DAY 21

MCA CET 2025

MATHS

VOLUME & SURFACE AREA

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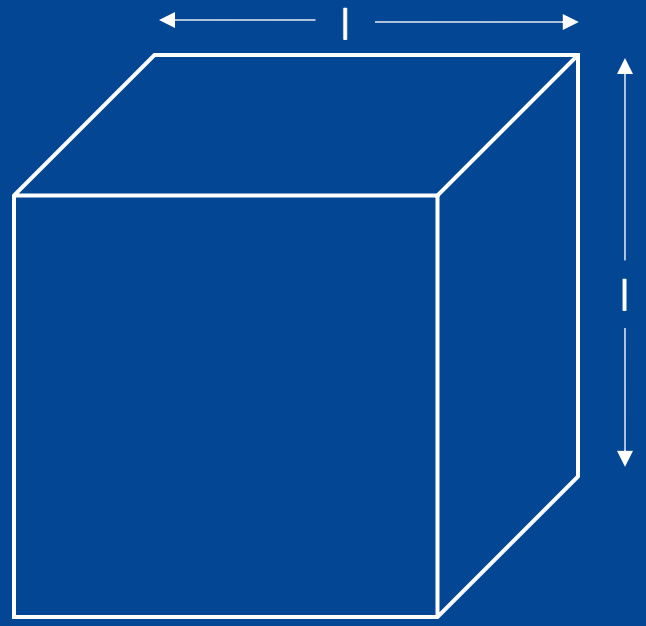
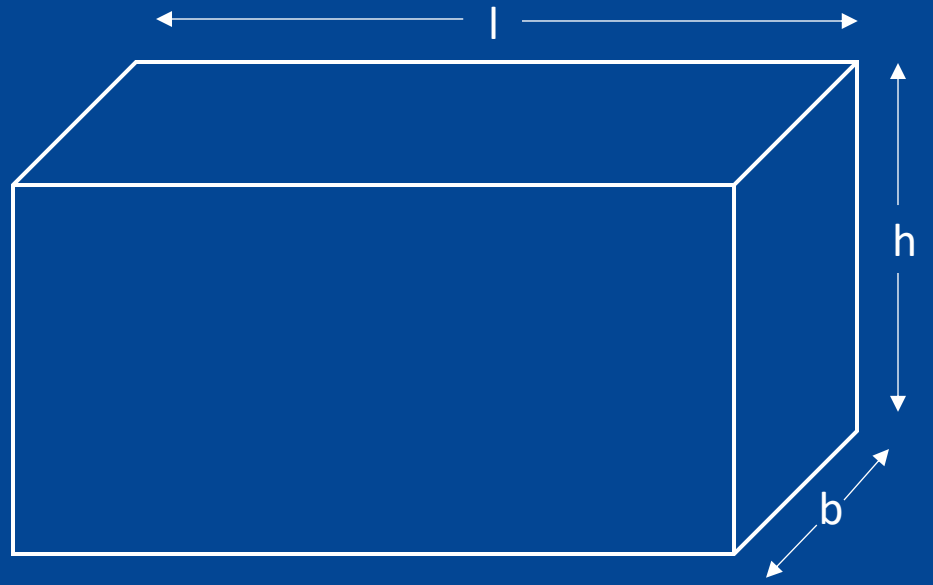


Cube:

Lateral surface area $= 4l^2$

Total surface area $= 6l^2$

Volume $= l^3$



l x b x h

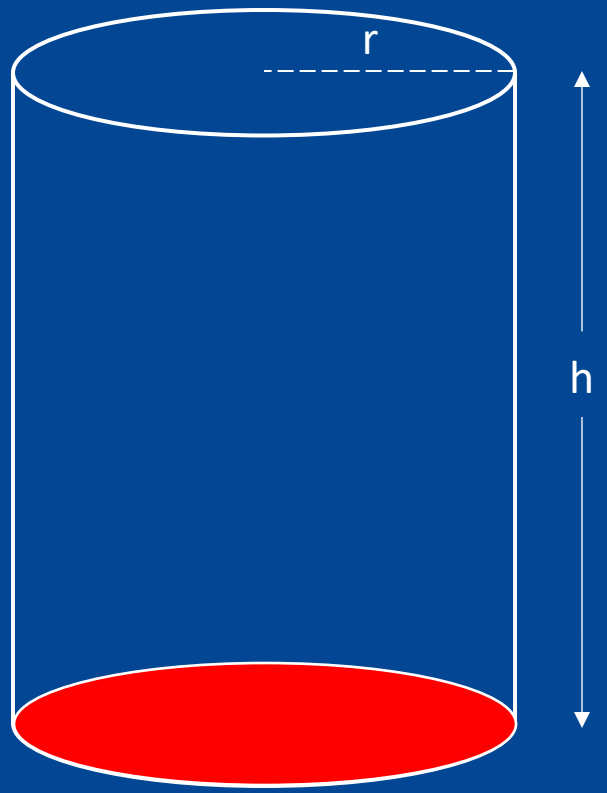
Cuboid:

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

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

Volume $= lbh$

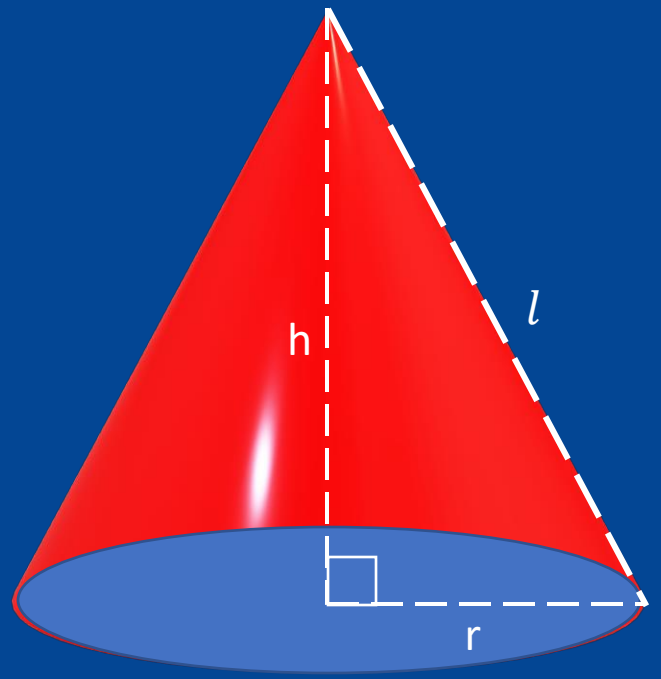
Cylinder:



Curved surface area $= 2\pi rh$

Total surface area $= 2\pi r(r + h)$

Volume $= \pi r^2 h$



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

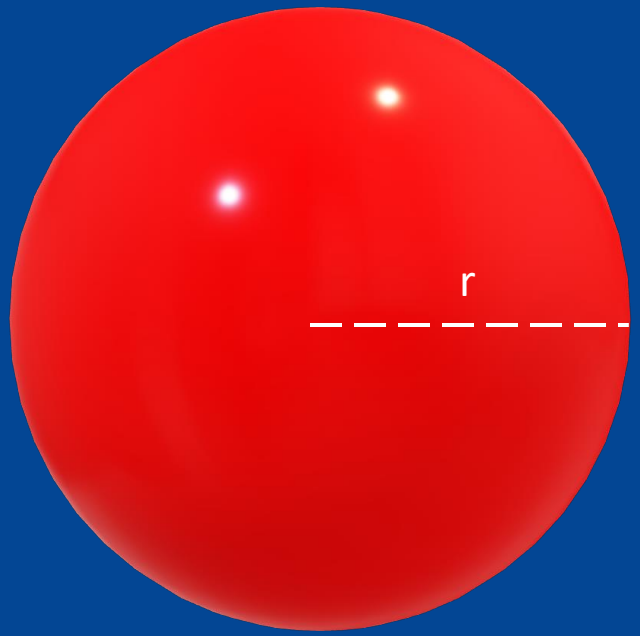
Cone:

Slant height $(l) = \sqrt{h^2 + r^2}$

Curved surface area $= \pi r l$

Total surface area $= \pi r(r + l)$

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

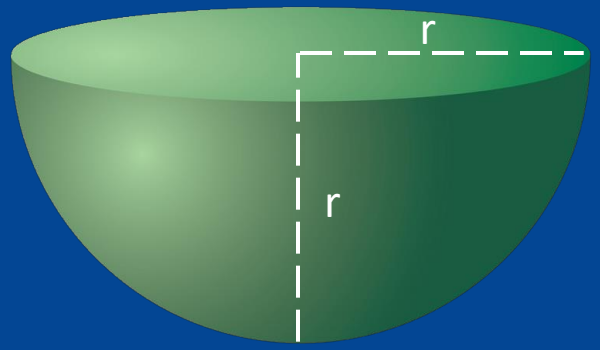


Sphere:

$$\text{Surface area} = 4\pi r^2$$

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

Hemisphere:



Curved Surface area $= 2\pi r^2$

Total Surface area
of solid hemisphere $= 3\pi r^2$

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

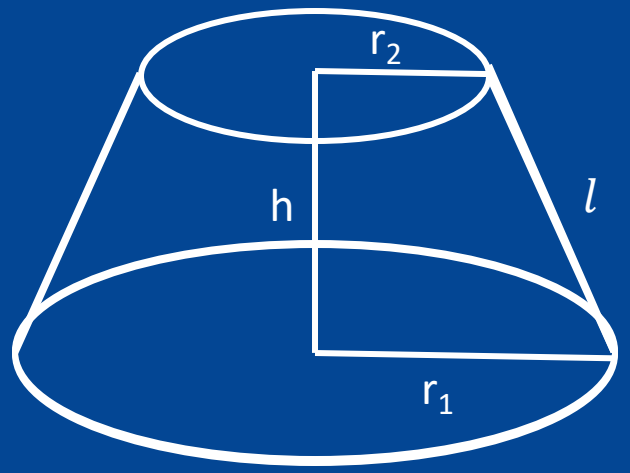
Formulas

No.	Three-dimensional figure name	Formulae
1.	Cuboid	$Lateral\ surface\ area = 2h(l + b)$ $Total\ surface\ area = 2h(lb + bh + hl)$ $Volume = lbh$
2.	Cube	$Lateral\ surface\ area = 4l^2$ $Total\ surface\ area = 6l^2$ $Volume = l^3$
3.	Cylinder	$Curved\ surface\ area = 2\pi rh$ $Total\ surface\ area = 2\pi r(r + h)$ $Volume = \pi r^2 h$
4.	Cone	$Slant\ height\ (l) = \sqrt{h^2 + r^2}$ $Curved\ surface\ area = \pi rl$ $Total\ surface\ area = \pi r(r + l)$ $Volume = \frac{1}{3}\pi r^2 h$
5.	Sphere	$Surface\ area = 4\pi r^2$ $Volume = \frac{4}{3}\pi r^3$
6.	Hemisphere	$Curved\ Surface\ area = 2\pi r^2$ $Total\ Surface\ area\ of\ solid\ hemisphere = 3\pi r^2$ $Volume = \frac{2}{3}\pi r^3$

Frustum of a cone

'Frustum' is Latin word meaning 'piece cut off'

$r_1 > r_2$



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

The curved surface area $= \pi(r_1 + r_2)l$

Total surface area

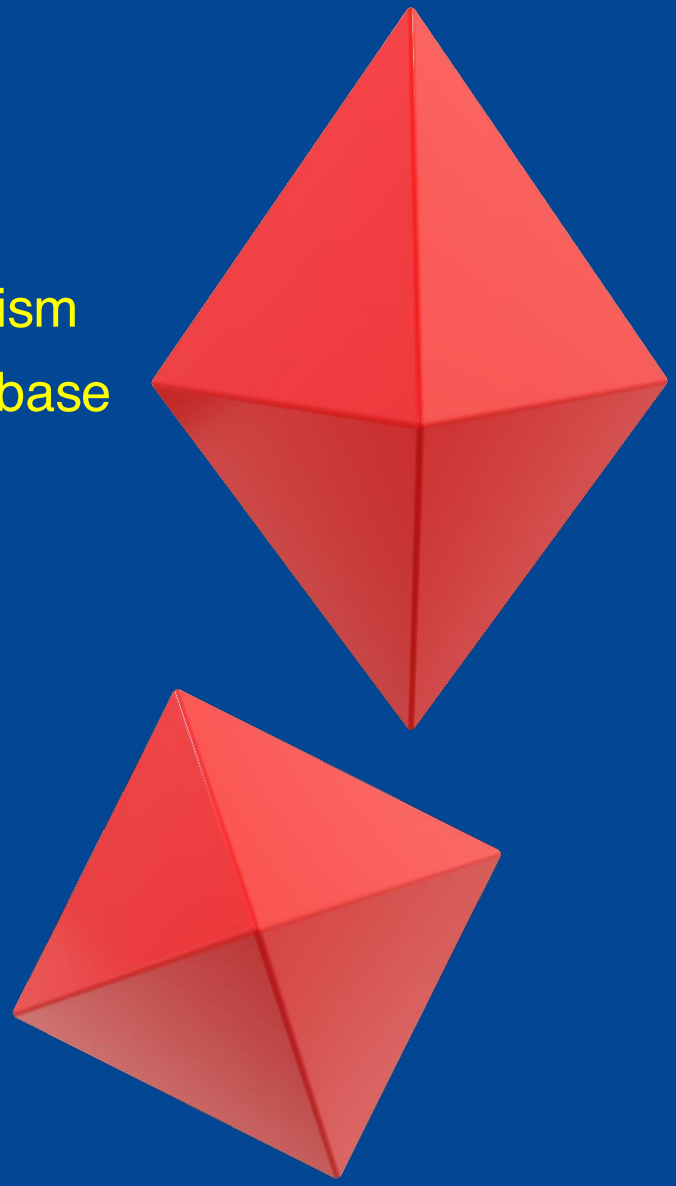
$$= \pi(r_1 + r_2)l + \pi {r_1}^2 + \pi {r_2}^2$$

$Volume\ of\ the\ frustum$

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

Prism

1. Volume of prism = Area of base x Height of the prism
2. Lateral surface area = Perimeter of base x Height of prism
3. Total surface area = Lateral surface area + 2 x Area of base



Pyramid

1. Volume of a pyramid = $\frac{1}{3}$ x Area of base x Height (vertical)
2. Lateral surface area = $\frac{1}{2}$ x Perimeter of the base x Slant height
3. Total surface area = Lateral surface area + Area of the base

If the total surface area of a cube is 6 sq units, then what is the volume of the cube?

(a) 1 cu unit (b) 2 cu units (c) 4 cu units (d) 6 cu units

$6l^2 = 6$

$l^2 = 1$

$l = 1$

Volume $= l^3 = 1^3 = 1$

The ratio of volumes of two cubes is 8:125. The ratio of their surface area is

(a) 4: 25 (b) 2 : 75 (c) 2: 15 (d) 4: 15

$$\frac{l_1^3}{l_2^3} = \frac{8}{125} \Rightarrow \frac{l_1}{l_2} = \frac{2}{5} \Rightarrow \frac{4}{25}$$

$$\frac{6l_1^2}{6l_2^2}$$

Find the surface area of a cuboid 10 m long, 5 m broad and 3 m high.

(a) 105 m^2 (b) 104 m^2 (c) 170 m^2 (d) 190 m^2

$2(lb + bh + lh)$

$= 2(50 + 15 + 30)$

$= 2 \times 95$

$= 190$

L b h

A water tank is 5m long, 3m broad and 1m deep. How many liters of water can it hold?

(a) 729 L (b) 810 L (c) 720 L (d) 15000 L

Volume = $L \times b \times h$

$= 5 \times 3 \times 1 =$ 15 cu. m.

$1\ m^3 = 1000\ L$

$15 \times 1000 = 15000\ L$

The sum of the radius and height of cylinder is 19 m. The total surface area of the cylinder is 1672 m^2. What is the volume of the cylinder?

(a) 3080 m^3

(b) ~~2940~~ m^3

(c) 3420 m^3

(d) 2860 m^3

$r + h = 19 \Rightarrow h = 5$

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

$1672 = 2 \times \frac{22}{7} \times r(19)$

$r = \frac{1672 \times 7}{2 \times 22 \times 19} = \frac{4 \times 7}{2}$

$r = 14$.

$\pi r^2 h = \frac{22}{7} \times 14 \times 14 \times 5$

$= 44 \times 70$

$= 3080$

A hemisphere has 28 cm diameter. Find its curved surface area.

(a) 1232 cm^2

(b) 1236 cm^2

(c) 1238 cm^2

(d) 1233 cm^2

$r = 14cm$

$2\pi r^2 \quad 2$

$\frac{2 \times 22}{7} \times 14 \times 14$

$3 \quad 88 \quad 14 \quad 2$

A prism and a pyramid have the same base and the same height. Find the ratio of the volumes of the prism and the pyramid.

(a) 1:1 (b) 1:3 (c) 3:1 (d) 2:3

$$\frac{\text{volume of prism}}{\text{pyramid}} = \frac{b \times h \times 3}{\frac{1}{3} \times b \times h}$$

$$\frac{3}{1}$$

$r = 2 \quad h = 8$

A right circular metal cone (solid) is 8 cm high and the radius is 2 cm. It is melted and recast into a sphere. What is the radius of the sphere?

(a) 2 cm (b) 3 cm (c) 4 c (d) 5 cm

$$\frac{4}{3}\pi r^3 = \frac{1}{3} \times \pi R^2 H$$

$$r^3 = \frac{2 \times 2 \times 8}{4}$$

$$r^3 = 8$$

$$r = 2$$

$d = 10.5$

The diameter of a circle is 10.5 cm and the radius of a sphere is twice the diameter of the circle. Find the volume of the sphere.

(a) 38808 cm^3

(b) 25996 cm^3

(c) 30804 cm^3

(d) 35664 cm^3

$r = 21\ cm$

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

$4 \times 22 \times 21 \times 21$

$44 \times 21 \times 21$

924×21

19404

(b)

If the volumes of two right circular cones are in the ratio 1 : 3 a n d their diameters are in the ratio 3: 5, then the ratio of their heights is

(a) 25: 27 (b) 1 : 5 (c) 3:5 (d) 5:27

$$\frac{d_1}{d_2} = \frac{3}{5}$$

$$\frac{2r_1}{2r_2} = \frac{3}{5}$$

$$\frac{\frac{1}{3}\pi R_1^2 H_1}{\frac{1}{3}\pi R_2^2 H_2} = \frac{1}{3}$$

$$\frac{9}{25} \times \frac{H_1}{H_2} = \frac{1}{3}$$

$$\frac{H_1}{H_2} = \frac{1}{3} \times \frac{25}{9}$$

$$\frac{25}{27}$$

$r = 12 \quad h = 16$

A conical cap has the base diameter 24 cm and height 16 cm. What is the cost of painting the surface of the cap at the rate of 70 paise per cm??

(a) Rs.520

(b) Rs.524

(c) Rs.528

(d) Rs.532

$\pi r l$

$l = \sqrt{256 + 144}$

$= \sqrt{400} = 20$

$\frac{22}{7} \times 12 \times 20 \times \frac{1}{2}$

$22 \times 12 \times 2$

$44r$

12

528

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