📘 Class 9 Maths – Ganita Manjari Part II

Chapter 14: Math of Space: Surface Area and Volume

Exercise Set 14.3 – Complete Solutions

For π, use π ≈ 22/7 or π ≈ 3.14.

Q1. Find the total surface area of a cone, if its slant height is 21 m and diameter of its base is 24 m.

Given:

Slant height, **l = 21 m**

Diameter = 24 m

Therefore, radius:

r = 24/2 = 12 m

Total surface area of cone:

TSA = πr(l + r)

= π × 12 × (21 + 12)

= 12 × 33π

= **396π**

Using π = 22/7:

TSA = 396 × 22/7

= **1244.57 m²**

✅ **Answer:**

Total surface area ≈ 1244.57 m²

Q2. Find the curved surface area of a right circular cone whose slant height is 10 cm and base radius is 7 cm.

Given:

l = 10 cm

r = 7 cm

Curved surface area:

CSA = πrl

= (22/7) × 7 × 10

= 220 cm²

✅ **Answer:**

220 cm²

Q3. The height of a cone is 16 cm, and its base radius is 12 cm. Find the curved surface area and the total surface area of the cone.

Given:

h = 16 cm

r = 12 cm

First find the slant height.

Using:

$l^2 = h^2 + r^2$

$l^2 = 16^2 + 12^2$

$= 256 + 144$

$= 400$

Therefore:

l = 20 cm

Curved Surface Area

CSA = πrl

$= \pi \times 12 \times 20$

$= 240\pi$

Using $\pi = 22/7$:

CSA = 5280/7

≈ 754.29 cm²

Total Surface Area

TSA = πr(l + r)

$= \pi \times 12 \times (20 + 12)$

$= 384\pi$

Using $\pi = 22/7$:

TSA = 8448/7

≈ 1206.86 cm²

✅ Answers:

Curved surface area ≈ 754.29 cm²

Total surface area ≈ 1206.86 cm²

Q4. A cone has a height of 15 cm. If its volume is 1570 cm³, find the radius of the base.

Given:

h = 15 cm

V = 1570 cm³

Formula:

V = 1/3 πr²h

Therefore:

1570 = 1/3 × π × r² × 15

1570 = 5πr²

Using π = 3.14:

1570 = 5 × 3.14 × r²

1570 = 15.7r²

Therefore:

r² = 1570/15.7 = 100

So:

r = 10 cm

✅ Answer:

Radius = 10 cm

Q5. The curved surface area of a cone is 308 cm² and its slant height is 14 cm. Find (i) the radius of the base, (ii) the total surface area of the cone.

Given:

CSA = 308 cm²

l = 14 cm

(i) Radius of the base

Formula:

CSA = πrl

Therefore:

308 = (22/7) × r × 14

308 = 44r

Therefore:

r = 7 cm

✅ Answer:

Radius = 7 cm

(ii) Total surface area

TSA = CSA + Area of base

$= 308 + \pi r^2$

$= 308 + (22/7) \times 7^2$

$= 308 + 154$

$=$ **462 cm²**

✅ Answer:

Total surface area = 462 cm²

Q6. 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.

Given:

r = 7 cm

h = 24 cm

A cap is open at the bottom, so we need the **curved surface area**.

First find the slant height:

$l^2 = h^2 + r^2$

$= 24^2 + 7^2$

$= 576 + 49$

= 625

Therefore:

l = 25 cm

Curved surface area of one cap:

CSA = πrl

= (22/7) × 7 × 25

= 550 cm²

For 10 caps:

10 × 550 = 5500 cm²

✅ Answer:

Area of sheet required = 5500 cm²

Q7. What length of tarpaulin 3 m wide is required to make a conical tent of height 8 m and base radius 6 m? Assume that the extra length of material required for stitching margins and wastage in cutting is 20 cm.

Given:

h = 8 m

r = 6 m

Width of tarpaulin = **3 m**

First find the slant height:

$l^2 = h^2 + r^2$

$= 8^2 + 6^2$

$= 64 + 36$

$= 100$

Therefore:

$l = 10$ m

The tent has no base, so we need the curved surface area.

$CSA = \pi rl$

$= \pi \times 6 \times 10$

$=$ **60π m²**

Using $\pi = 22/7$:

$CSA = 1320/7$

$\approx$ 188.57 m²

Let the required length of tarpaulin be **L**.

Since:

Area = length × width

$L \times 3 = 188.57$

$L \approx 62.86$ m

Extra material:

20 cm = 0.20 m

Therefore:

Total length = 62.86 + 0.20

= 63.06 m

✅ **Answer:**

Approximately 63.06 m of tarpaulin is required.

Q8. A right triangle with sides 6 cm, 8 cm and 10 cm is rotated through 360° about the side of 8 cm. Find the volume and the curved surface area of the solid so formed.

The triangle has sides:

6 cm, 8 cm and 10 cm

When rotated about the side of **8 cm**:

- Height of cone = **8 cm**
- Radius = **6 cm**
- Slant height = **10 cm**

Thus, the solid formed is a cone.

Volume

$V = 1/3\ \pi r^2 h$

$= 1/3 \times \pi \times 6^2 \times 8$

$= 1/3 \times \pi \times 36 \times 8$

$= 96\pi\ cm^3$

Using $\pi = 3.14$:

$V = 301.44\ cm^3$

✅ **Volume:**

301.44 cm³

Curved Surface Area

CSA = πrl

= π × 6 × 10

= 60π cm²

Using π = 3.14:

CSA = 188.4 cm²

✅ **Curved surface area:**

188.4 cm²

⭐ Q9. Suppose you have a cup in the shape of a right circular cone. Fill it with water to half the depth of the cone. What fraction of the volume of the cup is occupied by the water?

Let the original cone have:

- Radius = **r**
- Height = **h**

When water is filled to **half the depth**, the water forms a smaller cone similar to the original cone.

Therefore:

New height / Original height = 1/2

For similar cones, all corresponding lengths are in the ratio **1 : 2**.

Therefore, the ratio of their volumes is the cube of the ratio of their corresponding lengths:

Volume ratio = $(1/2)^3$

= 1/8

Therefore, the water occupies:

✅ Answer:

1/8 of the volume of the cup.