

**Selina Solutions For Class 10 Maths Unit 5 – Mensuration**  
**Chapter 20: Cylinder, Cone and Sphere (Surface Area and Volume)**

### Exercise 20(F)

From a solid right circular cylinder with height 10 cm and radius of the base 6 cm, a right circular cone of the same height and same base are removed. Find the volume of the remaining solid.

**Solution:**

Given,

Height of the cylinder (h) = 10 cm

And radius of the base (r) = 6 cm

Volume of the cylinder =  $\pi r^2 h$

Height of the cone = 10 cm

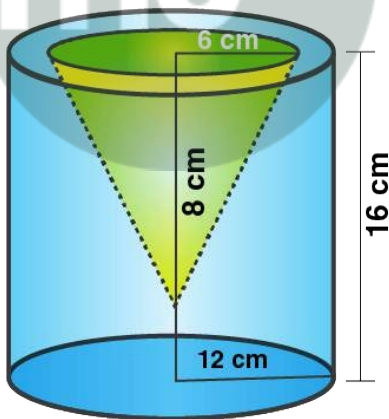
Radius of the base of cone = 6 cm

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

$$\begin{aligned}\text{Volume of the remaining part} &= \pi r^2 h - \frac{1}{3} \pi r^2 h \\ &= \frac{2}{3} \pi r^2 h \\ &= \frac{2}{3} \times \frac{22}{7} \times 6 \times 6 \times 10 \\ &= \frac{5280}{7} \text{ cm}^3 \\ &= 754 \frac{2}{7} \text{ cm}^3\end{aligned}$$

1. From a solid cylinder whose height is 16 cm and radius is 12 cm, a conical cavity of height 8 cm and of base radius 6 cm is hollowed out. Find the volume and total surface area of the remaining solid.

**Solution:**



Given,

Radius of solid cylinder (R) = 12 cm

And, Height (H) = 16 cm

$$\begin{aligned}\text{Volume} &= \pi R^2 h = \frac{22}{7} \times 12 \times 12 \times 16 \\ &= \frac{50688}{7} \text{ cm}^3\end{aligned}$$

Also given,

Radius of cone (r) = 6 cm, and height (h) = 8 cm.

$$\begin{aligned}\text{Volume} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 8 \\ &= \frac{2112}{7} \text{ cm}^3\end{aligned}$$

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(i) Volume of remaining solid =  $50688/7 - 2112/7$   
 $= 48567/7$   
 $= 6939.43 \text{ cm}^3$

(ii) Slant height of cone  $l = (h^2 + r^2)^{1/2}$   
 $= (6^2 + 8^2)^{1/2} = (36 + 64)^{1/2} = (100)^{1/2} = 10 \text{ cm}$

Thus,

Total surface area of remaining solid = curved surface area of cylinder + curved surface area of cone + base area of cylinder + area of circular ring on upper side of cylinder

$$= 2\pi Rh + \pi r l + \pi R^2 + \pi(R^2 - r^2)$$

$$= (2 \times \frac{22}{7} \times 12 \times 16) + (\frac{22}{7} \times 6 \times 10) + (\frac{22}{7} \times 12 \times 12) + (\frac{22}{7} (12^2 - 6^2))$$

$$= \frac{8448}{7} + \frac{1320}{7} + \frac{3168}{7} + \frac{22}{7} (144 - 36)$$

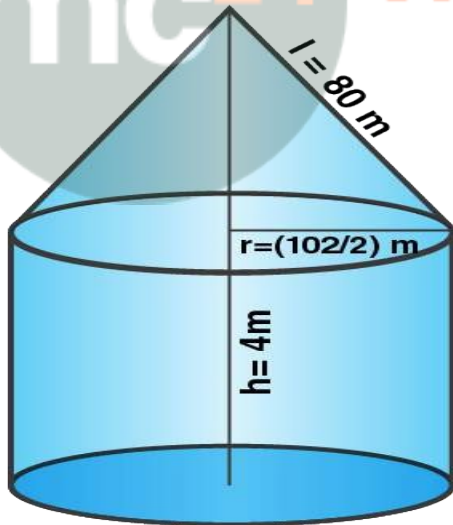
$$= \frac{8448}{7} + \frac{1320}{7} + \frac{3168}{7} + \frac{2376}{7}$$

$$= 15312/7$$

$$= 2187.43 \text{ cm}^2$$

2. A circus tent is cylindrical to a height of 4 m and conical above it. If its diameter is 105 m and its slant height is 80 m, calculate the total area of canvas required. Also, find the total cost of canvas used at Rs 15 per meter if the width is 1.5 m

Solution:



Given,

Radius of the cylindrical part of the tent ( $r$ ) =  $105/2 \text{ m}$

Slant height ( $l$ ) =  $80 \text{ m}$

So, the total curved surface area of the tent =  $2\pi r h + \pi r l$   
 $= (2 \times 22/7 \times 105/2 \times 4) + (22/7 \times 105/2 \times 80)$   
 $= 1320 + 13200$   
 $= 14520 \text{ m}^2$

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Width of canvas used = 1.5 m

Length of canvas =  $14520/1.5 = 9680$  m

Hence,

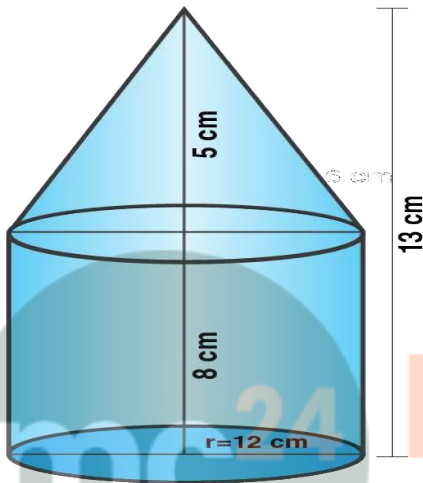
Total cost of canvas at the rate of Rs 15 per meter =  $9680 \times 15 = \text{Rs } 145200$

**3. A circus tent is cylindrical to a height of 8 m surmounted by a conical part. If total height of the tent is 13 m and the diameter of its base is 24 m; calculate:**

**(i) total surface area of the tent**

**(ii) area of canvas, required to make this tent allowing 10% of the canvas used for folds and stitching.**

**Solution:**



Given,

Height of the cylindrical part =  $H = 8$  m

Height of the conical part =  $h = (13 - 8) \text{ m} = 5$  m

Diameter = 24 m

So, its radius =  $24/2 = 12$  m

Then, slant height  $(l) = (r^2 + h^2)^{1/2}$

$$= (12^2 + 5^2)^{1/2} = (144 + 25)^{1/2} = (169)^{1/2} = 13 \text{ m}$$

$$\begin{aligned} \text{(i) Total surface area of the tent} &= 2\pi rh + \pi rl = \pi r(2h + l) \\ &= \frac{22}{7} \times 12 \times (2 \times 8 + 13) \\ &= \frac{264}{7} (16 + 3) \\ &= \frac{264}{7} \times 29 \\ &= \frac{7656}{7} \text{ m}^2 \\ &= 1093.71 \text{ m}^2 \end{aligned}$$

**(ii) Area of canvas used in stitching = total area of canvas**

Total area of canvas =  $\frac{7656}{7} + \text{total area of canvas}/10$

Total area of canvas – Total area of canvas/10 =  $\frac{7656}{10}$

Total area of canvas  $(1 - 1/10) = \frac{7656}{7}$

Total area of canvas  $\times 9/10 = \frac{7656}{7}$

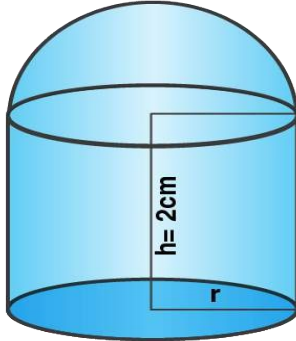
Total area of canvas =  $\frac{7656}{7} \times \frac{10}{9} = \frac{76560}{63}$

Therefore, the total area of canvas =  $1215.23 \text{ m}^2$

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4. A cylindrical boiler, 2 m high, is 3.5 m in diameter. It has a hemispherical lid. Find the volume of its interior, including the part covered by the lid.

**Solution:**



Given,

Diameter of cylindrical boiler = 3.5 m

So, the radius ( $r$ ) =  $3.5/2 = 35/20 = 7/4$  m

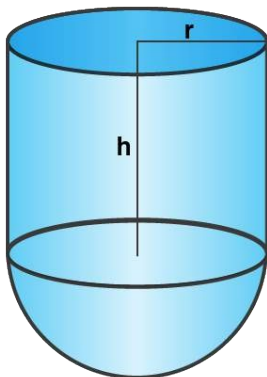
Height ( $h$ ) = 2m

Radius of hemisphere ( $R$ ) =  $7/4$  m

$$\begin{aligned} \text{Total volume of the boiler} &= \pi r^2 h + \frac{2}{3} \pi r^3 \\ &= \pi r^2 (h + \frac{2}{3} r) \\ &= \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} (2 + \frac{2}{3} \times \frac{7}{4}) \\ &= \frac{77}{8} (2 + \frac{7}{6}) \\ &= \frac{77}{8} \times \frac{19}{6} = \frac{1463}{48} \\ &= 30.48 \text{ m}^3 \end{aligned}$$

5. A vessel is a hollow cylinder fitted with a hemispherical bottom of the same base. The depth of the cylindrical part is  $4\frac{2}{3}$  m and the diameter of hemisphere is 3.5 m. Calculate the capacity and the internal surface area of the vessel.

**Solution:**



Given,

Diameter of the base = 3.5 m

So, its radius =  $3.5/2$  m = 1.75 m =  $7/4$  m

Height of cylindrical part =  $4 + \frac{2}{3} = \frac{14}{3}$

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(i) Capacity (volume) of the vessel =  $\pi r^2 h + \frac{2}{3} \pi r^2 = \pi r^2 (h + \frac{2}{3}r)$   
=  $22/7 \times 7/4 \times 7/4 (14/3 + 2/3 \times 7/4)$   
=  $77/8 (14/3 + 7/6)$   
=  $77/8 (28+7/6)$   
=  $77/8 \times 35/6$   
=  $2695/48$   
=  $56.15 \text{ m}^3$

(ii) Internal curved surface area =  $2\pi r h + 2\pi r^2 = 2\pi r (h + r)$   
=  $2 \times 22/7 \times 7/4 (14/3 + 7/4)$   
=  $11(56 + 21)/12$   
=  $11 \times 77/12$   
=  $847/12$   
=  $70.58 \text{ m}^2$

**6. A wooden toy is in the shape of a cone mounted on a cylinder as shown alongside. If the height of the cone is 24 cm, the total height of the toy is 60 cm and the radius of the base of the cone = twice the radius of the base of the cylinder = 10 cm; find the total surface area of the toy. [Take  $\pi = 3.14$ ]**



**Solution:**

Given,

Height of the cone (h) = 24 cm

Height of the cylinder (H) = 36 cm

Radius of the cone (r) = twice the radius of the cylinder = 10 cm

Radius of the cylinder (R) = 5 cm

Then, we know the slant height of the cone =  $(r^2 + h^2)^{1/2} = (10^2 + 24^2)^{1/2} = (100 + 576)^{1/2}$   
=  $(676)^{1/2} = 26 \text{ cm}$

Now, the surface area of the toy = curved area of the conical point + curved area of the cylinder

$$\begin{aligned} &= \pi r l + \pi r^2 + 2\pi R H \\ &= \pi (r l + r^2 + 2R H) \\ &= 3.14 (10 \times 26 + 10^2 + 2 \times 5 \times 36) \\ &= 3.14 (260 + 100 + 360) \\ &= 3.14 (720) \\ &= 2260.8 \text{ cm}^2 \end{aligned}$$