Surface Areas and Volumes: Exercise 13.3

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

Q.1 Diameter of the base of a cone is 10.5 cm and its slant height is 10 cm. Find its curved surface area.

***Sol.* Given:** Dimension of a cone, let diameter of base d = 10.5 cm, radius r = 10.5/2 = 5.25 cm and slant height l = 10 cm

So, curved surface area of the cone = $(\pi r \ell)$ cm²

$$= (\frac{22}{7} \times 5.25 \times 10) \text{ cm}^2$$

$$= 165 \text{ cm}^2$$

Thus, curved surface area of the cone = 165 cm²

Q.2 Find the total surface area of a cone, if its slant height is 21 m and diameter of its base is 24 m.

***Sol.* Given:** Dimension of a cone, let diameter of base d = 24 m, radius r = 24/2 = 12 m and slant height l = 21 m

So, total surface area of the cone = $(\pi r \ell + \pi r^2)$ m²

$$= \pi r (\ell + r) \text{ m}^2$$

$$= \frac{22}{7} \times 12 \times (21+12) \text{ m}^2$$

$$= (\frac{22}{7} \times 12 \times 33) \text{ m}^2$$

$$= 1244.57 \text{ m}^2 \text{ (approx)}$$

Thus, total surface area of the cone = 1244.57 m²

Q.3 Curved surface area of a cone is 308 cm² and its slant height is 14 cm. Find
(i) radius of the base and
(ii) total surface area of the cone.

***Sol.* Given:** Curved surface area of a cone = 308 cm² and slant height l = 14 cm

(i) Since, curved surface of a cone = 308 cm2

Let r be the radius of the base.

So, $\pi r \ell = 308$

$$\Rightarrow \frac{22}{7} \times r \times 14 = 308$$

$$\Rightarrow r = 308 \times \frac{7}{22} \times 14$$

$$= 7 \text{ cm}$$

Thus, the radius of the base of the cone = 7 cm

(ii) Now, total surface area of the cone = $\pi r (\ell + r)$ cm²

$$= \frac{22}{7} \times 7 \times (14+7) \text{ cm}^2$$

$= (22 \times 21)\ cm^2$
$= 462\ cm^2$
Thus, total surface area of the cone = 462 cm^2

Q.4 A conical tent is 10 m high and the radius of its base is 24 m. Find
(i) Slant height of the tent.
(ii) Cost of the canvas required to make the tent, if the cost of 1 m^2 canvas is Rs 70.
Sol. **Given:** Dimension of conical tent, let radius of base r = 24m and height h = 10 m.
(i) Suppose, *l* is the slant height of the cone. Then,

$\ell^2 = h^2 + r^2$
$\Rightarrow \ell^2 = h^2 + r^2$
$\Rightarrow \ell^2 = 24^2 + 10^2$
$\Rightarrow \ell^2 = 576 + 100$
$\Rightarrow \ell^2 = 676$
$\Rightarrow \ell^2 = 26$ m
Thus, slant height of conical tent = 26 m

(ii) Now, canvas required to make the conical tent = Curved surface of the cone

$$\pi r\ell = \left(\frac{22}{7} \times 24 \times 26\right) m^2$$

Since, rate of canvas per $1m^2$ is Rs 70
So, cost of canvas = $\left(\frac{22}{7} \times 24 \times 26 \times 70\right)$
= Rs. 137280
Thus, cost of required canvas is Rs. 137280.

Q.5 What length of tarpaulin 3 m wide will be required to make conical tent of height 8 m and base radius 6 m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. (Use π = 3.14)
Sol. **Given:** Dimension of conical tent, let base radius r = 6/2 = 3m, height h=8m.
Let *l* be the slant height of the tent.

$\Rightarrow \ell = \sqrt{r^2 + h^2}$
$= \sqrt{6^2 + 8^2}$
$= \sqrt{100}$
= 10m
Now, area of the canvas used for the tent will be equal to curved surface area of the tent.
So, curved surface area of the tent = $\pi r\ell$
$= (3.14 \times 6 \times 10)\ m^2$
$= 188.4\ m^2$

Since, this surface area of tent is bought in the form of a rectangle tarpaulin of width 3m.
Since, Area of required rectangle tarpaulin = Length of tarpaulin X Breadth of tarpaulin
So, length of tarpaulin required = $\frac{Area\ of\ tarpaulin\ required}{Width\ of\ tarpaulin}$
= (188.4/3) m
= 62.8 m
Also given that extra material required for stitching margins and cutting = 20 cm

= 0.2 m

Thus, the total length of tarpaulin needed = (62.8 + 0.2) m = 63m

Q.6 The slant height and base diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white - washing its curved surface at the rate of Rs 210 per 100 m².

***Sol.* Given:** Dimension of conical tomb, let slant height l = 25 m, base diameter d = 14m and radius r = 14/2 = 7m

Therefore, curved surface area = πrℓ m²

$$= \left(\frac{22}{7} \times 25 \times 7\right) m^2$$

$$= 550\ m^2$$

Since, rate of white- washing is Rs 210 per 100m²

So , cost of white - washing of tomb = $550 \times \frac{210}{100}$

= Rs. 1155

Thus, cost of white - washing of tomb = Rs. 1155

Q.7 A joker's cap is in the form of a right circular cone of base radius 7 cm and height 24 cm. Find the area of the sheet required to make 10 such caps.

***Sol.* Given:** dimension of conical shaped joker's cap, let base radius = 7 cm and height h = 24 cm.

Let l cm be the slant height of the joker's cap.

So, $\ell = \sqrt{r^2 + h^2}$

$= \sqrt{24^2 + 7^2}$

$= \sqrt{625}$

= 25 cm

Now, sheet needed for one cap = Curved surface of the cone

= πrℓ cm²

$$= \left(\frac{22}{7} \times 7 \times 25\right) cm^2$$

$$= 550\ cm^2$$

Thus, sheet required for 10 such caps = 550 x 10 = 5500 cm²

Q.8 A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40 cm and height 1m. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m², what will be the cost of painting all these cones? (Use π = 3.14 and take $\sqrt{1.04}$ =1.02).

***Sol.* Given:** Dimension of conical shaped, let base diameter d = 40 cm, radius r = 40/2 = 20 cm = 0.2 m and height h = 1m

Let l be the slant height of a cone.

Therefore, $\ell = \sqrt{r^2 + h^2}$

$= \sqrt{(0.2)^2 + (1)^2}$

$= \sqrt{1.04}$

= 1.02 m

Now, curved surface of 1 cone = $\pi r\ell$ m^2

= (3.14 × 0.2 × 1.02) m^2

Therefore, curved surface of same 50 cones = (50 × 3.14 × 0.2 × 1.02) m^2

Since, cost of painting is Rs. 12 per m^2

So, the cost of painting 50 cones = (50 × 3.14 × 0.2 × 1.02 × 12)

= Rs. 384.68 (approx)