

Volume of a Hemisphere

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Half of a sphere cut by a plane passing through its center, we get hemisphere. A hemisphere is half of a full sphere and the volume of a hemisphere is equal to two thirds multiplied by pi multiplied by radius to the power 3. So the formula to find the volume-hemisphere is :

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

Example on Volume of a Hemisphere

1) How many liters of milk can a hemispherical bowl of diameter 10.5 cm hold?

Solution : Diameter = 10.5 cm

$$\therefore \text{radius} = r = 5.25 \text{ cm}$$

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

$$\Rightarrow v = \frac{2}{3} \times 3.14 \times (5.25)^3$$

$$\Rightarrow V = 302.91 = 303 \text{ cm}^3$$

$$\therefore V = 0.303 \text{ liter}$$

Frequently Asked Questions on Volume of a Hemisphere

1) 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.

Solution : As the iron sheet is 1cm = 0.01 m thick and the inner radius is 1m (inner radius) so the radius of the tank becomes 0.01 + 1 = 1.01(outer radius) cm

Inner radius (r_1) of hemispherical tank = 1 m

Thickness of hemispherical tank = 1 cm = 0.01m

Outer radius (r_2) of hemispherical tank = (1+ 0.01) m = 1.01 cm

$$\text{Volume of hemisphere} = \frac{2}{3} \pi (r_2^3 - r_1^3)$$

$$V = \frac{2}{3} \times 3.14 \times (1.01^3 - 1^3)$$

$$\Rightarrow V = \frac{2}{3} \times 3.14 (1.030301 - 1)$$

$$\Rightarrow V = \frac{2}{3} \times 3.14 \times 0.030301$$

$$\Rightarrow V = 0.06343 \text{ m}^3$$

2) A right circular cylinder having diameter 12 cm and height 15 cm is full with ice cream. The ice cream is to be filled in cones of height 12 cm and diameter 6 cm having a hemispherical shape on the top. Find the number of such cones which can be filled with ice cream.

Solution : Diameter of cylinder = 12 cm $\Rightarrow$ radius = $r = 6$ cm and height = $h = 15$ cm

$$\therefore \text{Volume of cylinder} = \pi r^2 h$$

$$\Rightarrow V = 3.14 \times 6^2 \times 15$$

$$\Rightarrow V = 3.14 \times 36 \times 15 = 1695.6 \text{ cm}^3$$

Diameter of cone = 6

$$\therefore \text{Radius of cone} = \text{radius of hemisphere} = 3 \text{ cm}$$

$$\therefore \text{volume of cone} = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \times 3.14 \times 3 \times 3 \times 12 = 113.04 \text{ cm}^3$$

$$\text{And volume of hemisphere} = \frac{2}{3} \pi r^3$$

$$V = \frac{2}{3} \times 3.14 \times 3 \times 3 \times 3 = 56.52 \text{ cm}^3$$

$$\therefore \text{the total volume of cone} = \text{volume of cone} + \text{volume of hemisphere}$$

$$\Rightarrow V = 113.04 + 56.52 = 169.56$$

$$\therefore \text{Number of cones} = (\text{Volume of cylinder}) / \text{Total volume of cone}$$

$$\Rightarrow \text{Number of cones} = 1695.6 / 169.56$$

$$\therefore \text{Number of cones} = 10$$