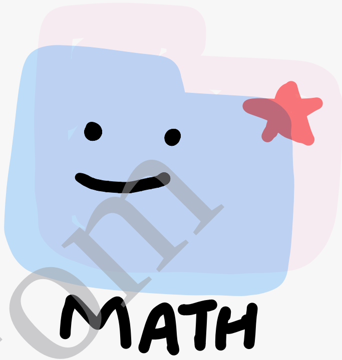
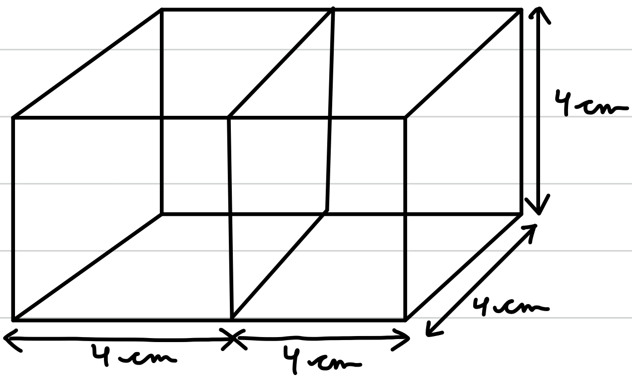
Surface Areas And Volumes



+ ×

− ÷

Ex. 13.1



1. Let edge of each cube $= a$ cm

Volume of cube $= 64$ cm^3

$a^3 = 64$

$a = \sqrt[3]{64}$

$a = 4$ cm

For the resulting cuboid

length, $l = 4+4 = 8$ cm

breadth, $b = 4$ cm

height, $h = 4$ cm

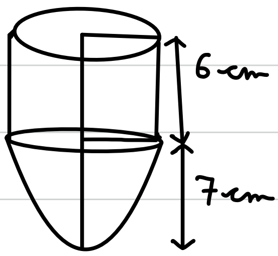
Surface area of resulting cuboid $= 2(lb + bh + hl)$

$= 2(8\times4 + 4\times4 + 4\times8)$

$= 2(32+16+32)$

$= 2\times80$

$= 160$ cm^2



2. Diameter of hemisphere $= 14$ cm

Radius of hemisphere, $r = \frac{d}{2} = \frac{14}{2} = 7$ cm

Radius of base of cylinder, $r = 7$ cm

Total height of vessel $= 13$ cm

Height of cylinder, $h = 13 - 7 = 6$ cm

Inner surface area of toy = curved surface area of cylinder + curved surface area of hemisphere

$= 2\pi r h + 2\pi r^2$

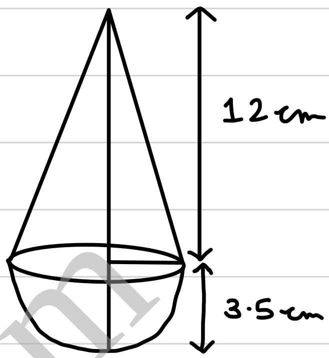
$= 2\pi r(h + r)$

$= 2\times\frac{22}{\cancel{7}_1}\times\cancel{7}^1(6+7)$

= $2 \times 22 \times 13$

= $572\ cm^2$

3\. Radius of base of cone and hemisphere, $r = 3.5$ cm



Total height of toy = 15.5 cm

Height of cone, $h = 15.5 - 3.5 = 12$ cm

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

or $l = \sqrt{12^2 + (3.5)^2}$

or $l = \sqrt{144 + 12.25}$

or $l = \sqrt{156.25}$

or $l = 12.5$ cm

Total surface area of toy

= curved surface area of cone + curved surface area of hemisphere

= $\pi r l + 2\pi r^2$

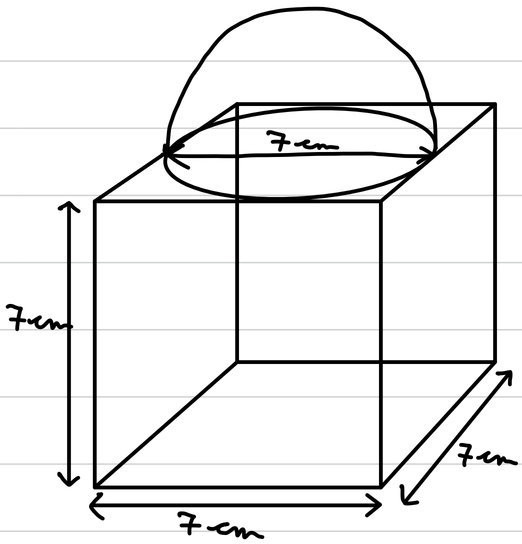
= $\pi r (l + 2r)$

= $\frac{22}{7} \times 3.5 (12.5 + 2 \times 3.5)$ (with 7 and 3.5 cancelled to 0.5)

= 11×19.5

= $214.5\ cm^2$

4\. Edge of cube, $a = 7$ cm



Diameter of base of hemisphere

= edge of cube = 7 cm

∴ greatest diameter the hemisphere can have = 7 cm

Radius of base of hemisphere,

$r = \frac{d}{2} = \frac{7}{2}$ cm

Surface area of solid

= surface area of cube + curved surface area of hemisphere − area of base of hemisphere

$= 6a^2 + 2\pi r^2 - \pi r^2$

$= 6a^2 + \pi r^2$

$= 6 \times 7^2 + \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

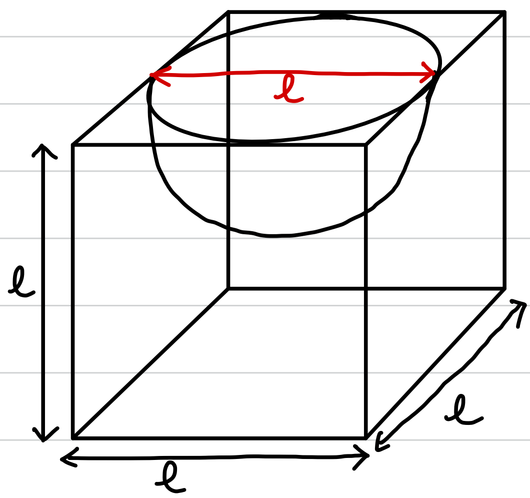
$= 294 + \frac{77}{2}$

$= 294 + 38.5$

$= 332.5\ cm^2$

5. Diameter of base of hemisphere = edge of cube = l units

Radius of base of hemisphere, $r = \frac{l}{2}$ units



Surface area of the remaining solid = surface area of cube + curved surface area of hemisphere − area of base of hemisphere

$= 6l^2 + 2\pi r^2 - \pi r^2$

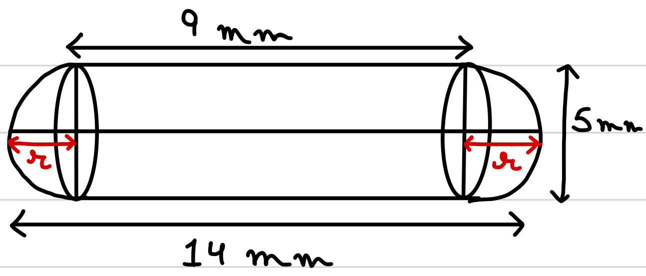
$= 6l^2 + \pi r^2$

$= 6l^2 + \pi \left(\frac{l}{2}\right)^2$

$= 6l^2 + \frac{\pi l^2}{4}$

$= \frac{24l^2 + \pi l^2}{4} = \frac{1}{4} l^2 (24 + \pi)$ square units

6\. Diameter of capsule, $d = 5\,mm$



Radius of base of cylinder and hemisphere, $r = \frac{d}{2} = \frac{5}{2}\,mm$

Length of entire capsule = 14 mm

Length of cylinder, $h = 14 - (r + r)$

$= 14 - 2r$

$= 14 - 2 \times \frac{5}{2}$

$= 14 - 5$

$= 9\,mm$

Surface area of capsule

= curved surface area of cylinder + 2× curved surface area of hemisphere

$= 2\pi r h + 2 \times 2\pi r^2$

$= 2\pi r h + 4\pi r^2$

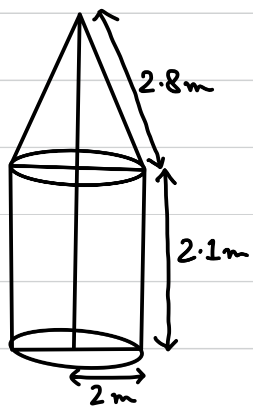
$= 2\pi r (h + 2r)$

$= 2 \times \frac{22}{7} \times \frac{5}{2}\left(9 + 2 \times \frac{5}{2}\right)$

$= \frac{110}{7} \times 14$

$= 220\,mm^2$

7\. Height of cylinder, $h = 2.1\,m$



Diameter of base, $d = 4\,m$

Radius of base of cylinder and cone,

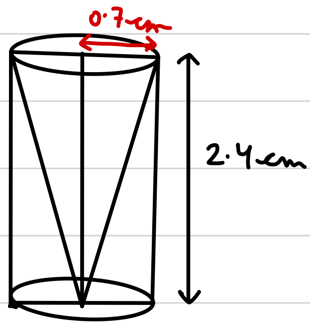
$r = \frac{d}{2} = \frac{4}{2} = 2\,m$

Slant height of cone, $l = 2.8\,m$

Area of canvas used for making the tent
= curved surface area of cone + curved surface area of cylinder
= $\pi r l + 2\pi r h$
= $\pi r (l + 2h)$
= $\frac{22}{7} \times 2 (2.8 + 2 \times 2.1)$
= $\frac{44}{7} \times 7$
= $44 \ m^2$

Cost of $1 \ m^2$ of canvas = ₹ 500
Cost of $44 \ m^2$ of canvas = 44×500
= ₹ 22000

8. Height of cylinder, $h = 2.4$ cm
Diameter of base of cylinder, $d = 1.4$ cm
Radius of base of cylinder and cone, r
= $\frac{d}{2} = \frac{1.4}{2} = 0.7$ cm



Slant height of cone, $l = \sqrt{h^2 + r^2}$
$= \sqrt{(2.4)^2 + (0.7)^2}$
$= \sqrt{5.76 + 0.49}$
$= \sqrt{6.25}$
$= 2.5$ cm

Total surface area of remaining solid
= total surface area of cylinder + curved surface of cone − area of base of cylinder
= $2\pi r h + 2\pi r^2 + \pi r l - \pi r^2$
= $2\pi r h + \pi r^2 + \pi r l$

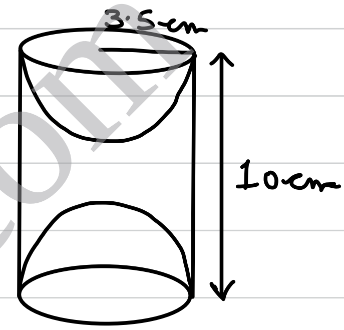
$= \pi r(2h + r + l)$

$= \frac{22}{7} \times 0.7\,(2 \times 2.4 + 0.7 + 2.5)$

$= 2.2 \times 8$

$= 17.6$

$\approx$ **18 cm^2**



9. Height of cylinder, $h = 10$ cm

Radius of base of cylinder and hemisphere, $r = 3.5$ cm

Total surface area of toy

= curved surface area of cylinder + 2 × curved surface area of hemisphere

$= 2\pi rh + 2 \times 2\pi r^2$

$= 2\pi rh + 4\pi r^2$

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

$= 2 \times \frac{22}{7} \times 3.5\,(10 + 2 \times 3.5)$

$= 22 \times 17$

$=$ **374 cm^2**