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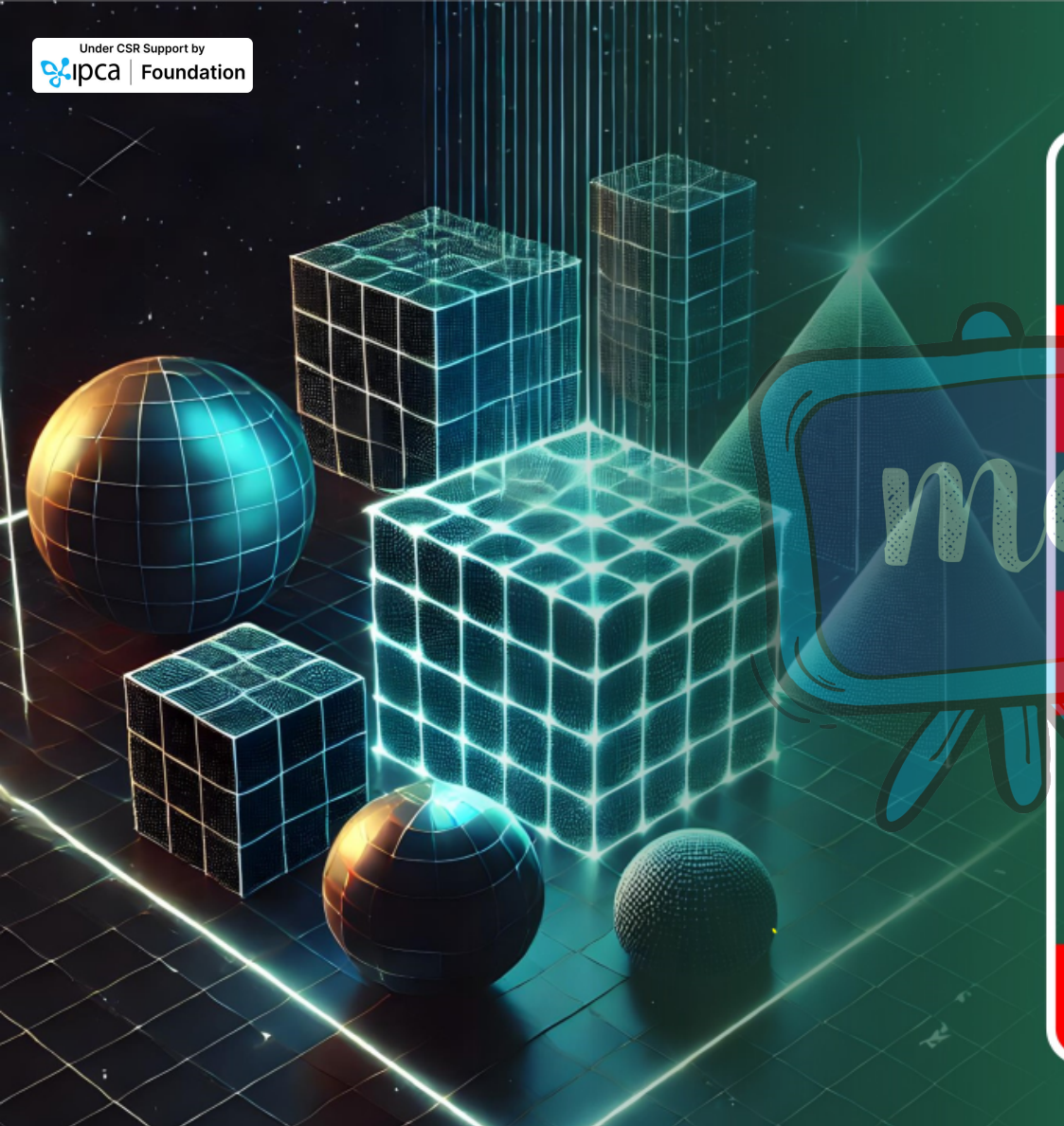

CLASS – 9

MATHEMATICS

Chapter – 11

Surface Areas and Volumes

Part – 14

Exercise 11.4 (Question 6 - 10)

Vikas Saini

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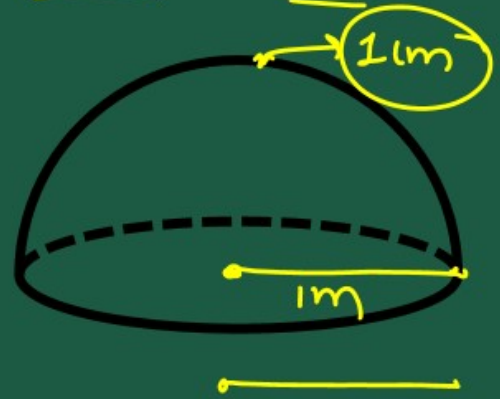
6. A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.



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A·T·Q

(r_i) Inner Radius of Tank = 1m

Thickness of Tank = 1cm = $\frac{1}{100}$ = 0.01m



So, Outer Radius (r_o) = Inner Radius + Thickness

= 1 + 0.01

= 1.01 m.

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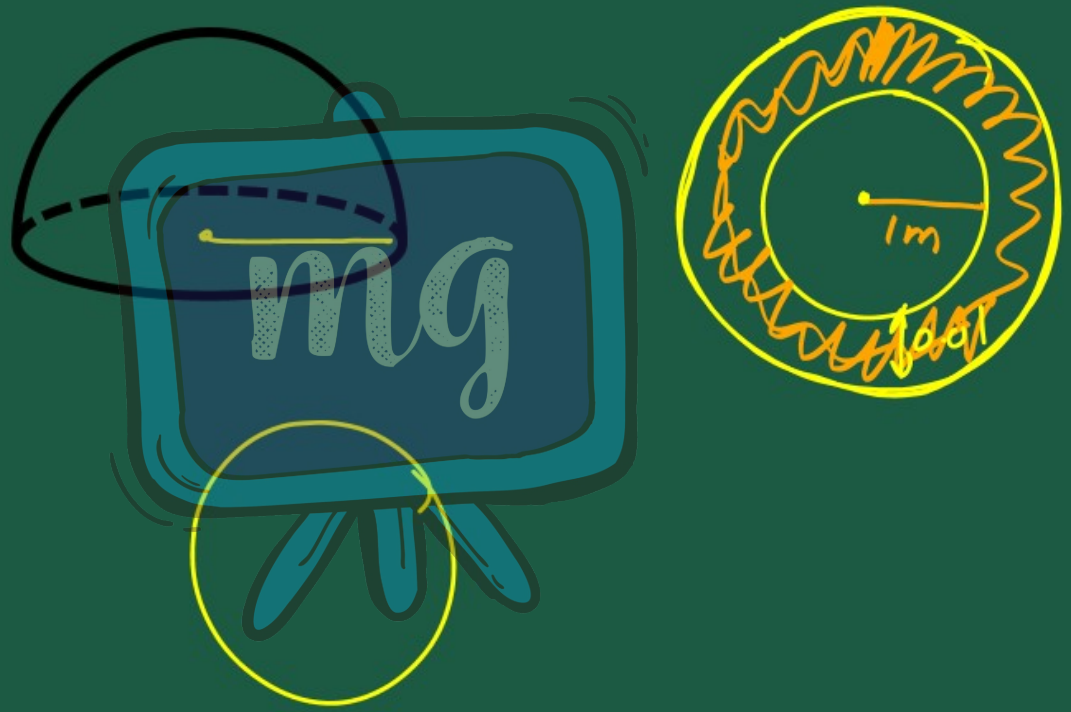

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Volume of iron used = Volume of Tank Regarding to outer Radius − Vol. of Tank Regarding To Inner Radius

$$= \frac{2}{3} \times \pi \times r_0^3 - \frac{2}{3} \times \pi \times r_i^3$$

$$= \frac{2}{3} \times \pi \times \left(r_0^3 - r_i^3 \right)$$

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$$= \frac{2}{3} \times \frac{22}{7} \times \left((1.01)^3 - 1^3\right)$$

$$= \frac{2 \times 22}{3 \times 7} \times \left(1.03031 - 1\right)$$

$$= \frac{44}{21} \times 0.03031$$

$$= \frac{1.33364}{21} = 0.0637833.$$

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Vol. of iron used = 0.06378 m^3



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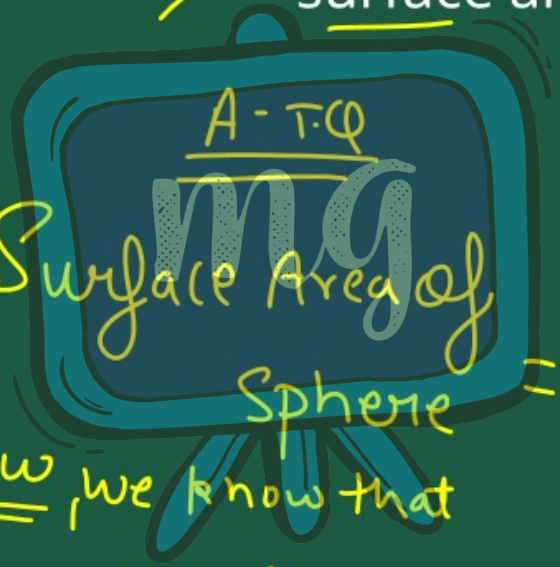
7. Find the volume of a sphere whose surface area is 154 cm^2.



A - T·Q

Surface Area of Sphere = 154 cm^2

Now, we know that

Surface area of Sphere = $4 \times \pi \times r^2$

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$\Rightarrow 4 \times \pi \times r^2 = 154$

$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 154$

$r^2 = \frac{154 \times 7}{4 \times 22}$

$r^2 = \frac{49}{4} \Rightarrow r = \sqrt{\frac{49}{4}}$

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$$r = \frac{\sqrt{49}}{\sqrt{4}}$$

$$r = \frac{7}{2} \text{ cm}$$

radius of sphere $= \frac{7}{2}$ cm

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Now,

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

$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$

$\Rightarrow \frac{11 \times 7 \times 7}{3}$

$\Rightarrow \frac{11 \times 49}{3} = \frac{539}{3} = 179.66\ldots, \text{cm}^3$

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Vol. of sphere = 179.666... cm^3



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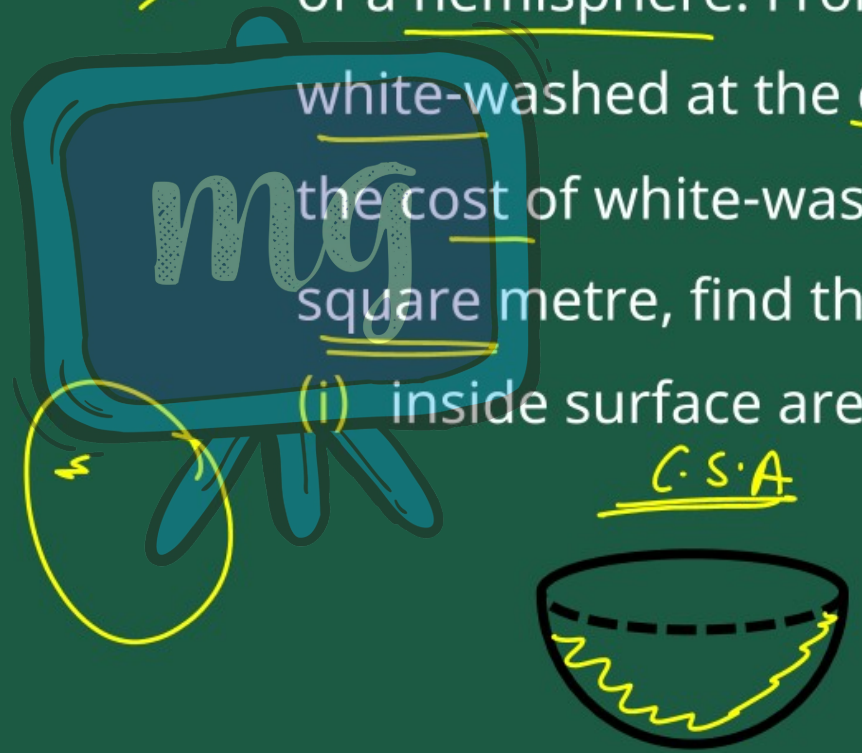
8. A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of 4989.6 If the cost of white-washing is ₹20 per square metre, find the

(i) inside surface area of the dome



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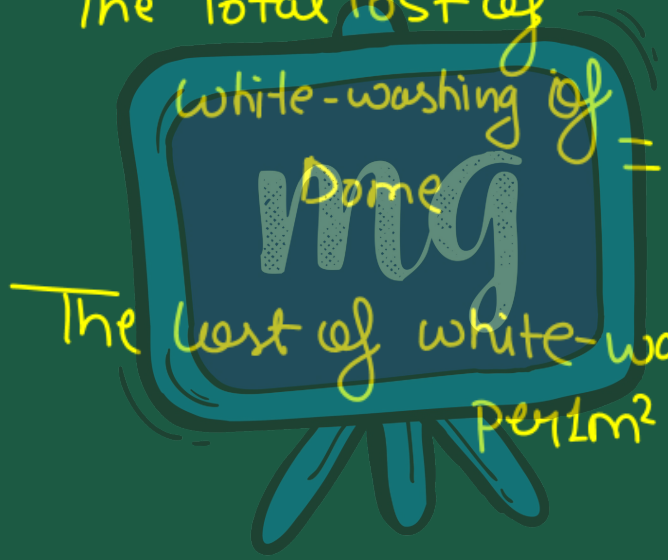
A-T-Q

The Total lost of white-washing of Dome = 4989.6 Rs



The cost of white-washing per $1m^2$ area = 20 Rs

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The cost of white-washing Per 1 m^2 area × Total Area Utilized for white-washing = Total cost



20 × Area = 4989.6

$$\text{Area} = \frac{4989.6}{20} = \frac{2494.8}{10}$$

$$= 249.48\ m^2$$

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Inside Surface Area of dome = C.S.A of dome = 249.48 m^2

Now

C.S.A of Hemisphere = $2 \times \pi \times r^2$

$2 \times \pi \times r^2 = 249.48$

$2 \times \frac{22}{7} \times r^2 = 249.48$

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$$\gamma^2 = \frac{249.48 \times 7}{2 \times 22}$$

$$= \frac{\cancel{249.48} \times 7}{\cancel{2} \times \cancel{22} \times 100}$$

$$\gamma^2 = \frac{537 \times 7}{100} = \frac{3969}{100}$$

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$$r^2 = \frac{3969}{100}$$

$$r = \sqrt{\frac{3969}{100}} = \frac{\sqrt{3969}}{\sqrt{100}}$$

$$r = \frac{63}{10}\ m$$

$r = 6.3\ m$ = radius of dome

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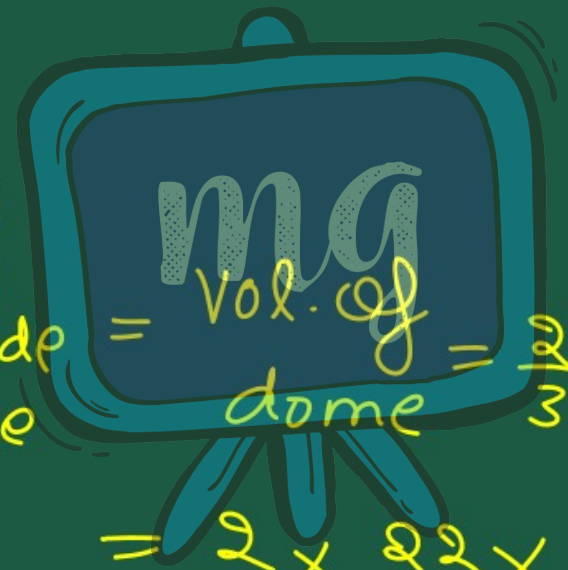
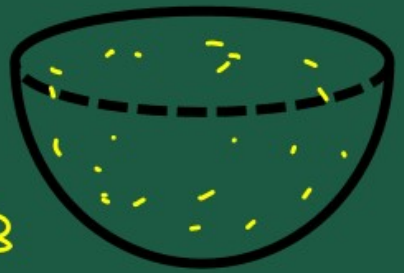
(ii) volume of the air inside the dome.





Vol. of Air inside dome = Vol. of dome $= \frac{2}{3} \times \pi \times r^3$

$= \frac{2}{3} \times \frac{22}{7} \times \frac{63}{10} \times \frac{63}{10} \times \frac{63}{10}$

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$$= \frac{2 \times 22 \times 3 \times 63 \times 63}{10 \times 10 \times 10}$$

$$= \frac{132 \times 3969}{1000}$$

$$= \frac{523908}{1000} = 523.908\ m^3$$

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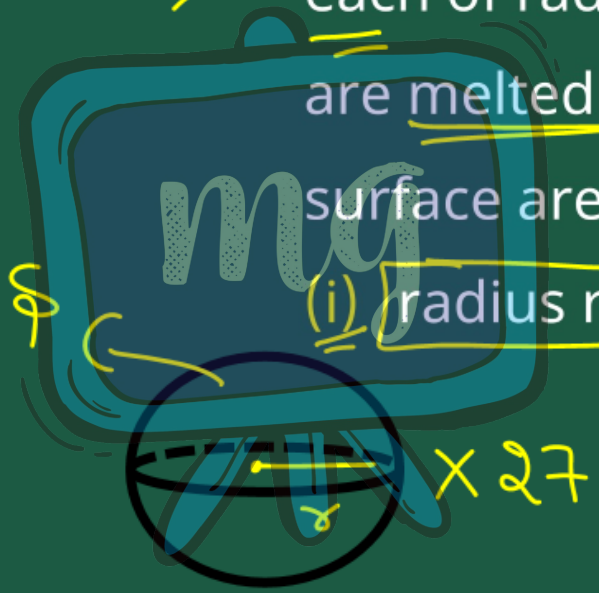
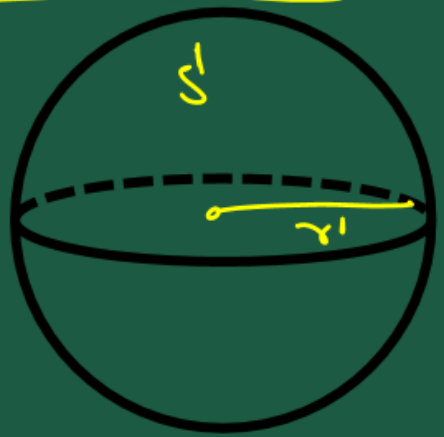
9. Twenty seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S'. Find the

(i) radius r' of the new sphere,





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A·T·Q

Radius of sphere [Solid iron Sphere] which goes for melting = r

& Surface Area = S

Now

Radius of New sphere = r'

& Surface Area = S'

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Now, we know that

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

& S.A. of Sphere $= 4 \times \pi \times r^2$

Now,

27 Solid iron Sphere of radius r each are melted to form Newsphere of Radius r'

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$27 \times$ Vol. of sphere of radius r $=$ Vol of New sphere of Radius r'

$$27 \times \frac{4}{3} \times \pi \times r^3 = \frac{4}{3} \times \pi \times (r')^3$$

$$27 \times \frac{4}{3} \times \pi = \frac{4}{3} \times \pi \times \frac{r'^3}{r^3}$$

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$$\frac{r^3}{r^3} = \frac{27}{1}$$

$$\left[\frac{a^m}{b^m} = \left[\frac{a}{b}\right]^m\right]$$

$$\left(\frac{r}{r}\right)^3 = \frac{27}{1}$$

$$\frac{r}{r} = \sqrt[3]{\frac{27}{1}} = \frac{\sqrt[3]{27}}{\sqrt[3]{1}} = \frac{3}{1}$$

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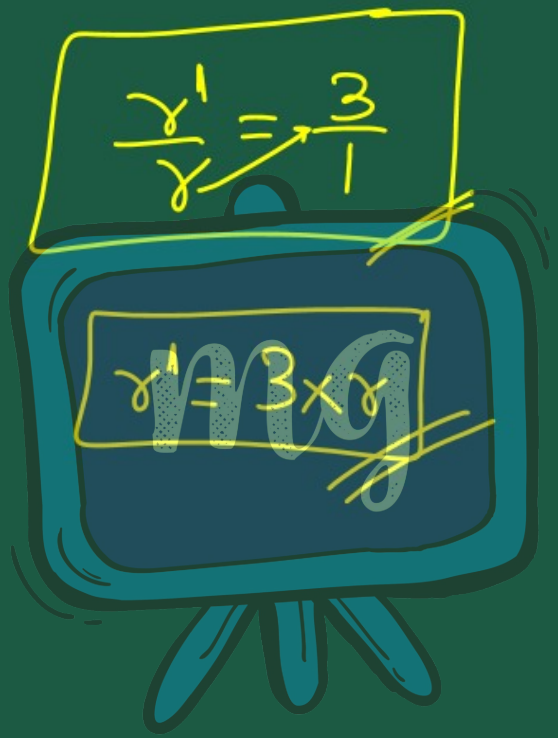

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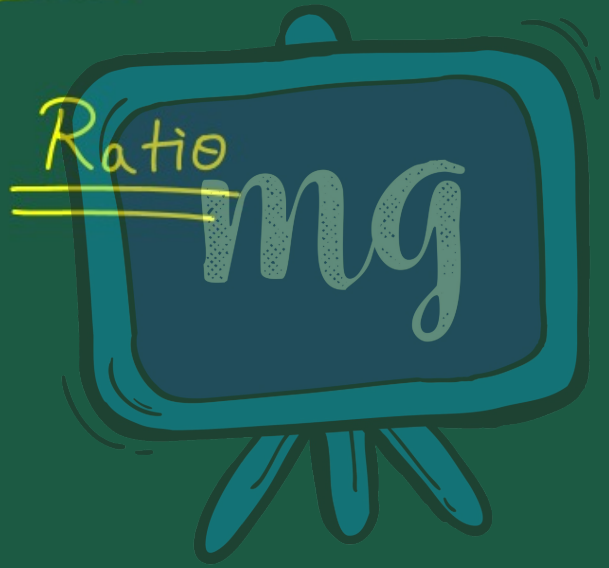
Now

Ratio



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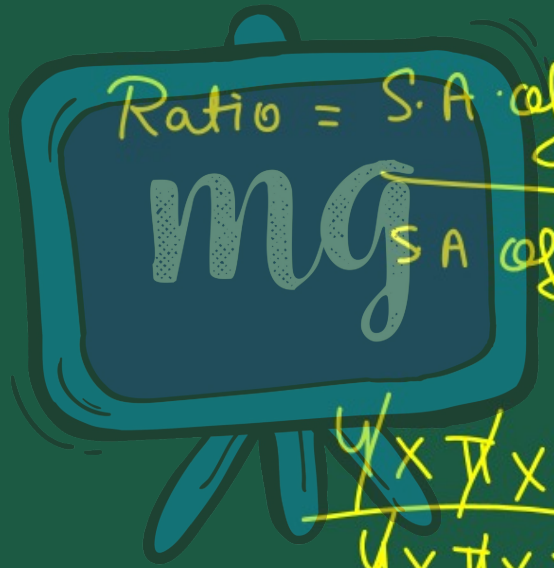
(ii) ratio of S and S'



$$\text{Ratio} = \frac{\text{S.A. of sphere of radius } r}{\text{S.A of sphere of radius } r'} = \frac{S}{S'}$$

$$\frac{4 \times \pi \times r^2}{4 \times \pi \times r'^2} = \frac{S}{S'}$$

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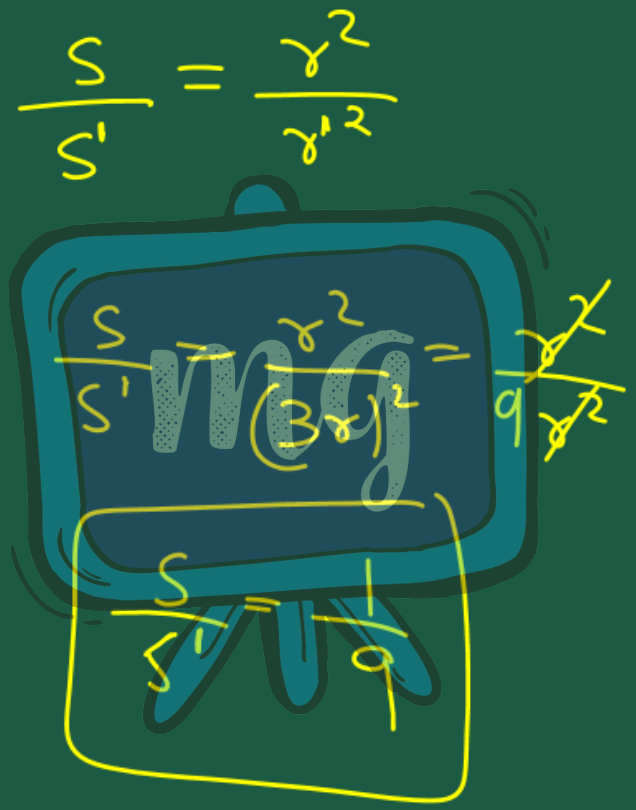

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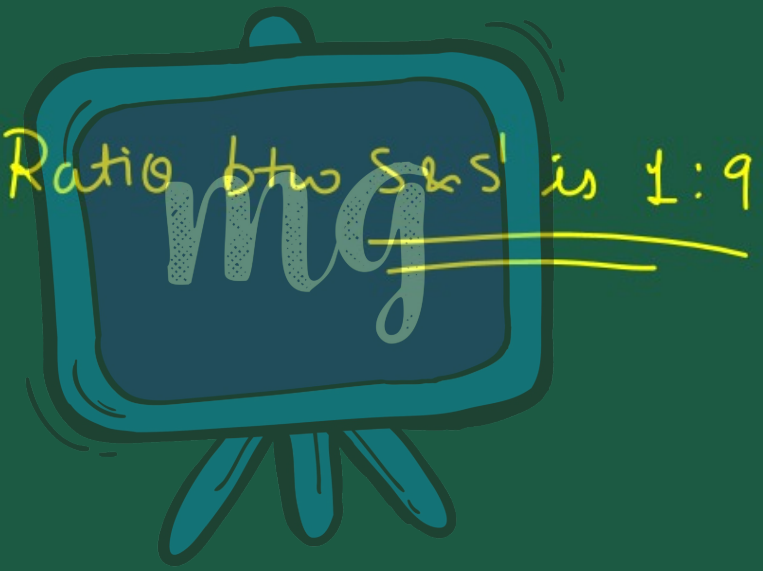

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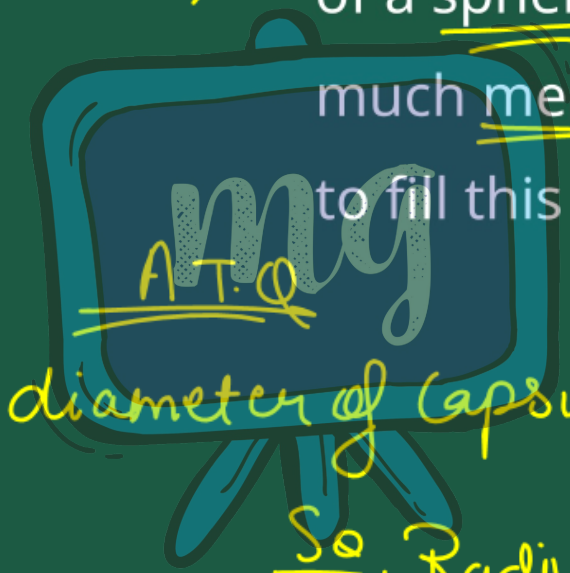
10. A capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in mm^3) is needed to fill this capsule?



A.T.Q

diameter of capsule = $3.5 = \frac{35}{10} = \frac{7}{2}$ mm

So, Radius = $\frac{1}{2} \times d = \frac{1}{2} \times \frac{7}{2} = \frac{7}{4}$ mm

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



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

$= \frac{11 \times 7 \times 7}{3 \times 2 \times 4} = \frac{11 \times 49}{24}$

$= \frac{539}{24}$

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$= \frac{539}{24}$

$= 22.458333\ldots\ mm^3$

mg