Mathematics

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(Chapter – 13) (Surface Areas and Volumes)

(Class – IX)

EXERCISE 13.7

Q.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) Here, $r = 6$ cm, $h = 7$ cm

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

$$= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 7 \text{ cm}^3 = \mathbf{264 \text{ cm}^3 \text{ Ans.}}$$

(ii) Here, $r = 3.5$ cm, $h = 12$ cm

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

$$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 12 \text{ cm}^3 = \mathbf{154 \text{ cm}^3 \text{ Ans.}}$$

Q.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) Here, $r = 7$ cm, $l = 25$ cm

$$\therefore r = \sqrt{l^2 - r^2} = \sqrt{625 - 49} = \sqrt{576} = 24 \text{ cm.}$$

$$\text{Volume of the conical vessel} = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24 \text{ cm}^3 = 1232 \text{ cm}^3$$

$$= \frac{1232}{1000} \text{ litres} = \mathbf{1.232 \text{ litres Ans.}}$$

(ii) Here, $h = 12$ cm, $l = 13$ cm

$$\therefore h = \sqrt{l^2 - h^2} = \sqrt{13^2 - 12^2} = \sqrt{169 - 144} = \sqrt{25} = 5 \text{ cm}$$

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

$= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 \text{ cm}^3 = \frac{22 \times 5 \times 5 \times 4}{7} \text{ cm}^3$

$= \frac{22 \times 5 \times 5 \times 4}{7 \times 1000}$ litres $= \frac{11}{35}$ **litres Ans.**

Q.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. (i) Here, $h = 15$ cm, volume $= 1570 \text{ cm}^3$

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

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

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

$\Rightarrow \quad r = 10$

Hence, radius of the base **= 10 cm Ans.**

Q.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. Here, $h = 9$ cm, volume $= 48\pi \text{ cm}^3$

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

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

$\Rightarrow \quad r^2 = \frac{48\pi \times 3}{\pi \times 9} = 16$

$\Rightarrow \quad r = 4$

Hence, base diameter of the cone $= 2 \times 4$ cm **= 8 cm Ans.**

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

Sol. Here, $r = \frac{3.5}{2}$ m = 1.75 m, h = 12 m

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

$= \frac{1}{3} \times \frac{22}{7} \times 1.75 \times 1.75 \times 12 \text{ m}^3$

$= 38.5 \text{ m}^3$ **= 38.5 *kl* Ans.**

Q.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. Here, $r = \frac{28}{2}$ cm = 14 cm, volume = 9856 cm^3

(i) Volume of the cone = $\frac{1}{3}\pi r^2 h$

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

$\Rightarrow \quad h = \frac{9856 \times 3 \times 7}{22 \times 14 \times 14} = 48$

Hence, height of the cone = 48 cm **Ans.**

(ii) Slant height $l = \sqrt{h^2 + r^2} = \sqrt{(48)^2 + (14)^2}$

$= \sqrt{2304 + 196} = \sqrt{2500} = 50$

Hence, slant height of the cone **= 50 cm Ans.**

(iii) Curved surface area of the cone = πrl

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

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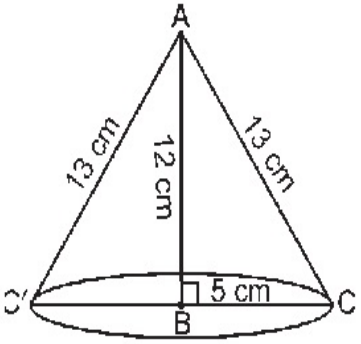
Q.7. *A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.*

Sol. The solid formed is a cone, whose height

h = 12 cm, base radius r = 5 cm.

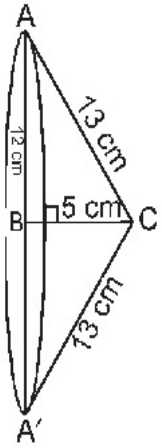


$$\therefore \text{ Volume of the cone } = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3} \times \pi \times 5 \times 5 \times 12 \text{ cm}^3 \quad \mathbf{= 100\ \pi\ cm^3\ Ans.}$$

Q.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. Here radius r of the cone = 12 cm and height h of the cone = 5 cm.



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

$$= \frac{1}{3}\pi \times 12 \times 12 \times 5 \quad \mathbf{= 240\ \pi cm^3\ Ans.}$$

Hence, required ratio $= \dfrac{100\,\pi}{240\,\pi} = \dfrac{5}{12}$ **= 5 : 12 Ans.**

Q.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. Here, radius $r = \dfrac{10.5}{2}$ m = 5.25 m, h = 3 m

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

$= \frac{1}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 3 \text{ m}^3 = \mathbf{86.625 \text{ m}^3}$ **Ans.**

Now, $l = \sqrt{h^2 + r^2} = \sqrt{3^2 + (5.25)^2}$

$= \sqrt{9 + 27.5625} = \sqrt{36.5625} = 6.05$ m (approx)

Curved surface area of the cone $= \pi r l$

$= \frac{22}{7} \times 5.25 \times 6.05 \text{ m}^2 = 99.825 \text{ m}^2$

Hence, 99.825 m^2 of canvas is needed. **Ans.**