CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 13

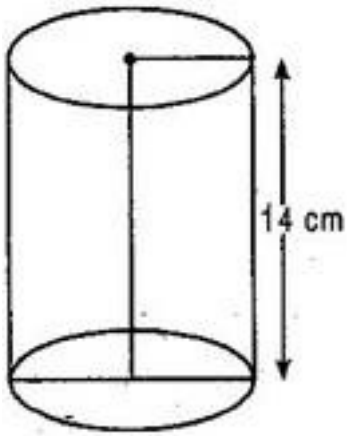
Surface Areas and Volumes(Ex. 13.2)

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

1. The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. Find the diameter of the base of the cylinder.

Ans. Given: Height of cylinder (h) = 14 cm, Curved Surface Area = 88 cm^2

Let radius of base of right circular cylinder = r cm



Now, $2\pi rh$ = 88

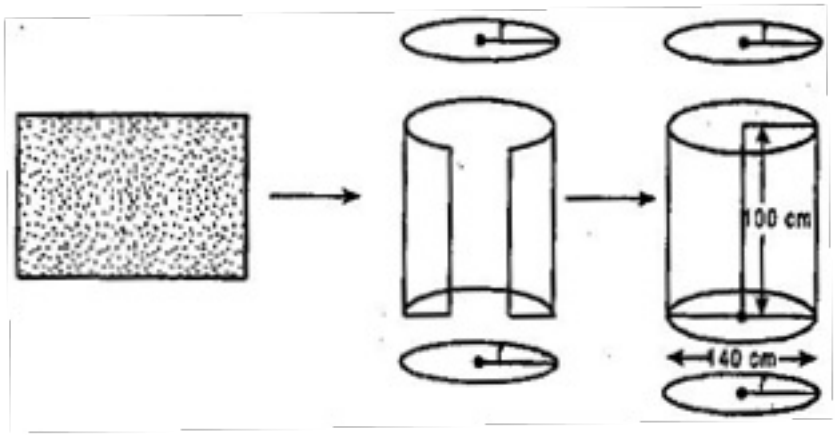
$$\Rightarrow 2\times\frac{22}{7}\times r\times 14 = 88$$

$$\Rightarrow r = 88\times\frac{7}{22}\times\frac{1}{14}\times\frac{1}{2}$$

$$\Rightarrow r = 1 \text{ cm}$$

Diameter of the base of the cylinder = $2r$ = 2 x 1 = 2 cm

2. It is required to make a closed cylindrical tank of height 1 m and base diameter 140 cm from a metal sheet. How many square meters of the sheet are required for the same?



Ans. Given: Diameter = 140 cm

$\Rightarrow$ Radius (r) = 70 cm = 0.7 m

Height of the cylinder (h) = 1 m

Total Surface Area of the cylinder

$= 2\pi r(r+h)$

$= 2\times\frac{22}{7}\times 0.7(0.7+1)$

= 2 x 22 x 0.1 x 1.7 = 7.48 m^2

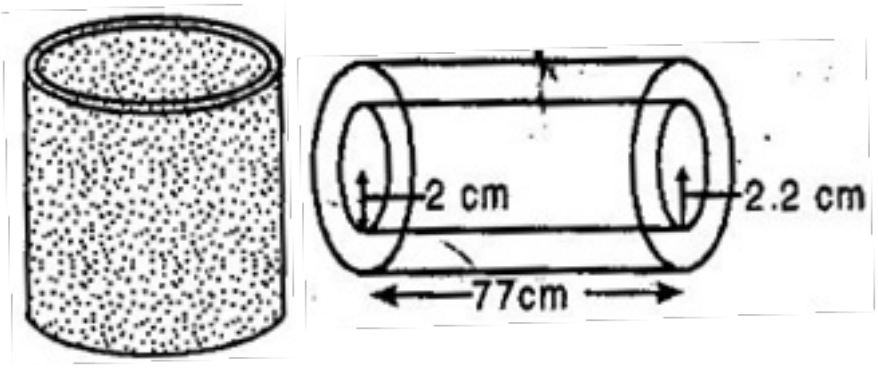
Hence 7.48 m^2 metal sheet is required to make the close cylindrical tank.

3. A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, the outer diameter being 4.4 cm. [See fig.]. Find its:

(i) Inner curved surface area

(ii) Outer curved surface area

(iii) Total surface area



Ans. (i) Length of the pipe (h) = 77 cm, Inner diameter of cross-section = 4 cm

$\Rightarrow$ Inner radius of cross-section (r) = 2 cm

Inner curved surface area of pipe = $2\pi rh = 2\times\frac{22}{7}\times 2\times 77$ = 2 x 22 x 2 x 11 = 968 cm^2

(ii) Length of pipe (h) = 77 cm, Outer diameter of pipe = 4.4 cm

$\Rightarrow$ Outer radius of the pipe (R) = 2.2 cm

Outer surface area of the pipe = $2\pi Rh$

= $2\times\frac{22}{7}\times 2.2\times 77$ = 44 x 2.2 x 11 = 1064.8 cm^2

(iii) Now there are two circles of radii 2 cm and 2.2 cm at both the ends of the pipe.

$\therefore$ Area of two bases of the pipe = 2 (Area of outer circle – area of inner circle)

= $2\left(\pi R^2-\pi r^2\right)= 2\pi\left(R^2-r^2\right)$

= $2\times\frac{22}{7}\left[(2.2)^2-(2)^2\right]= \frac{44}{7}(4.84-4)$

= $\frac{44}{7}\times 0.84$ = 5.28 cm^2

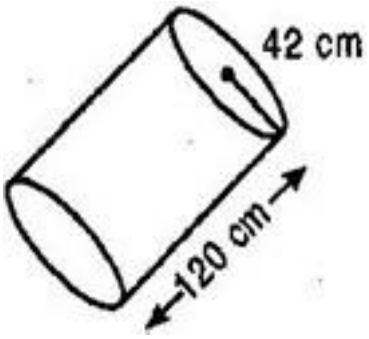
$\therefore$ Total surface area of pipe

= Inner curved surface area + Outer curved surface area + Area of two bases

= 968 + 1064.8 + 5.28 = 2038.08 cm^2

4. The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in m^2.

Ans. Diameter of roller = 84 cm



$\Rightarrow$ Radius of the roller = 42 cm

Length (Height) of the roller = 120 cm

Curved surface area of the roller = $2\pi rh = 2 \times \frac{22}{7} \times 42 \times 120$ = 31680 cm^2 = 3.1680 m^2

$\because$ Now area leveled by roller in one revolution = 3.1680 m^2

$\therefore$ Area leveled by roller in 500 revolutions

= 3.1680 x 500 = 1584.0000 = 1584 m^2

5. A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of white washing the curved surface of the pillar at the rate of Rs. 12.50 per m^2.

Ans. Diameter of pillar = 50 cm

$\Rightarrow$ Radius of pillar = $\frac{50}{2}$ = 25 cm = $\frac{25}{100} = \frac{1}{4}$ m

Height of the pillar = 3.5 m

Now, Curved surface area of the pillar= $2\pi rh$

= $2 \times \frac{22}{7} \times \frac{1}{4} \times 3.5 = \frac{11}{2}$ m^2

$\because$ Cost of white washing 1 m^2 = Rs. 12.50

$\therefore$ Cost of white washing $\frac{11}{2}$ m^2 = 12.50 x $\frac{11}{2}$ = Rs. 68.75

6. Curved surface area of a right circular cylinder is 4.4 m^2. If the radius of the base of the cylinder is 0.7 m, find its height.

Ans. Curved surface area of the cylinder= 4.4 m^2, Radius of cylinder = 0.7 m

Let height of the cylinder = h

$\therefore$ $2\pi rh$ = 4.4

$\Rightarrow 2 \times \frac{22}{7} \times 0.7 \times h = 4.4$

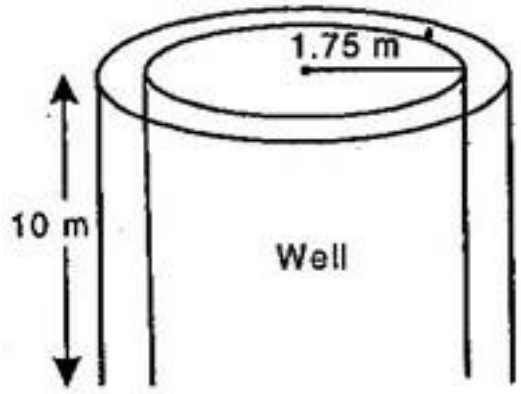
$\Rightarrow h = \frac{4.4}{0.7} \times \frac{7}{22} \times \frac{1}{2}$

$\Rightarrow h$ = 1 m

7. The inner diameter of a circular well is 3.5 m. It is 10 m deep. Find:

(i) its inner curved surface area.

(ii) thecosr of plastering this curved surface at the rate of Rs. 40 per m^2.



Ans. Inner diameter of circular well = 3.5 m

$\therefore$ Inner radius of circular well= $\frac{3.5}{2}$ = 1.75 m

And Depth of the well = 10 m

(i) Inner surface area of the well = $2\pi rh$

= $2\times\frac{22}{7}\times1.75\times10$ = 110 m^2

(ii) Cost of plastering 1 m^2 = Rs. 40

Cost of plastering 100 m^2 = 40 x 110 = Rs. 4400

8. In a hot water heating system, there is a cylindrical piping of length 28 m and diameter 5 m. Find the total radiating surface in the system.

Ans. The length (height) of the cylindrical pipe = 28 m

Diameter = 5 cm

$\Rightarrow$ Radius = $\frac{5}{2}$ cm

$\therefore$ Curved surface area of the pipe = $2\pi rh$

= $2\times\frac{22}{7}\times\frac{5}{2}\times2800$ = 44000 cm^2 = $\frac{44000}{10000}$ = 4.4 m^2

9. Find:

(i) the lateral or curved surface area of a petrol storage tank that is 4.2 m in diameter and 4.5 m high.

(ii) how much steel was actually used if $\frac{1}{12}$ of the steel actually used was wasted in making the tank?

Ans. **(i)** Diameter of cylindrical petrol tank = 4.2 m

$\therefore$ Radius of the cylindrical petrol tank = $\frac{4.2}{2}$ = 2.1 m

And Height of the tank = 4.5 m

$\therefore$ Curved surface area of the cylindrical tank = $2\pi rh$

= $2 \times \frac{22}{7} \times 2.1 \times 4.5$ = 59.4 m^2

(ii) Let the actual area of steel used be x meters

Since $\frac{1}{12}$ of the actual steel used was wasted, the area of steel which has gone into the tank.

Then, steel actually used = $x - \frac{1}{12}x = \frac{11}{12}x$ of its Total Surface area

$\therefore \frac{11}{12}x = 2\pi r(r+h)$

$\Rightarrow \quad \frac{11}{12}x = 2 \times \frac{22}{7} \times 2.1(2.1+4.5)$

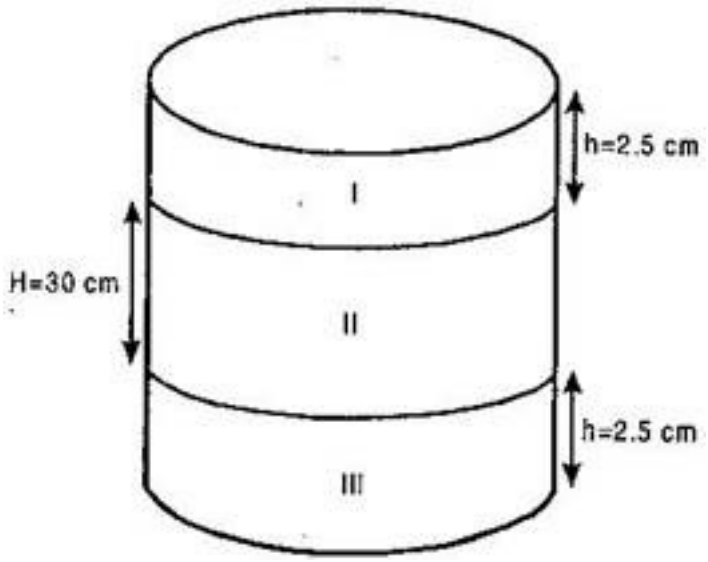
$\Rightarrow \quad \frac{11}{12}x = 44 \times 0.3 \times 6.6$

$\Rightarrow \quad \frac{11}{12}x = 87.12$

$\Rightarrow x = 87.12 \times \frac{12}{11}$ = 95.04 m^2

Hence steel actually used is 95.04 m^2.

10. In the adjoining figure, you see the frame of a lampshade. It is to be covered with a decorative cloth. The frame has a base diameter of 20 cm and height of 30 cm. A margin of 2.5 cm is to be given for folding it over the top and bottom of the frame. Find how much cloth is required for covering the lampshade. [See fig.]



Ans. Height of each of the folding at the top and bottom (h) = 2.5 cm

Height of the frame (H) = 30 cm

Diameter = 20 cm

$\Rightarrow$ Radius = 10 cm

Now cloth required for covering the lampshade

= CSA of top part + CSA of middle part + CSA of bottom part

= $2\pi rh + 2\pi r\mathrm{H} + 2\pi rh$

= $2\pi r(h + \mathrm{H} + h)$

= $2\pi r(\mathrm{H} + 2h)$

= $2 \times \frac{22}{7} \times 10\,(30 + 2 \times 2.5)$

= 2200 cm^2

10. The students of a Vidyalaya were asked to participate in a competition for making and decorating pen holders in the shape of a cylinder with a base, using cardboard. Each pen holder was to be of radius 3 cm and height 10.5 cm. The Vidyalaya was to supply the competitors with cardboard. If there were 35 competitors, how much cardboard was required to be bought for the competition?

Ans. Radius of a cylindrical pen holder (r) = 3 cm

Height of the cylindrical pen holder (h) = 10.5 cm

Cardboard required for pen holder = CSA of pen holder + Area of circular base

= $2\pi rh + \pi r^2 = \pi r(2h + r)$

= $\frac{22}{7} \times 3(2 \times 10.5 + 3)$ = 226.28 cm^2

Since Cardboard required for making 1 pen holder = 226.28 cm^2

$\therefore$ Cardboard required for making 35 pen holders = 226.28 x 35 = 7919.8 cm^2

= 7920 cm^2 (approx.)