CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 13

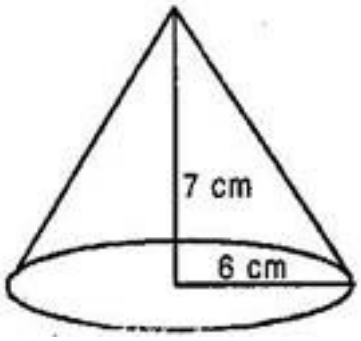
Surface Areas and Volumes(Ex. 13.7)

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

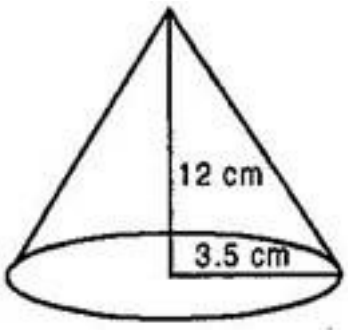


Ans. (i) Given: r = 6 cm, h = 7 cm

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

= $\frac{1}{3}\times\frac{22}{7}\times 6\times 6\times 7$ = 264 cm^3

(ii) Given: r = 3.5 cm, h = 12 cm



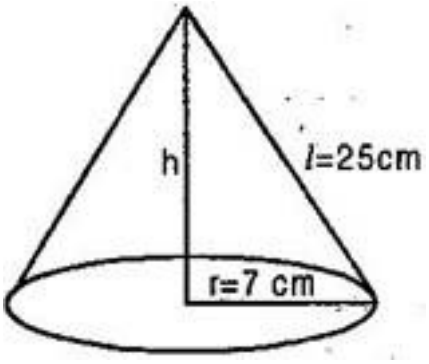
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

2. Find the capacity of a conical vessel with:

(i) Radius 7 cm, Slant height 25 cm

(ii) Height 12 cm, Slant height 13 cm



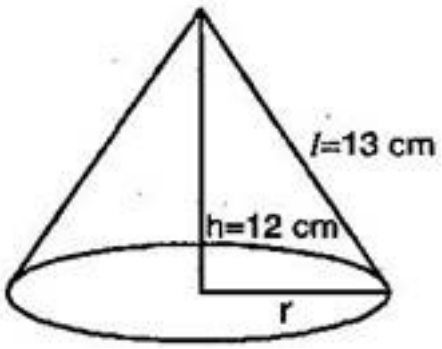
Ans. (i) Given: r = 7 cm, l = 25 cm

$h = \sqrt{l^2 - r^2}$ = $\sqrt{(25)^2 - (7)^2}$ = $\sqrt{625 - 49}$ = $\sqrt{576}$ = 24 cm

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

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

= 1.232 liters [$\because$ 1000 cm^3= 1liter]



(ii) Given: h = 12 cm, l = 13 cm

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

$= \sqrt{169 - 144}$

$= \sqrt{25} = 5$ cm

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

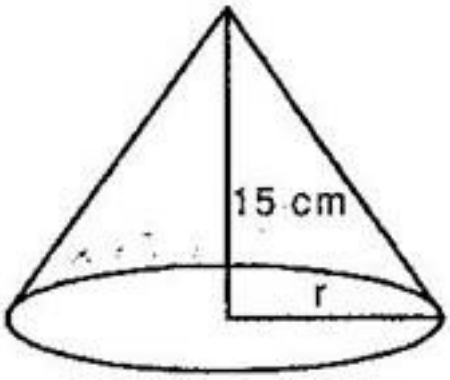
$= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 = \frac{2200}{7}$ cm^3

$= \frac{2200}{7} \times \frac{1}{1000}$ liters [$\because$ 1000 cm^3= 1liter]

$= \frac{11}{35}$ liter

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

Ans. Height of the cone (h) = 15 cm



Volume of cone = 1570 cm^3

$\Rightarrow \frac{1}{3}\pi r^2 h$ = 1570

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

$\Rightarrow 15.70r^2 = 1570$

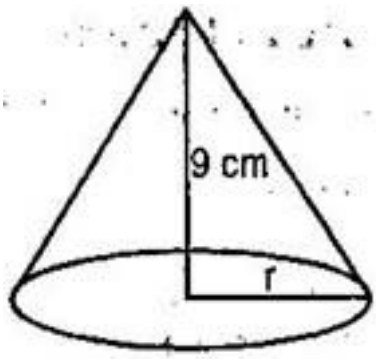
$\Rightarrow r^2 = 1570 \times \frac{100}{1570}$ = 100

$\Rightarrow r$ = 10 cm

Hence required radius of the base is 10 cm.

4. If the volume of a right circular cone of height 9 cm is $48\pi cm^3$, find the diameter of the base.

Ans. Height of the cone (h) = 9 cm



Volume of cone = $48\pi \text{cm}^3$

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

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

$$\Rightarrow 3r^2 = 48$$

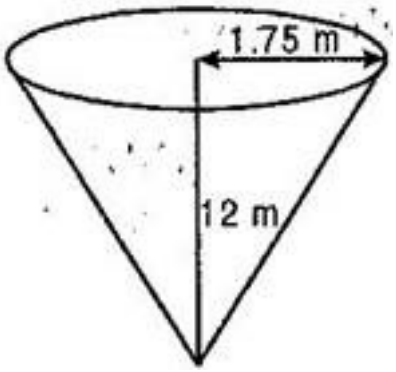
$$\Rightarrow r^2 = \frac{48}{3} = 16$$

$\Rightarrow r$ = 4 cm

$\therefore$ Diameter of base = $2r$ = 2 x 4 = 8 cm

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

Ans. Diameter of pit = 3.5 m



$\therefore$ Radius of pit = $\frac{3.5}{2}$ = 1.75 m

Depth of pit (h) = 12 m

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

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

$= \frac{1}{3} \times \frac{22}{7} \times \frac{175}{100} \times \frac{175}{100} \times 12$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times 12$

$= 22 \times \frac{7}{4} = \frac{77}{2}$ $m^3 = 38.5$ m^3

= 38.5 kl [$\because$ 1 m^3 = 1 kl]

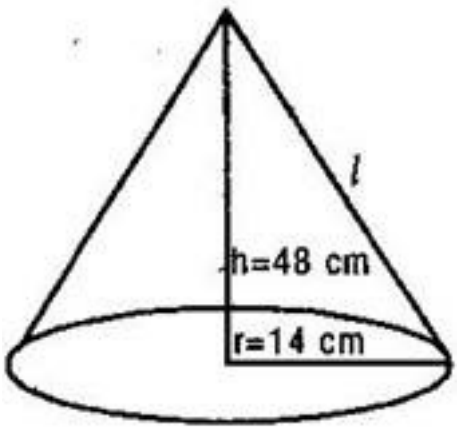
6. The volume of a right circular cone is 9856 cm^3. If the diameter of the base if 28 cm, find:

(i) Height of the cone

(ii) Slant height of the cone

(iii) Curved surface area of the cone.

Ans. (i) Diameter of cone = 28 cm



$\therefore$ Radius of cone = 14 cm

Volume of cone = 9856 cm^3

$\Rightarrow \frac{1}{3}\pi r^2 h = 9856$

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

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

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

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

= $\sqrt{196+2304}$

= $\sqrt{2500}$ = 50 cm

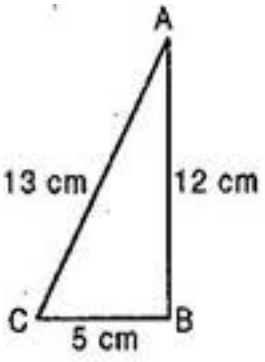
(iii) Curved surface area of cone = πrl = $\frac{22}{7}\times 14\times 50$ = 2200 cm^2

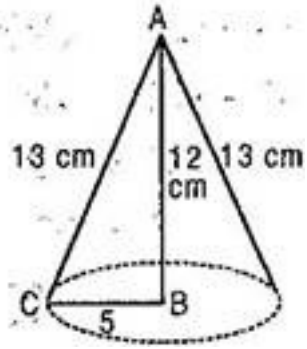
7. A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

Ans. When right angled triangle ABC is revolved about side 12 cm, then the solid formed is a cone.

In that cone, Height (h) = 12 cm

And radius (r) = 5 cm





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

= $\frac{1}{3}\pi \times 5 \times 5 \times 12$

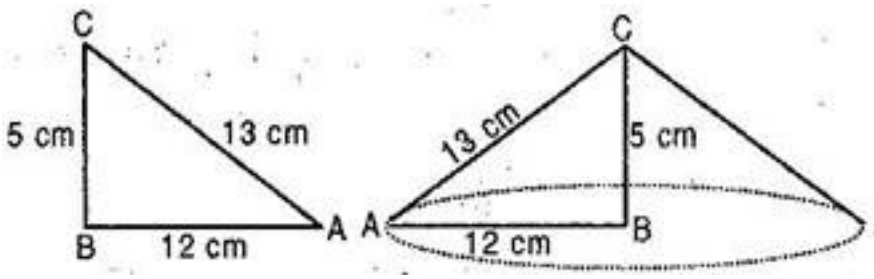
= $100\pi \text{cm}^3$

8. If the triangle ABC in 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 volume of the two solids obtained in Q.7 and Q.8.

Ans. When right angled triangle ABC is revolved about side 5 cm, then the solid formed is a cone.

In that cone, Height (h) = 5 cm

And radius (r) = 12 cm



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

= $\frac{1}{3}\pi \times 12 \times 12 \times 5 = 240\pi \text{cm}^3$

Now, $\frac{\text{Volume of cone in Q. No. 7}}{\text{Volume of vone in Q. No. 8}}$

= $\frac{100\pi}{240\pi} = \frac{5}{12}$

∴ Required ratio = 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.

Ans. Radius (r) of heap $= \left(\frac{10.5}{2}\right)\ \text{m} = 5.25\ \text{m}$

Height (h) of heap = 3 m

Volume of heap

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

$$= \left(\frac{1}{3} \times \frac{22}{7} \times (5.25)^2 \times 3\right)\ \text{m}^3$$

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

Therefore, the volume of the heap of wheat is 86.625 m^3.

Area of canvas required = CSA of cone

$= \pi r l = \pi r \sqrt{h^2 + r^2}$

$= \frac{22}{7} \times 5.25 \times \sqrt{(3)^2 + (5.25)^2}$

$= \frac{22}{7} \times 5.25 \times \sqrt{9 + 27.5625}$

$= \frac{22}{7} \times 5.25 \times \sqrt{36.5625}$

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

Therefore, 99.825 m^2 canvas will be required to protect the heap from rain.