Exercise 11.3

Assume $\pi = \frac{22}{7}$, unless stated otherwise.

1. *Find the volume of the right circular cone with*

(i) radius 6 cm, height 7 cm (ii) radius 3.5 cm, height 12 cm.

Sol. *(i)* Radius $(r) = 6$ cm

Height $(h) = 7$ cm

$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume} = \frac{1}{3} \times \frac{22}{7} \times (6)^2 \times 7 \text{ cm}^3 = 264 \text{ cm}^3$$

(ii) Radius $(r) = 3.5$ cm

Height $(h) = 12$ cm

$$\text{Volume} = \frac{1}{3}\pi r^2 h.$$

$$= \frac{1}{3} \times \frac{22}{7} \times (3.5)^2 \times 12 \text{ cm}^3 = 154 \text{ cm}^3.$$

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2. *Find the capacity in litres of a conical vessel with*

(i) radius 7 cm, slant height 25 cm

(ii) height 12 cm, slant height 13 cm.

Sol. (*i*) $r = 7$ cm, $l = 25$ cm.

$$\therefore \quad h = \sqrt{l^2 - r^2} = \sqrt{(25)^2 - (7)^2} \text{ cm}$$

$$= \sqrt{625 - 49} \text{ cm} = \sqrt{576} \text{ cm} = 24 \text{ cm}.$$

$$\therefore \quad \text{Capacity} = \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24 \text{ cm}^3$$

$$= 1232 \text{ cm}^3 = 1.232 \, l.$$

(*ii*) $h = 12$ cm, $l = 13$ cm.

$$\therefore \quad r = \sqrt{l^2 - h^2} = \sqrt{(13)^2 - (12)^2} \text{ cm}$$

$$= \sqrt{169 - 144} \text{ cm} = \sqrt{25} \text{ cm} = 5 \text{ cm}.$$

$$\therefore \quad \text{Capacity} = \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 \text{ cm}^3$$

$$= \frac{2200}{7} \text{ cm}^3 = \frac{11}{35} \text{ litre}.$$

3. *The height of a cone is 15 cm. If its volume is 1570 cm^3, find the radius of the base. (Use $\pi = 3.14$).*

Sol. Let r be the required radius.

Height (h) = 15 cm

$$\text{Volume} = 1570 \Rightarrow \frac{1}{3} \times 3.14 \times r^2 \times 15 = 1570$$

$$\Rightarrow \quad r^2 = \frac{1570 \times 3}{3.14 \times 15} = 100 \Rightarrow \quad r = 10 \text{ cm}.$$

4. *If the volume of a right circular cone of height 9 cm is 48 π cm^3, find the diameter of its base.*

Sol. Height (h) = 9 cm, radius (r) = ?

$$\text{Volume} = 48\pi \text{ cm}^3 \Rightarrow \frac{1}{3} \times \pi \times r^2 \times 9 = 48\pi$$

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$\Rightarrow \quad r^2 = 16 \quad \Rightarrow \quad r = 4$ cm.

Diameter $= 2r = 8$ cm.

5. *A conical pit of top diameter 3.5 m is 12 m deep. What is its capacity in kilolitres?*

Sol. Diameter $(d) = 3.5$ m

$$\text{Radius } (r) = \frac{\text{diameter}}{2} = \frac{3.5}{2} \text{ m} = \frac{35}{20} \text{ m}$$

Deep, *i.e.*, height $(h) = 12$ m

$$\text{Capacity of the pit} = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3} \times \frac{22}{7} \times \frac{35}{20} \times \frac{35}{20} \times 12 \text{ m}^3$$

$= 38.5 \text{ m}^3 = 38.5$ kilolitres.

$[1 \text{ m}^3 = 1 \text{ k}l]$

6. *The volume of a right circular cone is 9856 cm^3. If the diameter of the base is 28 cm, find*

(*i*) *height of the cone*

(*ii*) *slant height of the cone*

(*iii*) *curved surface area of the cone.*

Sol. Diameter $= 28$ cm, radius $= \frac{28}{2} = 14$ cm

(*i*) Volume of cone $= 9856 \text{ cm}^3$

$$\frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times h = 9856$$

$$\Rightarrow \quad h = \frac{4856 \times 3}{44 \times 14} \quad \Rightarrow \quad h = 48$$

$\therefore$ Height (h) of the cone $= 48$ cm.

(*ii*) Slant height of cone (l)

$$= \sqrt{(14)^2 + (48)^2} \text{ cm}$$

$$= \sqrt{196 + 2304} \text{ cm} = \sqrt{2500} \text{ cm} = 50 \text{ cm}.$$

(*iii*) Curved surface area of the cone $= \pi rl$

$$= \frac{22}{7} \times 14 \times 50 = 2200 \text{ cm}^2.$$

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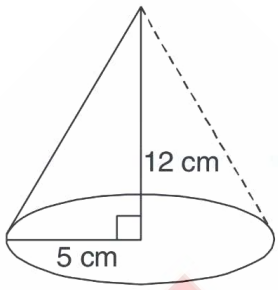
7. *A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.*

Sol. As sides are 5 cm, 12 cm, 13 cm. Hence, triangle is right angled. We have $r = 5$ cm, $h = 12$ cm.



$$\therefore \quad \text{Volume} = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times 5 \times 5 \times 12 \text{ cm}^3$$

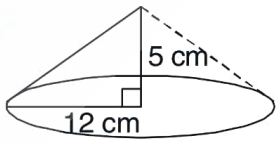
$$= 100\pi \text{ cm}^3.$$

8. *If the triangle ABC in the Question 7 above is revolved about the side 5 cm, then find the volume of the solid so obtained. Find also the ratio of the volumes of the two solids obtained in Questions 7 and 8.*

Sol. In this case, $r = 12$ cm, $h = 5$ cm.

$$\therefore \quad \text{Volume} = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times 12 \times 12 \times 5 \text{ cm}^3$$

$$= 240\pi \text{ cm}^3$$



Ratio of volumes obtained in Question 7 and Question 8:

$$\frac{V_1}{V_2} = \frac{100\pi}{240\pi} = \frac{5}{12}, \text{ i.e., } V_1 : V_2 = 5 : 12.$$

9. *A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.*

Sol. Diameter $(d) = 10.5$ m $\Rightarrow$ radius $(r) = \frac{10.5}{2} = 5.25$ m

Height $(h) = 3$ m

Volume of the heap of wheat $= \frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 3 \text{ m}^3$$

$$= 86.625 \text{ m}^3.$$

Slant height of the cone = $\sqrt{(5.25)^2 + (3)^2}$ m

= $\sqrt{27.5625 + 9}$ m

= $\sqrt{36.5625}$ m $\approx$ 6.05 m.

Area of canvas required = $\frac{22}{7} \times 5.25 \times 6.05$ m^2

= 99.825 m^2.

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