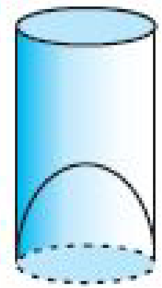
DAY 5

1. **A juice seller was serving his customer using glasses as shown. The inner diameter of the cylindrical glass was 5 cm, but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of the glass was 10 cm, find the apparent capacity and actual capacity of the glass.** (Use $\pi = 3.14$)
[Example 6]



Sol:- Given Height of glass $(h) = 10\ cm$

and Diameter of cylindrical part = Diameter of hemisphere $= 5cm$

$\therefore$ Radius of cylindrical part = Radius of hemisphere$(r) = \frac{5}{2}cm$

Now Apparent capacity of glass (which is visible)

=Volume of cylinder $= \pi r^2 h$

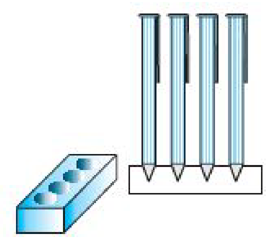
$= 3.14 \times \frac{5}{2} \times \frac{5}{2} \times 10 = \mathbf{196.25\ cm^3}$

and Actual Capcaity of the glass $= \begin{pmatrix}\textbf{Volume of the} \\ \textbf{cylinder}\end{pmatrix} - \begin{pmatrix}\textbf{Volume of the} \\ \textbf{hemisphere}\end{pmatrix}$

$= \pi r^2 h - \frac{2}{3}\pi r^3 = 196.25 - \frac{2}{3} \times 3.14 \times \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2}$

$= 196.25 - 32.71 = \mathbf{163.54\ cm^3}$

2. **A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are $15cm \times 10cm \times 3.5cm$. The radius of each depression is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand.** **[Ex 13.2, Q4]**



Sol:- Given Dimensions of cuboid$= l \times b \times h = 15cm \times 10cm \times 3.5cm$

Radius of conical part $(r) = 0.5\ cm$ and Height (H) $= 1.4\ cm$

Volume of wood in stand $= \begin{pmatrix}\textbf{Volume of the} \\ \textbf{Cuboid}\end{pmatrix}$

$-\mathbf{4} \times \begin{pmatrix}\textbf{Volume of the} \\ \textbf{Cone}\end{pmatrix}$

$= lbh - 4 \times \frac{1}{3}\pi r^2 \mathrm{H}$

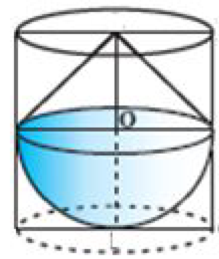
$= 15 \times 10 \times 3.5 - \frac{4}{3} \times \frac{22}{7} \times 0.5 \times 0.5 \times 1.4$

$= 525 - 1.47 = \mathbf{523.53\ cm^3}$

3. **A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and the height is 180 cm.** **[Ex 13.2, Q7]**

Sol:- Given Radius of cylinder $=$ Radius of cone and hemisphere$(r) = 60cm$
and height of cone $(h) = 120\ cm$ and Height of cylinder $(\mathrm{H}) = 180\ cm$

Volume of water left in cylinder $= \begin{pmatrix}\textbf{Volume of}\\ \textbf{Cylinder}\end{pmatrix} - \left\{\begin{pmatrix}\textbf{Volume of}\\ \textbf{Cone}\end{pmatrix} + \begin{pmatrix}\textbf{Volume of}\\ \textbf{Hemisphere}\end{pmatrix}\right\}$



$$= \pi r^2\mathrm{H} - \left\{\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3\right\}$$
$$= \pi r^2\mathrm{H} - \pi r^2\left\{\frac{1}{3}h + \frac{2}{3}r\right\}$$
$$= \pi r^2\left[H - \frac{1}{3}h - \frac{2}{3}r\right]$$
$$= 3.14 \times 60 \times 60\left[180 - \frac{1}{3} \times 120 - \frac{2}{3} \times 60\right]$$
$$= 314 \times 6 \times 6[180 - 40 - 40]$$
$$= 314 \times 36 \times 100 = \mathbf{1130400\ cm^3}$$

4. **A vessel is in the form of an inverted cone. Its height is 8 cm and radius of top which is open is 5 cm. It is filled with water upto the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.** **[Ex 13.2, Q5]**

Sol:- Given Radius of Cone $(\mathrm{R}) = 5cm$ and height $(\mathrm{H}) = 8\ cm$
and Radius of spherical lead shot $(r) = 0.5\ cm$
Let Number of lead shots $= \boldsymbol{n}$
According to given condition: When n lead shots are dropped then one-fourth of water flows out.

$\Rightarrow$ **Volume of n lead shots** $= \frac{1}{4}$**(Volume of water in cone)**

$\Rightarrow$ $n \times \frac{4}{3}\pi r^3 = \frac{1}{4}\left(\frac{1}{3}\pi \mathrm{R}^2\mathrm{H}\right)$

$\Rightarrow$ $n = \frac{4}{3}\pi r^3 = \frac{1}{12}\pi \mathrm{R}^2\mathrm{H} \times \frac{3}{4\pi r^3} = \frac{1}{12} \times \frac{3}{4} \times \frac{\mathrm{R}^2\mathrm{H}}{r^3}$

$$= \frac{1}{16} \times \frac{5\times5\times8}{0.5\times0.5\times0.5} = \mathbf{100}$$