



### Surface Areas and Volumes Ex.16.3 Q15

**Answer :**

The height of the bucket is  $h=16\text{cm}$ . The radii of the upper and lower circles of the bucket are  $r_1=20\text{ cm}$  and  $r_2=8\text{ cm}$  respectively.

The slant height of the bucket is

$$\begin{aligned} l &= \sqrt{(r_1 - r_2)^2 + h^2} \\ &= \sqrt{(20 - 8)^2 + 16^2} \\ &= \sqrt{400} \\ &= 20 \text{ cm} \end{aligned}$$

The volume of the bucket is

$$\begin{aligned} V &= \frac{1}{3} \pi (r_1^2 + r_1 r_2 + r_2^2) \times h \\ &= \frac{1}{3} \pi (20^2 + 20 \times 8 + 8^2) \times 16 \\ &= \frac{1}{3} \times 3.14 \times 624 \times 16 \\ &= 3.14 \times 208 \times 16 \\ &= 10449.92 \text{ cm}^3 \end{aligned}$$

Hence the volume of the bucket is  $\boxed{10449.92 \text{ cm}^3}$

The surface area of the used metal sheet to make the bucket is

$$\begin{aligned} S_1 &= \pi (r_1 + r_2) \times l + \pi r_2^2 \\ &= \pi \times (20 + 8) \times 20 + \pi \times 8^2 \\ &= \pi \times 28 \times 20 + 64\pi \\ &= 624\pi \text{ cm}^2 \end{aligned}$$

Therefore, the total cost of making the bucket is

$$\begin{aligned} &= \frac{624\pi}{100} \times 20 \\ &= \boxed{\text{Rs.}391.9} \end{aligned}$$

### Surface Areas and Volumes Ex.16.3 Q16

**Answer :**

The height of the frustum of a cone is  $h=9\text{cm}$ . The radii of the upper and lower circles of the frustum of the cone are  $r_1=30\text{cm}$  and  $r_2=18\text{cm}$  respectively.

The slant height of the frustum of the cone is

$$\begin{aligned} l &= \sqrt{(r_1 - r_2)^2 + h^2} \\ &= \sqrt{(30 - 18)^2 + 9^2} \\ &= \sqrt{225} \\ &= 15 \text{ cm} \end{aligned}$$

The volume of the frustum of the cone is

$$\begin{aligned} V &= \frac{1}{3} \pi (r_1^2 + r_1 r_2 + r_2^2) \times h \\ &= \frac{1}{3} \pi (30^2 + 30 \times 18 + 18^2) \times 9 \\ &= \frac{1}{3} \times 1764 \times 9 \times \pi \\ &= \boxed{5292\pi \text{ cm}^3} \end{aligned}$$

The total surface area of the frustum of the cone is

$$\begin{aligned} S_1 &= \pi (r_1 + r_2) \times l + \pi r_1^2 + \pi r_2^2 \\ &= \pi \times (30 + 18) \times 15 + \pi \times 30^2 + \pi \times 18^2 \\ &= \pi \times 48 \times 15 + 900\pi + 324\pi \\ &= \boxed{1944\pi \text{ cm}^2} \end{aligned}$$

### Surface Areas and Volumes Ex.16.3 Q17

**Answer :**

Let the depth of the container is  $h$  cm. The radii of the top and bottom circles of the container are  $r_1 = 20$  cm and  $r_2 = 8$  cm respectively.

The volume/capacity of the container is

$$\begin{aligned} V &= \frac{1}{3} \pi (r_1^2 + r_1 r_2 + r_2^2) \times h \\ &= \frac{1}{3} \pi (20^2 + 20 \times 8 + 8^2) \times h \\ &= \frac{1}{3} \times \frac{22}{7} \times 624 \times h \\ &= \frac{22}{7} \times 208 \times h \text{ cm}^3 \end{aligned}$$

Given that the capacity of the bucket is  $10459 \frac{3}{7} \text{ cm}^3$ . Thus, we have

$$\begin{aligned} \frac{22}{7} \times 208 \times h &= 10459 \frac{3}{7} \\ \Rightarrow h &= \frac{73216}{22 \times 208} \\ \Rightarrow h &= 16 \text{ cm} \end{aligned}$$

Hence, the height of the container is 16 cm.

The slant height of the container is

$$\begin{aligned} l &= \sqrt{(r_1 - r_2)^2 + h^2} \\ &= \sqrt{(20 - 8)^2 + 16^2} \\ &= \sqrt{400} \\ &= 20 \text{ cm} \end{aligned}$$

The surface area of the used metal sheet to make the container is

$$\begin{aligned} S_1 &= \pi (r_1 + r_2) \times l + \pi r_2^2 \\ &= \pi \times (20 + 8) \times 20 + \pi \times 8^2 \\ &= \pi \times 28 \times 20 + 64\pi \\ &= 624\pi \text{ cm}^2 \end{aligned}$$

The cost to make the container is  $= 624\pi \times 1.4 = 624 \times \frac{22}{7} \times 1.4 = \boxed{\text{Rs. } 2745.6}$

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