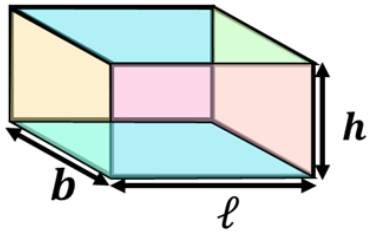
# MIND MAP

## Surface Areas and Volumes

### Cuboid

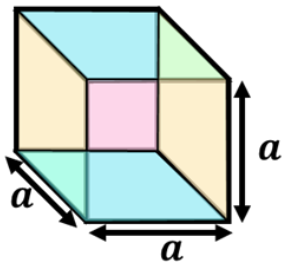



Length = $\ell$ units
Breadth = $b$ units
Height = $h$ units

| | | |
|---|---|---|
| T. S. A. | $2(\ell b + bh + \ell h)$ | sq. units |
| C. S. A. | $2h \times (\ell + b)$ | sq. units |
| Volume | $\ell \times b \times h$ | cubic units |

| | |
|---|---|
| Longest Diagonal | $\sqrt{\ell^2 + b^2 + h^2}$ |
| Sum of lengths of all edges | $4(\ell + b + h)$ |

### Cube

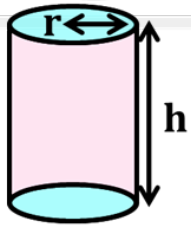



Length = $a$ units
Breadth = $a$ units
Height = $a$ units

| | | |
|---|---|---|
| T. S. A. | $6a^2$ | sq. units |
| C. S. A. | $4a^2$ | sq. units |
| Volume | $a^3$ | cubic units |

| | |
|---|---|
| Longest Diagonal | $a\sqrt{3}$ |
| Sum of lengths of all edges | 12a |

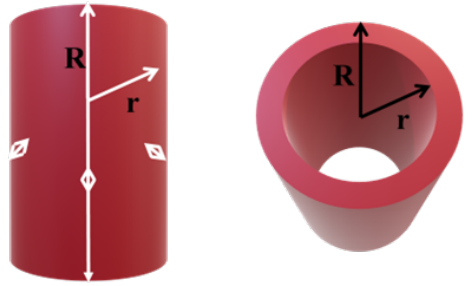
### Right Circular Cylinder




Radius : r units
Height : h units

| | | |
|---|---|---|
| T. S. A. | $2\pi rh + 2\pi r^2$ $2\pi r(h + r)$ | sq. units |
| C. S. A. | $2\pi rh$ | sq. units |
| Volume | $\pi r^2 h$ | cubic units |

### Hollow Cylinder




Outer Radius = R
Inner Radius = r

Thickness
(R – r) units
Height = h

**C. S. A**

= (External C. S. A.) + (Internal C. S. A.)
= $(2\pi Rh + 2\pi rh)$ sq. units

**T. S. A**

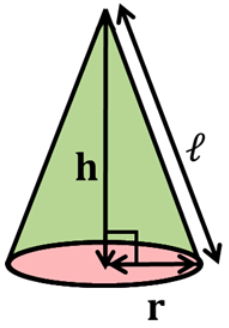
= (C. S. A.) + (Area of 2 base rings)
= $(2\pi Rh + 2\pi rh) + (2\pi R^2 - 2\pi r^2)$
= $2\pi(Rh + rh + R^2 - r^2)$ sq. units

Volume = $\pi R^2 h - \pi r^2 h$
= $\pi(R^2 - r^2)h$ cubic units

# MIND MAP

## Surface Areas and Volumes

### Right Circular Cone




Radius : r units

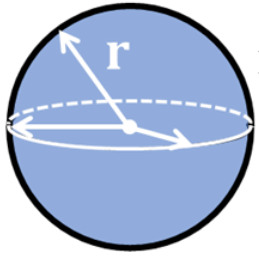
Height : h units

Slant Height : $\ell$ units

| | | |
|---|---|---|
| T. S. A. | $\pi r\ell + \pi r^2$ <br> $\pi r(\ell + r)$ | sq. units |
| C. S. A. | $\pi r\ell$ | sq. units |

| | | |
|---|---|---|
| Volume | $\frac{1}{3}\pi r^2 h$ | cubic units |
| Slant Height | $\sqrt{r^2 + h^2}$ | units |

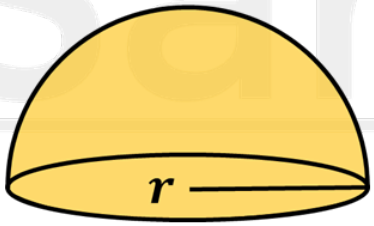
### Sphere




Radius (Sphere) = r

| | | |
|---|---|---|
| T. S. A. | $4\pi r^2$ | sq. units |
| C. S. A. | $4\pi r^2$ | sq. units |
| Volume | $\frac{4}{3}\pi r^3$ | cubic units |

### Hemisphere




Total Surface Area $= 2\pi r^2 + \pi r^2$

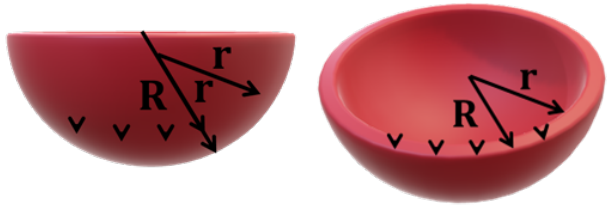
$= 3\pi r^2$ sq. units

Curved Surface Area $= 2\pi r^2 + \pi r^2$ sq. units

Volume $= \frac{2}{3}\pi r^3$ cubic units

(Half of that of a sphere)

### Hollow Hemisphere




Thickness

(R – r) units

Curved Surface Area =

(External C. S. A.) + (Internal C. S. A.)

$= (2\pi R^2 + 2\pi r^2)$ sq. units

Total Surface Area

= (C. S. A.) + (Area of upper ring)

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

$= 3\pi R^2 + \pi r^2$ sq. units

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

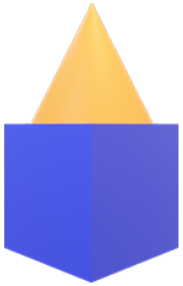
$= \frac{2}{3}\pi(R^3 - r^3)$ cubic units

# MIND MAP

## Surface Areas and Volumes

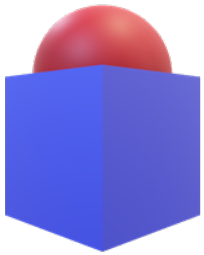
### Surface Area of Combination of Solid

Area (Orange) = C. S. A. (Cone) $(\pi r\ell)$ + Base Area (Cone) $(\pi r^2)$ − Base Area (Cylinder) $(\pi(r')^2)$



T. S. A. = T. S. A. (Cube) + C. S. A. (Cone) − Base Area (Cone)

Volume = Volume (Cube) + Volume (Cone)



T. S. A. = T. S. A. (Cube) + C. S. A. (Hemisphere) − Base Area (Hemisphere)

Volume = Volume (Cube) + Volume (Hemisphere)

T. S. A. = T. S. A. (Cube) + T. S. A. (Cylinder) − Base Area (Cylinder)

Volume = Volume (Cube) + Volume (Cylinder)

T. S. A. = C. S. A. (Cylinder) + C. S. A. (Cone) + Base Area (Cylinder)

Volume = Volume (Cone) + Volume (Cylinder)

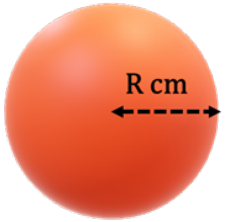
T. S. A. = C. S. A. (Cone) + C. S. A. (Hemisphere)

Volume = Volume (Cone) + Volume (Hemisphere)

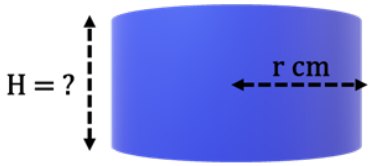
### CONVERSION OF SOLID FROM ONE SHAPE TO ANOTHER

**Example -1:**

Sphere




Cylinder



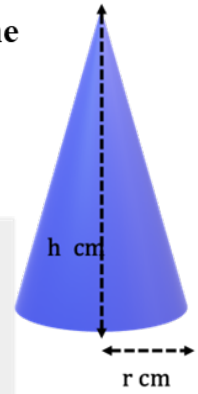

Volume = $V_1$ Volume = $V_2$

$V_1 = V_2$

$\Rightarrow \frac{4}{3}\pi(R)^3 = \pi(r)^2H$

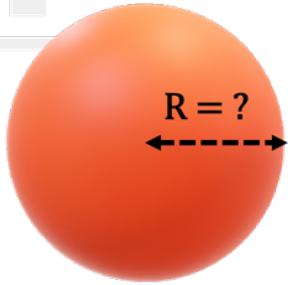
**Example -2:**

Cone




Volume = $V_1$

Sphere




Volume = $V_2$

$V_1 = V_2$

$\therefore \frac{1}{3} \times \pi \times r \times h = \frac{4}{3} \times \pi \times R^3$