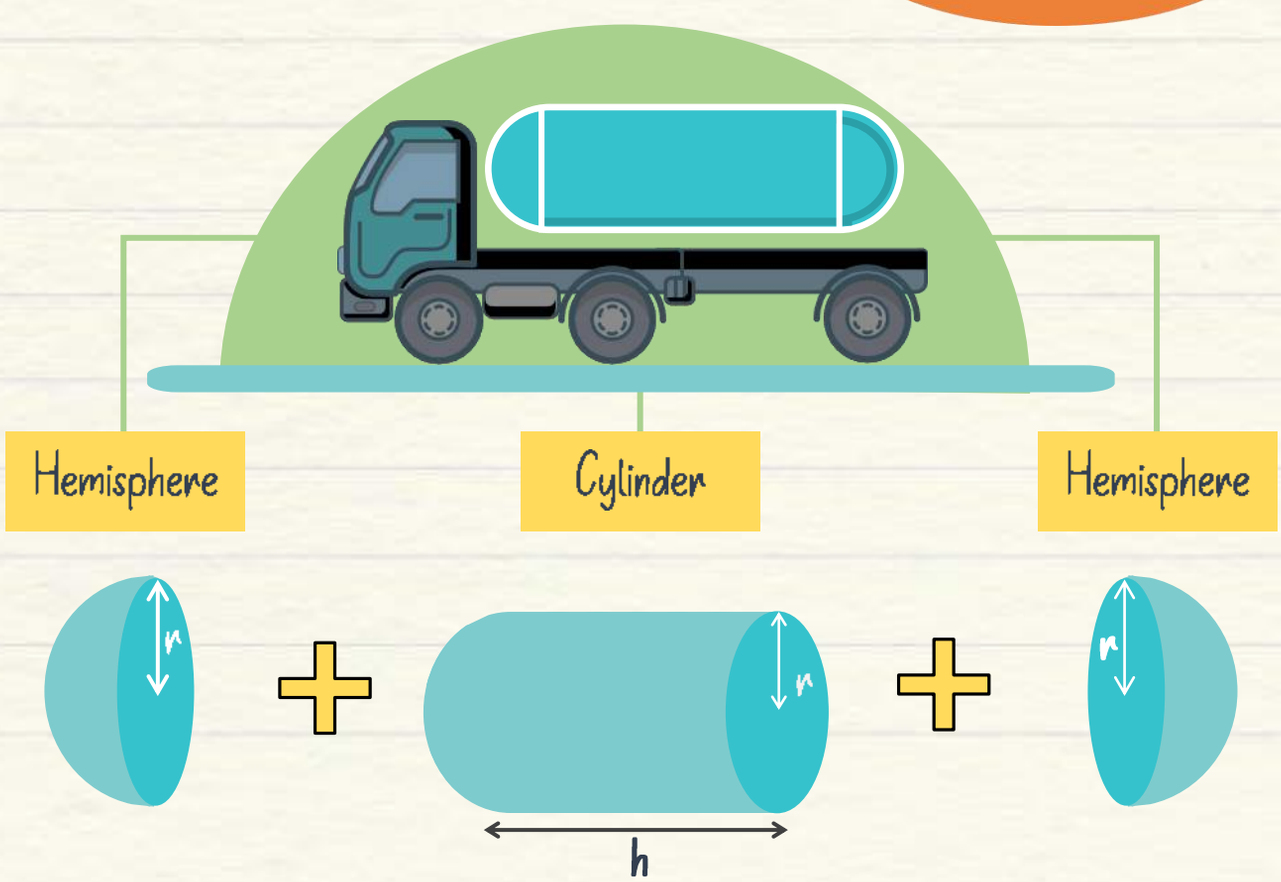
$\pi rl + \pi r^2$: Total surface area

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

2. Combination of Solids

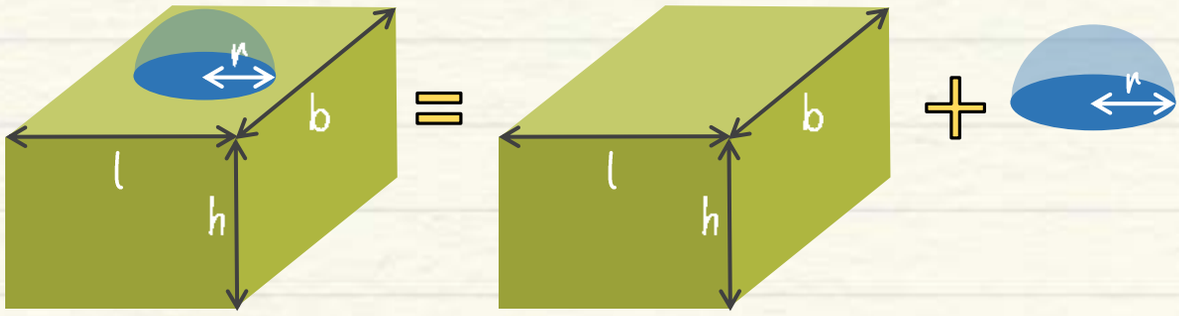
Shapes that are formed by combining two or more solids.





3. Surface Area of Combination of Solids

It is the sum of the surface areas of individual solids" visible portion, in the given combined solid.



Total Surface Area

Total surface area of cuboid

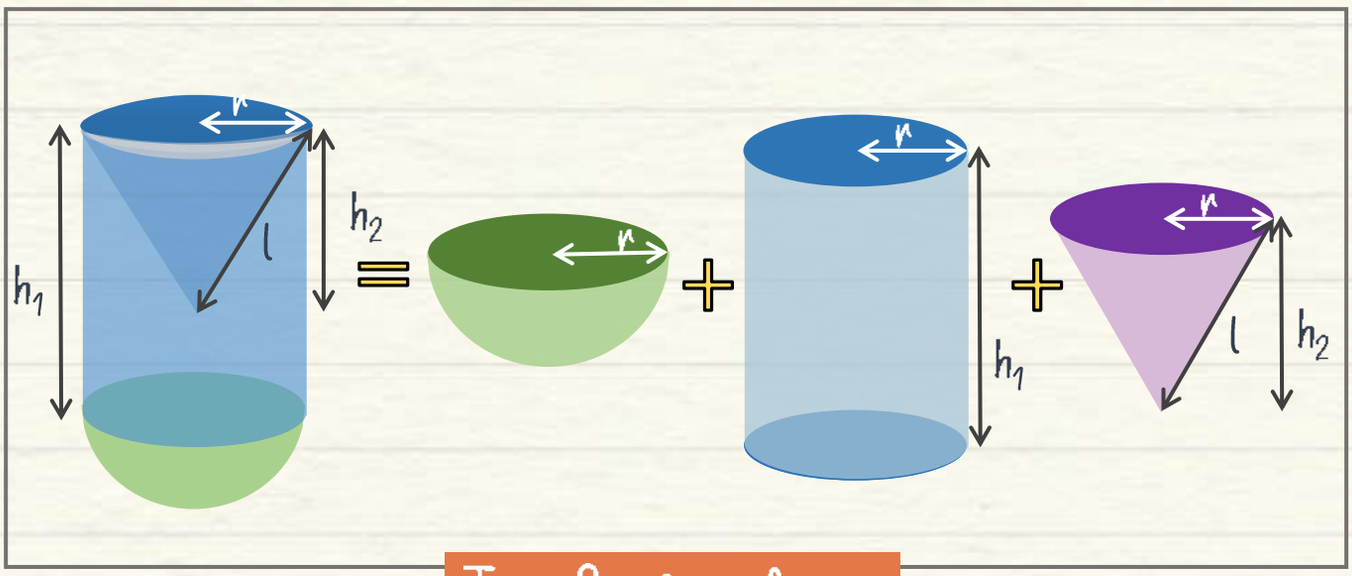
+

Curved surface area of hemisphere

−

Base area of hemisphere

$$2(lb + bh + hl) + 2\pi r^2 - \pi r^2$$



Total Surface Area

Curved surface area of hemisphere

+

Curved surface area of cylinder

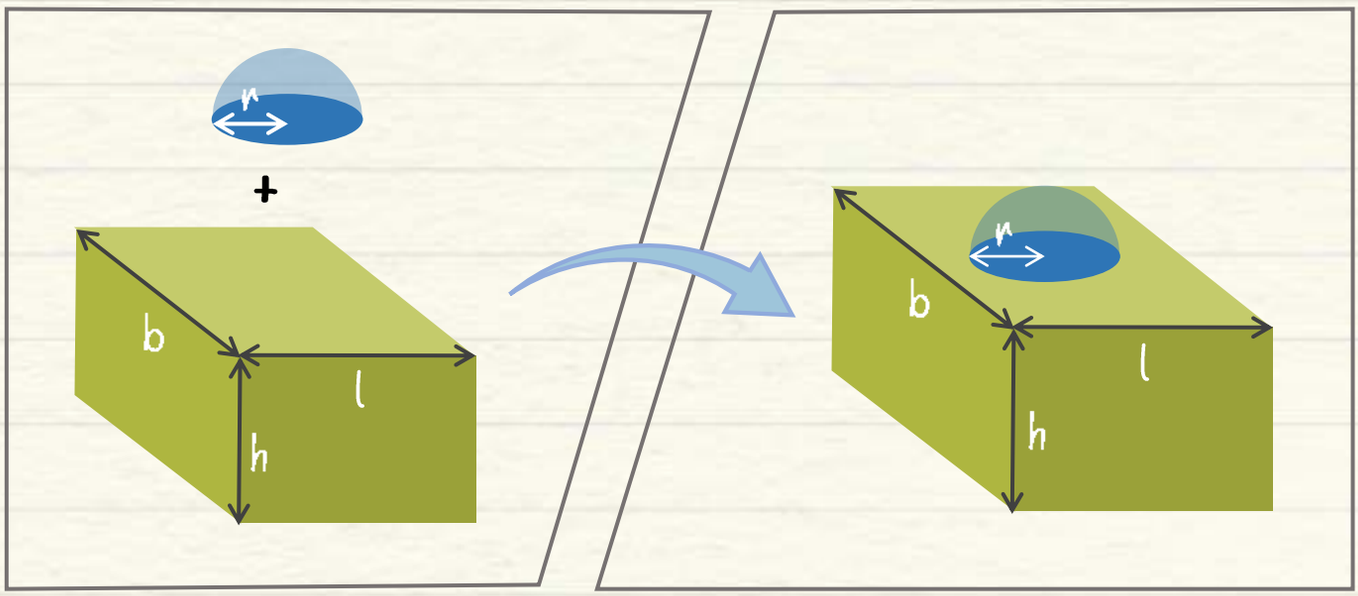
+

Curved surface area of cone

$$2\pi r^2 + 2\pi r h_1 + \pi r l$$

4. Volume of Combination of Solids

It is the sum of the volumes of solids that are being combined, and subtraction of the volumes of the solids that are being removed.



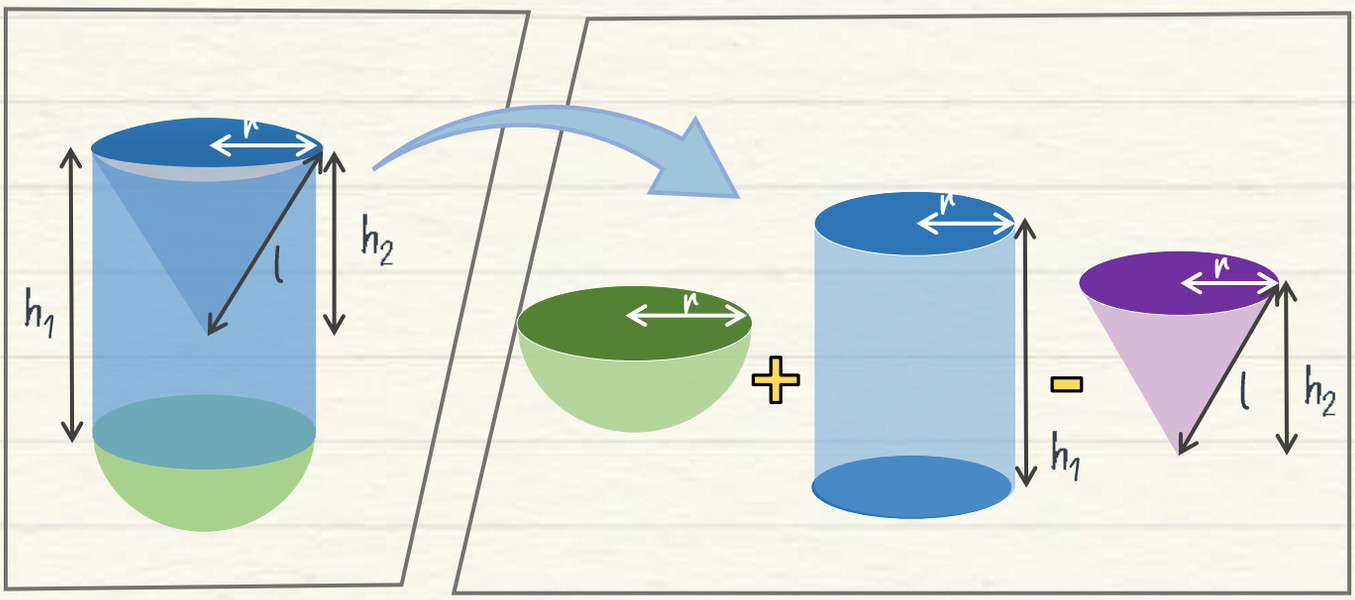
Volume

Volume of cuboid

+

Volume of hemisphere

$$lbh + \frac{2}{3}\pi r^3$$



Volume

Volume of hemisphere

+

Volume of Cylinder

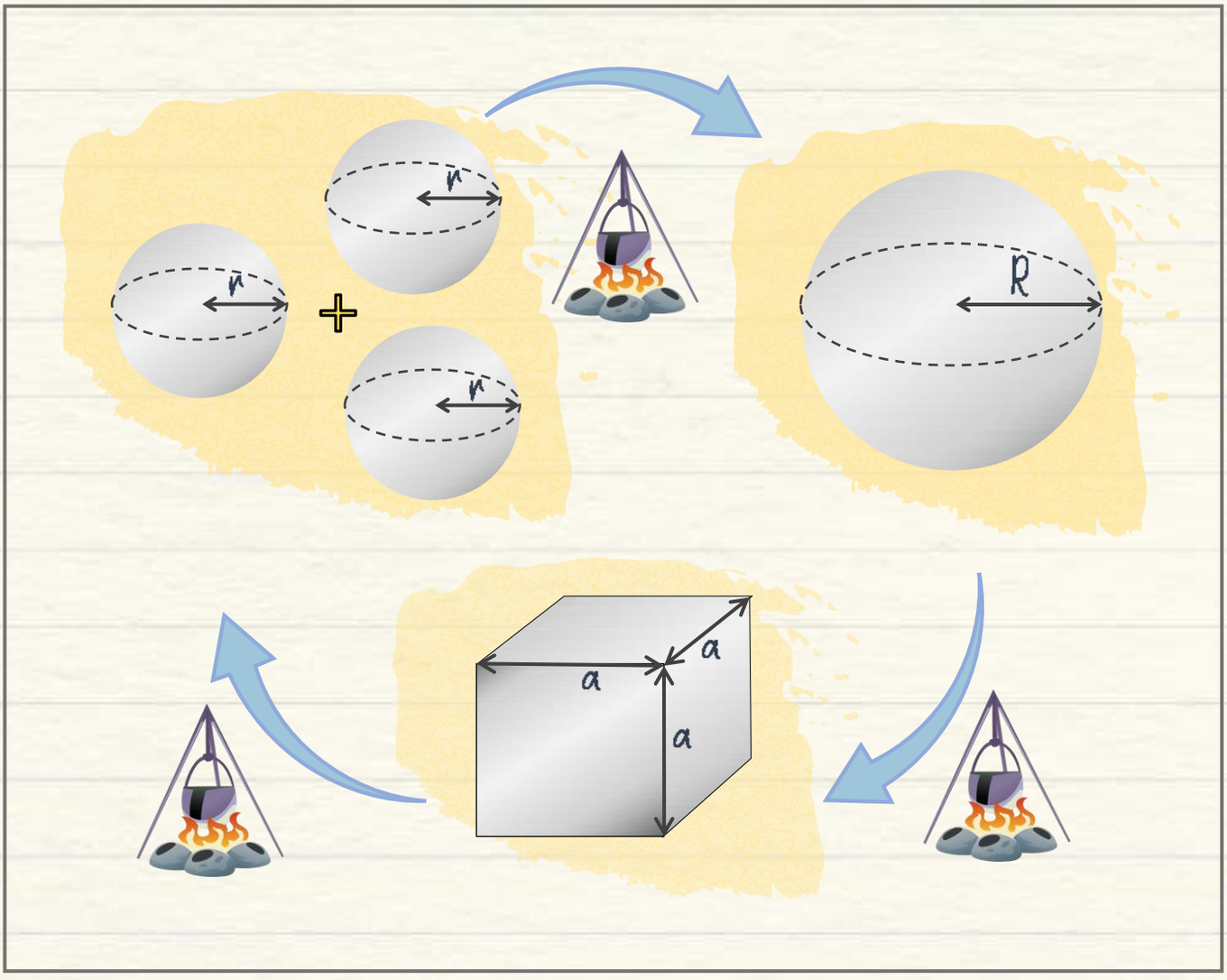
−

Volume of cone

$$\frac{2}{3}\pi r^3 + \pi r^2 h_1 - \frac{1}{3}\pi r^2 h_2$$

5. Conversion of Solids

When a solid is reshaped, its volume remains the same.

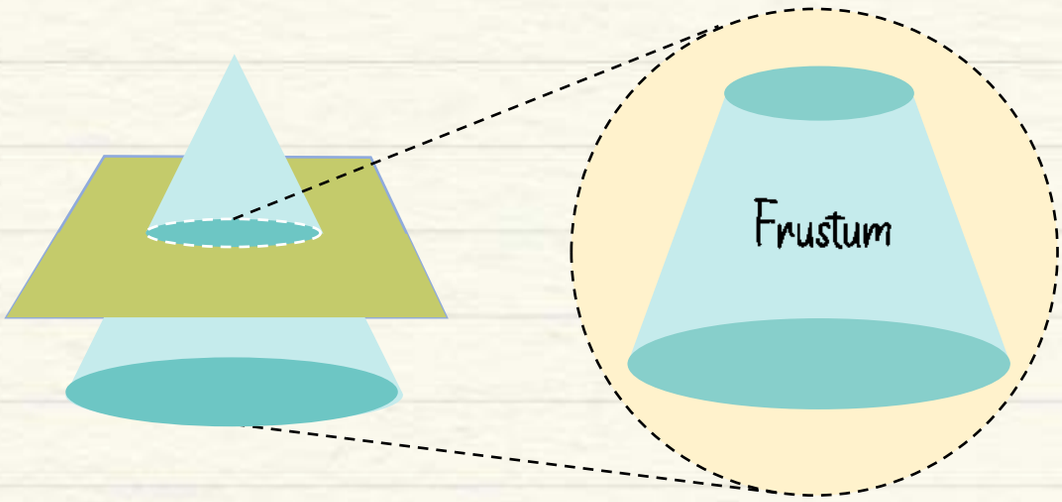


Sum of volumes of the smaller spheres	=	Volume of the larger sphere	=	Volume of the cube
$3\left(\frac{4}{3}\pi r^3\right)$		$\frac{4}{3}\pi R^3$		a^3

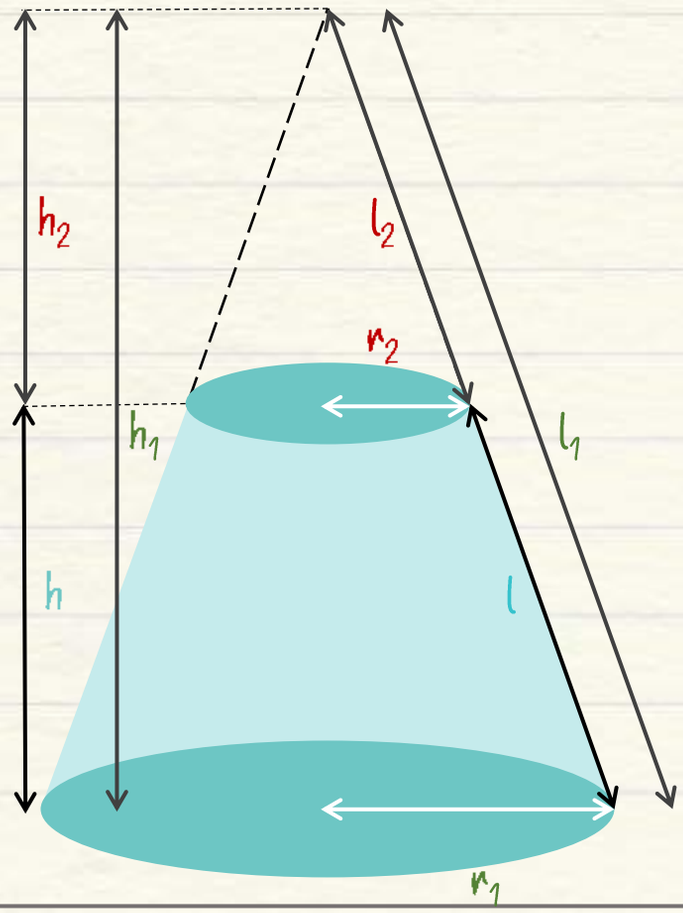
B

b. Frustum of a Cone

It is a shape with 2 circular ends, obtained by intersecting right circular cone with a plane parallel to its base.



Formula related to frustum



Slant height

$$l = \sqrt{h^2 + (r_1 - r_2)^2}$$

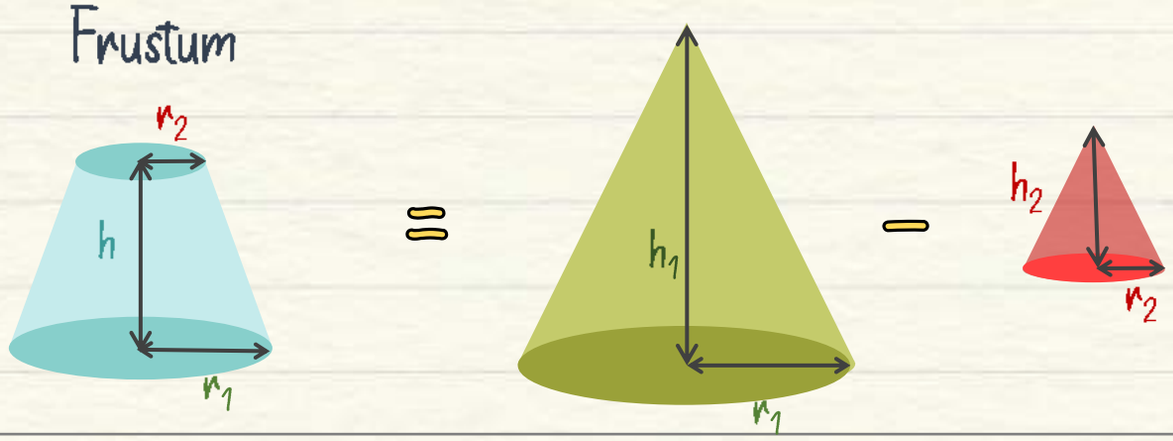
Curved surface area

$$\pi(r_1 + r_2)l$$

Total surface area

$$\pi(r_1 + r_2)l + \pi r_1^2 + \pi r_2^2$$

Frustum



Volume of frustum

If dimensions of both cones are known

Volume of Bigger Cone

−

Volume of Smaller Cone

$$\frac{1}{3}\pi(h_1 r_1^2 - h_2 r_2^2)$$

If dimensions of frustum are known

$$\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$$

Mind Map

Volume remains Constant