

Class 10-Mathematics

Instructions for students: The notes provided must be copied to the Maths copy and then do the homework in the same copy.

Chapter 17

MENSURATION (Part - 3)

Sphere: A sphere is a three- dimensional figure, which is made up of all points in space that lie at a constant distance from a fixed point.

The constant distance is called the **radius(r)** and the fixed point is called the **centre** of the sphere.

If a circular lamina is revolved about any of its diameters, a **solid sphere** is generated.

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

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

Spherical shell: The solid enclosed between two concentric spheres is a spherical shell.

$$\text{Volume of material a spherical shell} = \frac{4}{3} \pi (R^3 - r^3)$$

Hemisphere: When a sphere is cut into two equal parts through its centre each part is known as a hemisphere.

$$\text{Volume of a hemisphere} = \frac{2}{3} \pi r^3$$

$$\text{Curved surface area} = 2\pi r^2$$

$$\text{Total surface area} = 3\pi r^2$$

Hemispherical shell: The solid enclosed between two concentric hemi spheres is a hemi spherical shell.

$$\text{Volume of material of a spherical shell} = \frac{2}{3} \pi (R^3 - r^3)$$

$$\text{External curved surface area} = 2\pi R^2$$

$$\text{Internal curved surface area} = 2\pi r^2$$

$$\text{Total surface area} = 2\pi R^2 + 2\pi r^2 + \pi(R^2 - r^2)$$

Exercise 17.3

10. Let the radii of the two spheres be $3x$ and $7x$.

$$\begin{aligned}\text{Volume of the first sphere } V_1 &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \pi (3x)^3 \\ &= \frac{4}{3} \pi \cdot 27x^3\end{aligned}$$

$$\begin{aligned}\text{Volume of the second sphere } V_2 &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \pi (7x)^3 \\ &= \frac{4}{3} \pi \cdot 343x^3\end{aligned}$$

$$V_1:V_2 = \frac{\frac{4}{3} \pi \cdot 27x^3}{\frac{4}{3} \pi \cdot 343x^3}$$

$$V_1:V_2 = \frac{27}{343}$$

$$\begin{aligned}\text{Surface area of the first sphere } A_1 &= 4\pi r^2 \\ &= 4\pi (3x)^2 \\ &= 4\pi \cdot 9x^2\end{aligned}$$

$$\begin{aligned}\text{Surface area of the second sphere } A_2 &= 4\pi r^2 \\ &= 4\pi (7x)^2 \\ &= 4\pi \cdot 49x^2\end{aligned}$$

$$A_1:A_2 = \frac{4\pi \cdot 9x^2}{4\pi \cdot 49x^2}$$

$$A_1:A_2 = \frac{9}{49}$$

11. Diameter of the sphere = Edge of the cube = 4 cm

Radius of the sphere = 2 cm

Volume of cube = 4^3 = 64cm^3

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

$$\begin{aligned}
 &= \frac{4}{3} \times \frac{22}{7} \times 2^3 \\
 &= \frac{4}{3} \times \frac{22}{7} \times 8 \\
 &= \frac{704}{21} \\
 &= 33.52 \text{ cm}^3 \text{ approx.}
 \end{aligned}$$

Volume of the gap in between = $64 - 33.52 = 30.48 \text{ cm}^3 \text{ approx.}$

15. Diameter of the hemispherical tank = 14 m

Radius r = 7 m

Total capacity (Volume)

Of the tank

$$\begin{aligned}
 &= \frac{2}{3} \pi r^3 \\
 &= \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 \\
 &= 718.67 \text{ m}^3 = 718.67 \text{ Kilolitres approx.}
 \end{aligned}$$

Volume of water already in the tank

= 50 Kilolitres

Volume of more water to fill the tank

$$\begin{aligned}
 &= 718.67 - 50 \\
 &= 668.67 \text{ Kilolitres approx.}
 \end{aligned}$$

Home Work: Complete **Exercise 17.3** in the Maths copy.

(Solve all the problems)