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CLASS – 9

MATHEMATICS

Chapter – 11

Surface Areas and Volumes

Part – 12

Volume of a Sphere

Vikas Saini

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OVERVIEW

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1. Surface Area of a Right Circular Cone
2. Surface Area of a Sphere
3. Volume of a Right Circular Cone
4. Volume of a Sphere

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VOLUME OF A SPHERE



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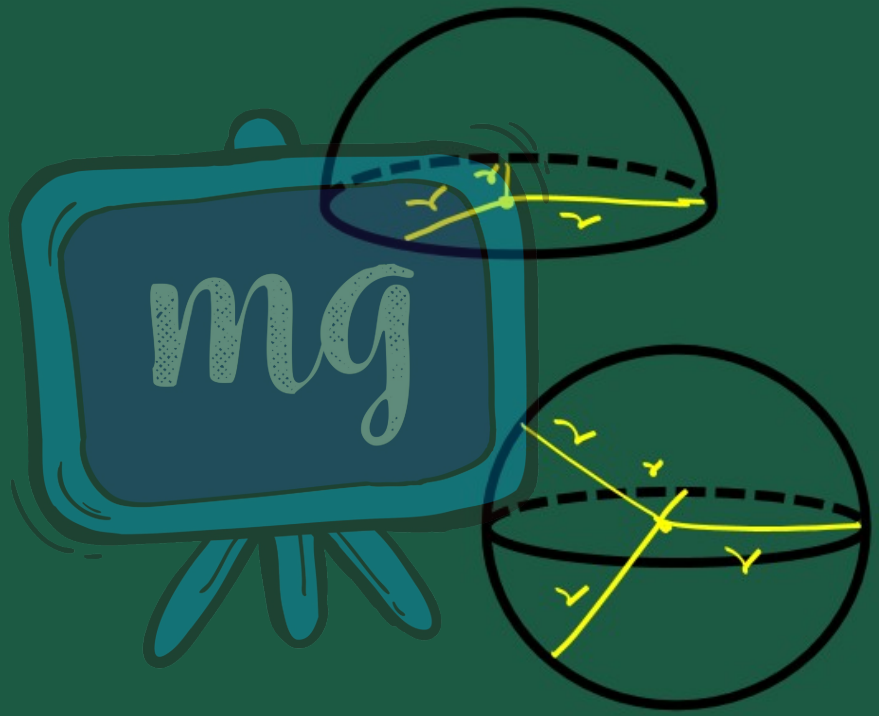

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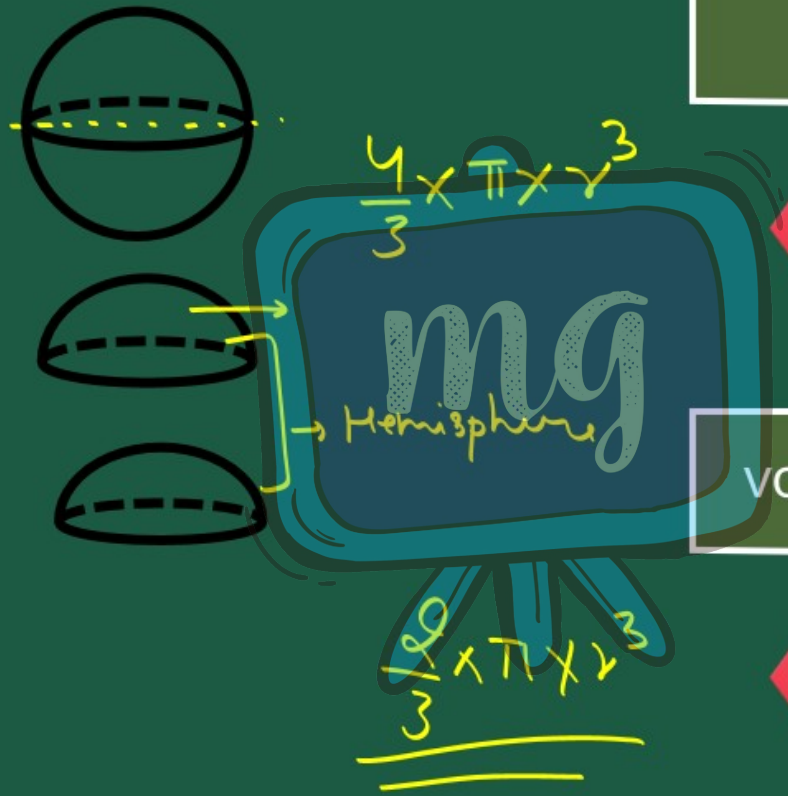

Volume of a Sphere

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

volume of a hemisphere

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

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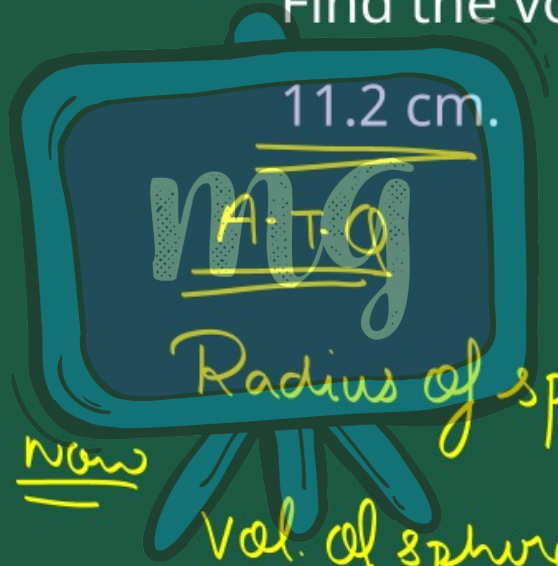
Example : 10

Find the volume of a sphere of radius 11.2 cm.



Radius of sphere = 11.2 cm

Now

Vol. of sphere $= \frac{4}{3} \times \pi \times r^3$

$r^3 = r \times r \times r$

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$$= \frac{4}{3} \times \frac{22}{7} \times (11.2)^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 11.2 \times 11.2 \times 11.2$$

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{112}{10} \times \frac{112}{10} \times \frac{112}{10}$$

$$= \frac{4 \times 22 \times 16 \times 112 \times 112}{3 \times 1000}$$

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$$= \frac{4 \times 22 \times 16 \times 112 \times 112}{3 \times 1000}$$

$$= \frac{88 \times 16 \times 12,544}{3 \times 1000}$$

$$= \frac{88 \times 200,704}{3 \times 1000}$$

$$= \frac{17661952}{3 \times 1000} = \frac{5887317.333}{1000}$$

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$$= \frac{5887317.333}{1000}$$

$$= 5887.317333\ldots\ cm^3$$



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Example : 11

A shot-putt is a metallic sphere of radius 4.9 cm. If the density of the metal is 7.8 g per cm3, find the mass of the shot-putt.



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A. T. Q

Radius of shot-put [metallic sphere] = 4.9 cm

density of shot-put = 7.8 g per cm^3



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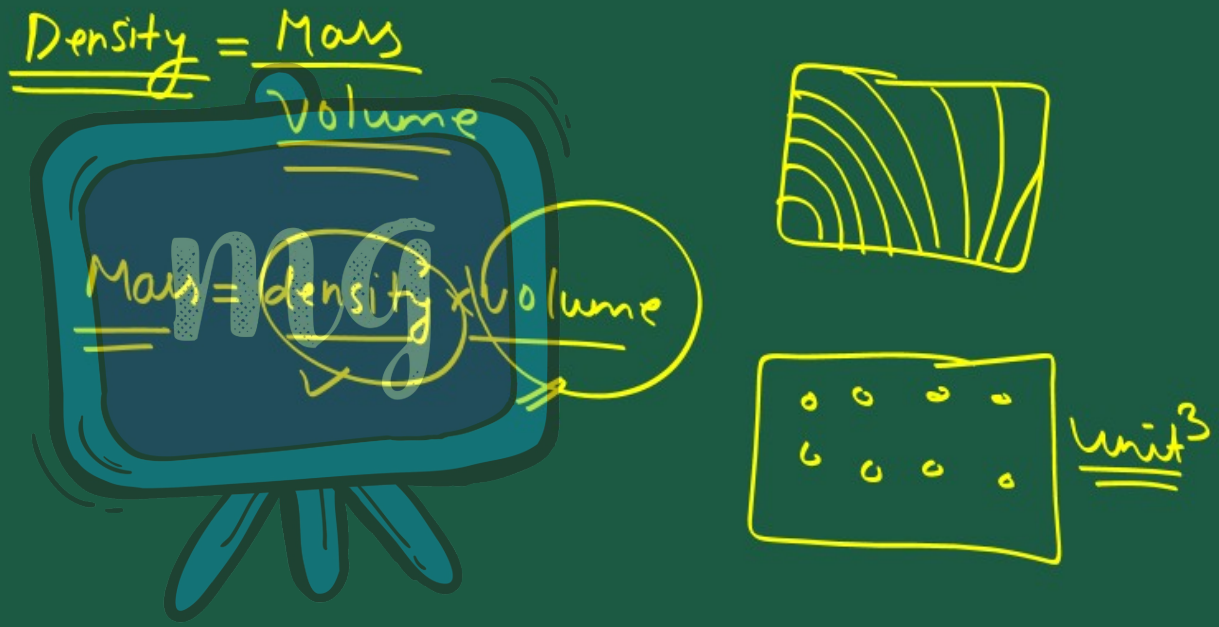

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Now

Vol. of sphere $= \frac{4}{3} \times \pi \times r^3$



So,

Vol. of shot-put $= \frac{4}{3} \times \frac{22}{7} \times (4.9)^3$

$= \frac{4}{3} \times \frac{22}{7} \times 4.9 \times 4.9 \times 4.9$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{\cancel{49}^{7}}{10} \times \frac{49}{10} \times \frac{49}{10}$

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$$= \frac{4 \times \frac{22}{7} \times 7 \times 49 \times 49}{3 \times 10 \times 10 \times 10}$$

$$= \frac{4 \times 22 \times 7 \times 2401}{3 \times 1000}$$

$$= \frac{88 \times 16807}{3 \times 1000} = \frac{1479016}{3 \times 1000}$$

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$$= \frac{1479016}{3 \times 1000}$$

$$= \frac{493005.333}{1000}$$

$$= 493.00533\ldots\ cm^3$$

$$\approx 493\ cm^3$$

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Since we know that

$$\text{density} = \frac{\text{Mass}}{\text{Volume}}$$

So, $\text{Mass} = \text{density} \times \text{volume}$

$\frac{g}{cm^3} \times cm^3$

So,

Mass of shot-put $= 7.8 \times 493$

$= 3845.44\ldots\ g$

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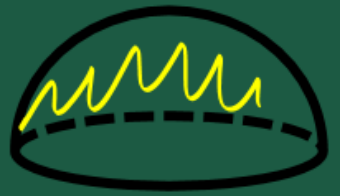
Example : 12

A hemispherical bowl has a radius of 3.5 cm. What would be the volume of water it would contain?

A·T·Q

Radius of Hemispherical Bowl = 3.5 cm = $\frac{35}{10} = \frac{7}{2}$ cm



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Vol. of Hemisphere $= \frac{2}{3} \times \pi \times r^3$

$= \frac{\cancel{2}^{1}}{\cancel{3}} \times \frac{\cancel{22}^{11}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{7}{2} \times \frac{7}{2}$

$= \frac{11 \times 7 \times 7}{3 \times 2} = \frac{11 \times 49}{6}$

$= \frac{539}{6} = 89.833\ldots\ cm^3$

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LEARNING OUTCOMES

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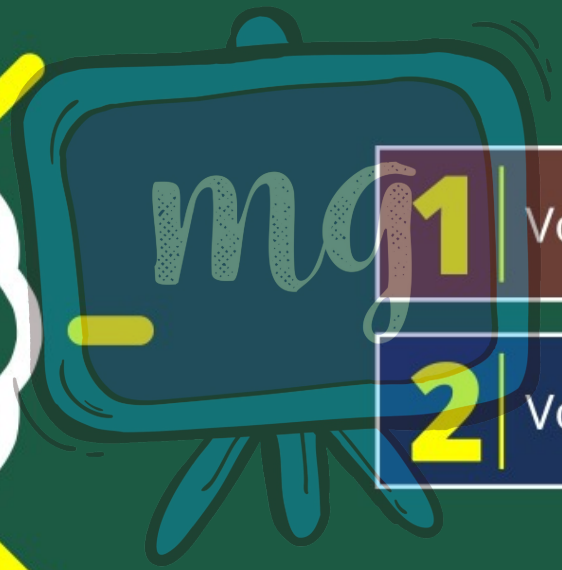

1. Volume of a sphere
2. Volume of a hemisphere



1 If the radius of a sphere is halved, what is the ratio of the volume of the original sphere and the new sphere?

A 4 : 1

B 1 : 4

C 6 : 1

D 8 : 1

Radius of Sphere = R_1
original

Radius of New sphere = $\frac{R_1}{2}$

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$$\text{Ratio} = \frac{\text{Vol. of sphere [original]}}{\text{Vol of sphere [New sphere]}}$$

$$= \frac{\frac{4}{3}\times\pi\times(R_1)^3}{\frac{4}{3}\times\pi\times\left(\frac{R_1}{2}\right)^3} = \frac{R_1^3}{\frac{R_1^3}{8}}$$

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$$= R_1^3 \div \frac{R_1^3}{8}$$

$$= \frac{R_1^3 \times 8}{R_1^3} = \frac{8}{1}$$

Ratio = 8 : 1



2 What is the ratio of the volume of a sphere and a hemisphere of the same radius?

A 1 : 2

B 2 : 1

C 3 : 2

D 2 : 3

Sphere Hemisphere

Same Radius

$\frac{4}{3}\pi r^3$ $\frac{2}{3}\times\pi\times r^3$

$$\text{Ratio} = \frac{\text{Vol. of Sphere}}{\text{Vol. of Hemisphere}}$$

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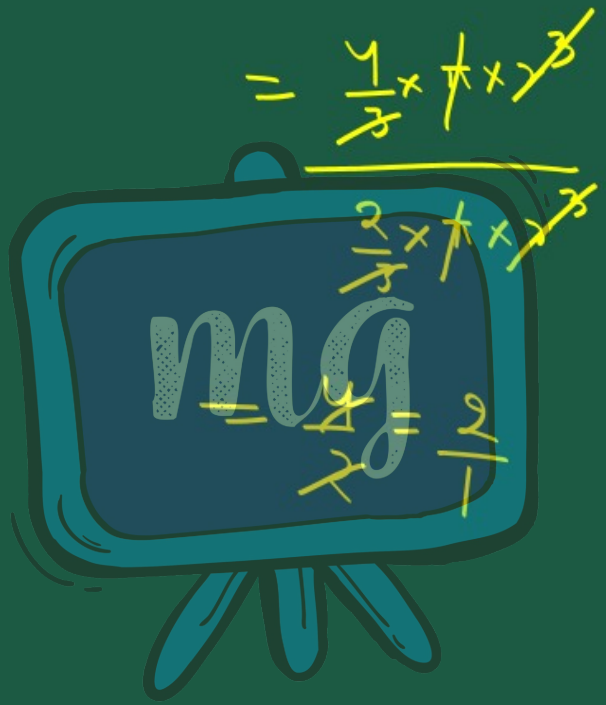



3 If the radius of a sphere is 2r, then its volume will be –

A $(4/3)\ \pi r^3$

B $4\pi r^3$

C $(8/3)\ \pi r^3$

D $(32/3)\ \pi r^3$