

Chapter - 13

Surface Area and Volume

Notes

Name of Solid	C.S.A / L.S.A	T.S.A
Cube	$4a^2$ Sq. units	$6a^2$ Sq. units
Cuboid	$2(l+b) \times h$	$2(lb + bh + hl)$
Cylinder	$2\pi rh$	$2\pi r(h+r)$
Cone	πrl $l = \sqrt{r^2 + h^2}$ $l \rightarrow$ Slant height	$\pi r(l+r)$

Cone	$\pi r l$ $l = \sqrt{r^2 + h^2}$ $l \rightarrow$ Slant height	$\pi r h (l + r)$
Sphere	-	$4\pi r^2$
Hemisphere	$2\pi r^2$	$3\pi r^2$
Hollow Cylinder	$2\pi (R+r)h$	$2\pi (R+r)(h+R-r)$ $2\pi [Rh + rh + (R^2 - r^2)]$

Diagonal of a cube = $\sqrt{3}a$ units

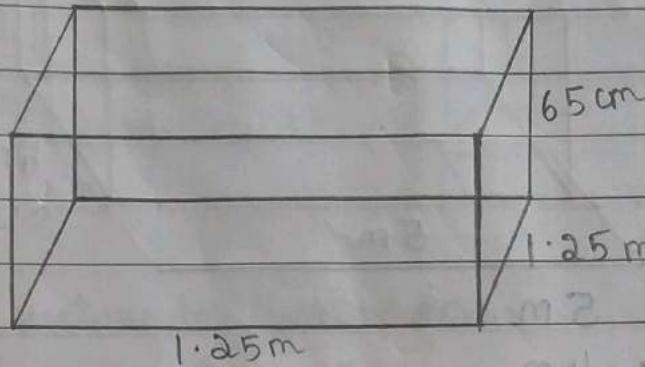
Length of 12 edges of cube = $12a$

Diagonal of a cuboid = $\sqrt{l^2 + b^2 + h^2}$ units

Length of 12 edges of cuboid = $4(l + b + h)$

Ex: 13.1

1. Refer text book pg: 213



55750

given:

$$l = 1.5 \text{ m}$$

$$b = 1.25 \text{ m}$$

$$h = 65 \text{ cm}$$

$$= 0.65 \text{ m}$$

$$\begin{aligned} \text{i) Area of Sheet Required} &= \text{C.S.A of a cuboid} + \text{area of rectangular base} \\ &= 2(l+b)h + lb \\ &= (2 \times (1.5 + 1.25) \times 0.65) + (1.5 \times 1.25) \\ &= (1.30 \times 2.75) + 1.875 \\ &= 3.5750 \text{ m} + 1.875 \\ &= 5.45 \text{ m}^2 \end{aligned}$$

$$\text{ii) Rate of Sheet per m}^2 = ₹ 20$$

$$\begin{aligned} \text{Rate of Sheet for } 5.45 \text{ m}^2 &= 5.45 \times 20 \\ &= ₹ 109 \end{aligned}$$

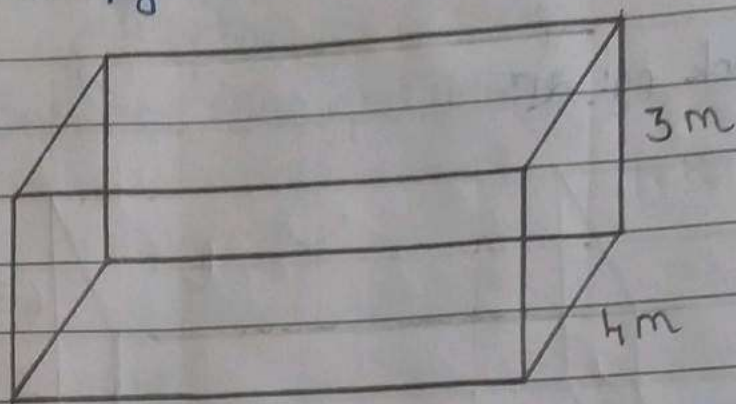
$$\text{Ans} \Rightarrow \text{i) } 5.45 \text{ m}^2$$

$$\text{ii) } ₹ 109$$



$$\begin{array}{r} 125 \\ 15 \\ \hline 625 \\ 125 \\ \hline 1875 \\ \hline 000 \end{array}$$

2. Refer text book pg : 213



given:

$$l = 5\text{ m}$$

$$b = 4\text{ m}$$

$$h = 3\text{ m}$$

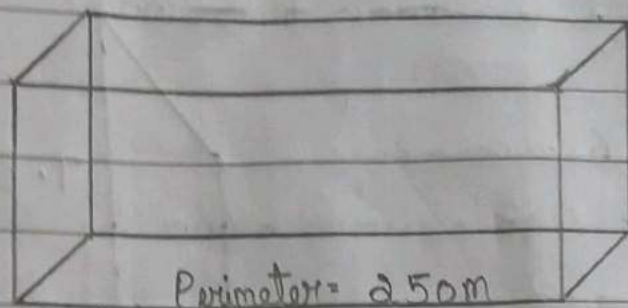
$$\begin{aligned}\text{Total area to be whitewashed} &= \text{area of 4 walls} + \text{area of ceiling} \\ &= (\text{C.S.A of cuboid}) + \text{area of rectangle} \\ &= (2(l+b)h) + l \times b \\ &= (2(5+4)3) + (5 \times 4) \\ &= (6 \times 9) + 20 \\ &= 54 + 20 \\ &= 74\text{ m}^2\end{aligned}$$

$$\text{Cost of white washing per m}^2 = ₹ 7.50$$

$$\begin{aligned}\text{Cost of white washing } 74\text{ m}^2 &= ₹ 7.50 \times 74 \\ &= ₹ 555\end{aligned}$$

Ans = ₹ 555

3. Refer text book pg: 213



given:

Perimeter of rectangular floor = 250 m

Cost of painting per m^2 = ₹ 10

Cost of painting 4 walls = ₹ 15000

Perimeter of 4 walls = 250 m

$$\Rightarrow 2(l+b) = 250m$$

\therefore Cost of painting 4 walls = ₹ 15000,

Cost of painting per m^2 = ₹ 10

$$\therefore \text{Area of 4 walls} = \frac{15000}{10}$$

$$= 1500m^2$$

$$\Rightarrow 2(l+b)h = 1500m^2$$

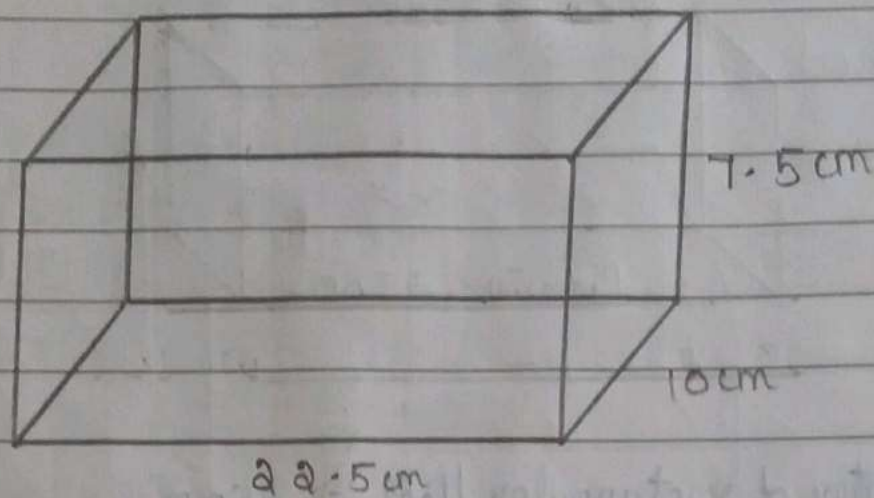
$$\Rightarrow 250 \times h = 1500$$

$$\Rightarrow h = \frac{1500}{250}$$

$$h = 6m$$

Ans = $h = 6m$ ✓

4. Refer text book pg: 2103



Soln:

$$l = 22.5 \text{ cm}$$

$$b = 10 \text{ cm}$$

$$h = 7.5 \text{ cm}$$

$$\begin{aligned} \text{T.S.A of a brick} &= 2(lb + bh + hl) \\ &= 2(22.5 \times 10 + 10 \times 7.5 + 22.5 \times 7.5) \\ &= 2(225 + 75 + 168.75) \\ &= 2(468.75) \\ &= 937.5 \text{ cm}^2 \end{aligned}$$

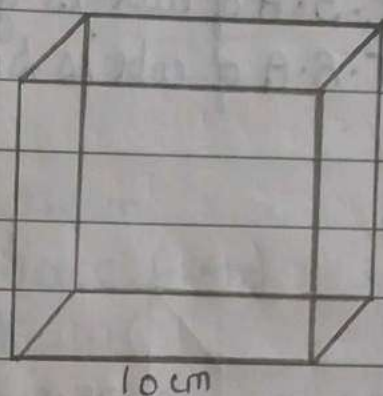
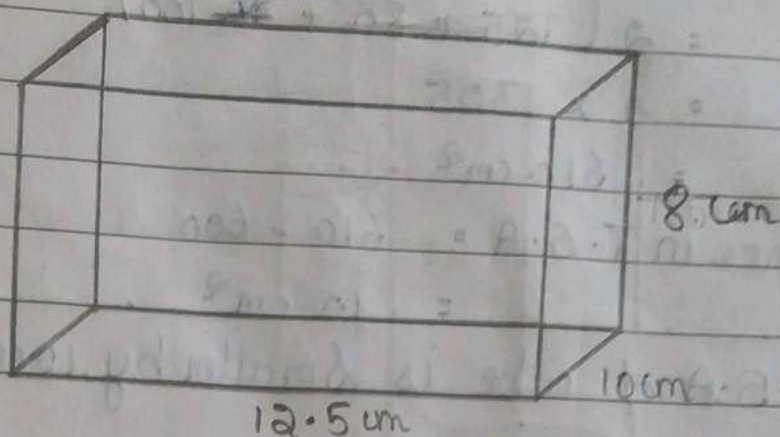
$$\begin{aligned} \text{Sufficient paint available} &= 937.5 \text{ m}^2 \\ &= 93750 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{No. of bricks can be painted} &= 93750 \div 937.5 \Rightarrow \frac{937500}{9375} \\ &= 100 \end{aligned}$$

Ans = 100 bricks.



5. Refer text book pg: 213



Soln:

i) Edge of a cube = 10 cm

$$\begin{aligned}\text{L.S.A of a cube} &= 4a^2 \\ &= 4 \times (10)^2 \\ &= 4 \times 100 \\ &= 400 \text{ cm}^2\end{aligned}$$

In a cuboid,

$$l = 12.5 \text{ cm}, b = 10 \text{ cm}, h = 8 \text{ cm}$$

$$\begin{aligned}\text{L.S.A of a cuboid} &= 2(l+b)h \\ &= 2 \times (12.5 + 10) \times 8 \\ &= 2 \times 22.5 \times 8 \\ &= 360 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Difference in L.S.As} &= 400 - 360 \text{ cm}^2 \\ &= 40 \text{ cm}^2\end{aligned}$$

\therefore L.S.A of a cube is greater by 40 cm^2

ii) ~~Q. 1~~ T.S.A of a cube = $6a^2$
= $6 \times (10)^2$
= 6×100
= 600 cm^2

T.S.A of a cuboid = $2(lb + bh + hl)$

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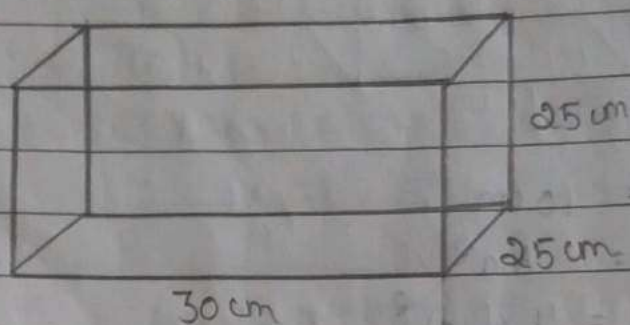
$$\begin{aligned}
 &= 2((12.5 \times 10) + (10 \times 8) + (12.5 \times 8)) \\
 &= 2(125 + 80 + 100) \\
 &= 2 \times 305 \\
 &= 610 \text{ cm}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Difference in T.S.A} &= 610 - 600 \\
 &= 10 \text{ cm}^2
 \end{aligned}$$

\therefore T.S.A of cube is smaller by 10 cm^2

Ans \Rightarrow i) C.S.A of cube is greater by 40 cm^2
 ii) T.S.A of cube is smaller by 10 cm^2

6. Refer text book pg: 213



Soln:

$$l = 30 \text{ cm}$$

$$b = 25 \text{ cm}$$

$$h = 25 \text{ cm}$$

$$\begin{aligned} \text{i) Area of the glass} &\Rightarrow \text{T.S.A of a cuboid} = 2(lb + bh + hl) \\ &= 2(30 \times 25) + (25 \times 25) + (25 \times 30) \\ &= 2(750 + 625 + 750) \\ &= 2 \times 2125 \\ &= 4250 \text{ cm}^2 \end{aligned}$$

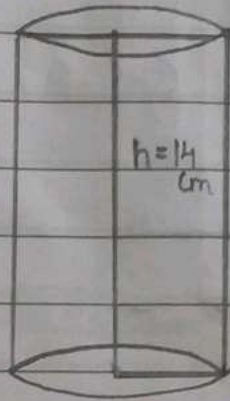
$$\begin{aligned} \text{ii) Tape needed for 12 edges} &= 4(l + b + h) \\ &= 4(30 + 25 + 25) \\ &= 4 \times 80 \\ &= 320 \text{ cm} \end{aligned}$$

$$\text{Ans} = \text{i) } 4250 \text{ cm}^2$$

$$\text{ii) } 320 \text{ cm}$$

Ex: 13.2

1. Refer text book pg: 216



$$C.S.A = 88 \text{ cm}^2$$

Soln:

given:

$$h = 14 \text{ cm}$$

$$\text{Curved Surface Area} = 88 \text{ cm}^2$$

$$2\pi rh = 88 \text{ cm}^2$$

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

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

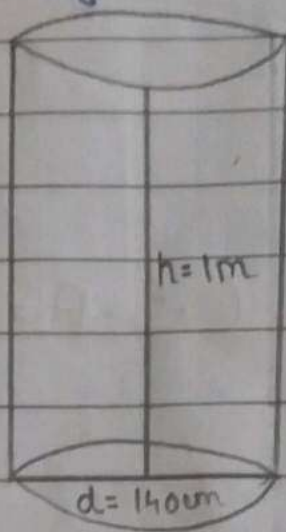
$$r = 1 \text{ cm}$$

$$\therefore \text{Diameter, } d = 2 \times r$$

$$= 2 \text{ cm}$$

$$\text{Ans} = 2 \text{ cm}$$

2. Refer text book pg: 216



Soln:

given:

$$d = 140cm$$

$$r = \frac{140}{2}$$

$$r = 70cm$$

$$r = 0.7m$$

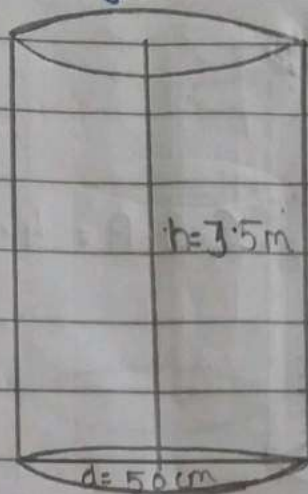
$$h = 1m$$

$$\begin{aligned} \text{T.S.A of a cylindrical tank} &= 2\pi r(h+r) \\ &= 2 \times \frac{22}{7} \times 0.7 (1+0.7) \\ &= 4.4 \times 1.7 \\ &= 7.48m^2 \end{aligned}$$

$$\text{Ans} = 7.48m^2$$



5. Refer text book pg: 217



Soln:

given:

$$d = 50 \text{ cm}$$

$$r = \frac{50}{2}$$

$$r = 25 \text{ cm}$$

$$r = 0.25 \text{ m}$$

$$h = 3.5 \text{ m}$$

$$\text{C.S.A of a cylindrical pillar} = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 0.25 \times 3.5$$

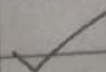
$$= 5.5 \times 1$$

$$= 5.5 \text{ m}^2$$

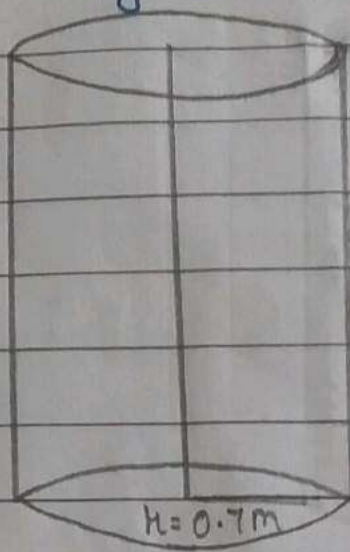
$$\text{Cost of painting C.S.A of a pillar per m}^2 = ₹ 12.50$$

$$\begin{aligned} \text{Cost of painting C.S.A of a pillar for } 5.5 \text{ m}^2 &= ₹ 12.50 \times 5.5 \\ &= ₹ 68.750 \end{aligned}$$

$$\text{Ans} = ₹ 68.75$$



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$$C.S.A = 4.4 \text{ m}^2$$

Soln:

given:

$$h = 0.7 \text{ m}$$

$$C.S.A \text{ of a right circular cylinder} = 4.4 \text{ m}^2$$
$$2\pi r h = 4.4 \text{ m}^2$$

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

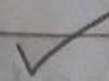
$$\Rightarrow h = \frac{4.4}{44 \times 0.1}$$

$$h = \frac{4.4}{4.4}$$

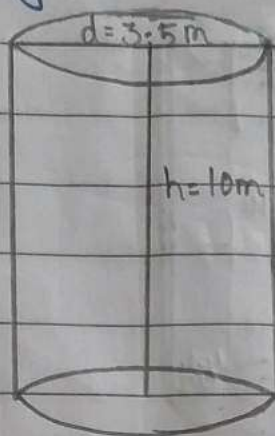
$$h = \frac{4.4}{4.4}$$

$$h = 1 \text{ m}$$

$$\text{Ans} \Rightarrow h = 1 \text{ m}$$



7. Refer text book pg: 217



Soln:

given:

$$\text{Inner diameter} = 3.5 \text{ m}$$

$$\text{Inner Radius, } r = \frac{3.5 \text{ m}}{2}$$

$$h = 10 \text{ m}$$

$$\begin{aligned} \text{i) Inner curved surface area} &= 2\pi rh \\ &= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 10 \\ &= 22 \times 5 \\ &= 110 \text{ m}^2 \end{aligned}$$

$$\text{ii) Cost of plastering per m}^2 = ₹ 40$$

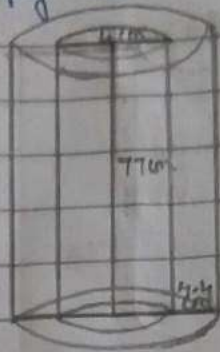
$$\begin{aligned} \text{Cost of plastering } 110 \text{ m}^2 &= ₹ 40 \times 110 \text{ m}^2 \\ &= ₹ 4400 \end{aligned}$$

Ans: i) 110 m^2

ii) ₹ 4400



3. Refer text book pg: 216



Soln:

given:

i) C.S.A of Inner cylinder :

$$d = 4 \text{ cm}$$

$$\therefore r = 2 \text{ cm}$$

$$h = 77 \text{ cm}$$

$$\begin{aligned} \text{C.S.A of a cylinder} &= 2\pi rh \\ &= 2 \times 22 \times 2 \times 77 \\ &= 968 \text{ cm}^2 \end{aligned}$$

$$\begin{array}{r} 22 \\ \times 77 \\ \hline 154 \\ 440 \\ \hline 1694 \end{array}$$

$$\begin{array}{r} 22 \\ \times 22 \\ \hline 44 \\ 440 \\ \hline 484 \end{array}$$

ii) C.S.A of outer cylinder:

$$D = 4.4 \text{ cm}$$

$$R = 2.2 \text{ cm}$$

$$h = 77 \text{ cm}$$

$$\begin{aligned} \text{C.S.A of a cylinder} &= 2\pi Rh \\ &= 2 \times 22 \times 2.2 \times 77 \\ &= 1064.8 \text{ cm}^2 \end{aligned}$$

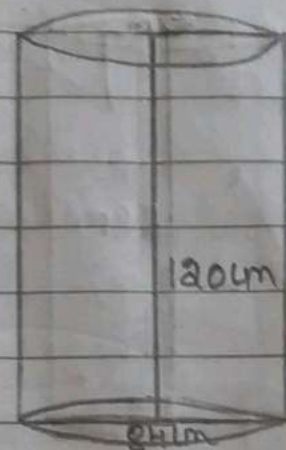
$$\begin{array}{r} 22 \\ \times 22 \\ \hline 44 \\ 440 \\ \hline 484 \end{array}$$

$$\begin{aligned} \text{iii) T.S.A of hollow cylinder} &= 2\pi (R+r)(h) \\ &= 2 \times 22 \times (2.2 + 2) \times 77 \\ &= 22 \times 4.2 \times 77 \\ &= 2038.08 \text{ cm}^2 \end{aligned}$$

$$= 2038.08 \text{ cm}^2$$

Ans: i) 968 cm^2 , ii) 1064.8 cm^2 , iii) 2038.08 cm^2

4. Refer text book pg: 217



Soln:-

given:

$$d = 84 \text{ cm}$$

$$r = 42 \text{ cm}$$

$$h = 120 \text{ cm}$$

C.S.A of a cylindrical roller = $2\pi rh$

$$= 2 \times \frac{22}{7} \times 42 \times 120$$

$$\begin{array}{r} 1440 \\ 22 \\ \hline 2880 \\ 2880 \\ \hline 31680 \end{array}$$

Area levelled in 1 revolution = 31680 cm^2

No. of rounds to complete a playground = 500

Area of a playground = 500×31680

$$= 15840000 \text{ cm}^2$$

$$= 15840000$$

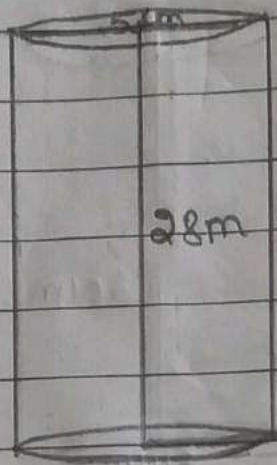
$$10000$$

$$= 1584 \text{ m}^2$$

$$\begin{array}{r} 120 \\ 12 \\ \hline 240 \\ 120 \\ \hline 1440 \\ 31680 \\ \hline 1584000 \\ 10000 \\ \hline 158400 \end{array}$$

Ans = 1584 m^2

8. Refer text book pg: 217



Soln:

$$h = 28 \text{ m}$$

$$h = 2800 \text{ cm}$$

$$d = 5 \text{ cm}$$

$$r = \frac{5}{2} \text{ cm}$$

Radiating Surface = Outer C.S.A of a cylindrical pipe

$$= 2\pi rh$$

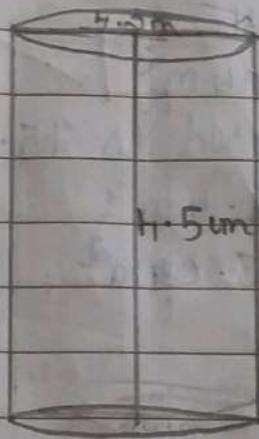
$$= 2 \times \frac{5}{2} \times \frac{400}{2}$$

$$= 1100 \times 400$$

$$= 44000 \text{ cm}^2$$

<p>Ans = 44000 cm^2 (or) 4.4 m^2</p>	✓
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9. Refer text book pg: 217



Soln:

given:

i) C.S.A of a cylindrical petrol tank:

$$d = 4.2\text{m}$$

$$r = 2.1\text{m}$$

$$h = 4.5\text{m}$$

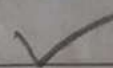
$$\text{C.S.A of a cylindrical tank} = 2\pi rh$$

$$= 2 \times \frac{4.2}{2} \times \frac{4.2}{2} \times 4.5$$

$$= 44 \times 1.35$$

$$= 59.40\text{ m}^2$$

$$= 59.4\text{ m}^2$$



① ②
① ②
135
4
54
540
59.4
①
6
10
③ ③ ③
10

$$\begin{aligned}
 \text{ii) T.S.A of a tank} &= 2\pi r(h+r) \\
 &= 2 \times \frac{44}{7} \times \frac{3}{10} (4.5 + 2.1) \\
 &= 44 \times 0.3 \times 6.6 \\
 &= 87.12 \text{ m}^2
 \end{aligned}$$

Let area of Sheet used be ' x ' m²

$$\text{Amount of Sheet wasted} = \frac{1}{12} x$$

$$\begin{aligned}
 \therefore \text{Sheet used to make the tank} &= x - \frac{x}{12} \\
 &= \frac{12x - x}{12} \\
 &= \frac{11x}{12}
 \end{aligned}$$

$$\therefore \frac{11x}{12} = 87.12 \text{ m}^2$$

$$\begin{array}{r}
 \textcircled{3} \textcircled{7} \textcircled{3} \\
 198 \\
 \textcircled{4} 44 \\
 \textcircled{1} 792 \\
 \hline
 792 \\
 \hline
 8712
 \end{array}$$

$$x = \frac{7.92}{87.12} \times 12$$

$$= 95.04 \text{ m}^2 \quad \checkmark$$

The metal sheet used is 95.04 m^2

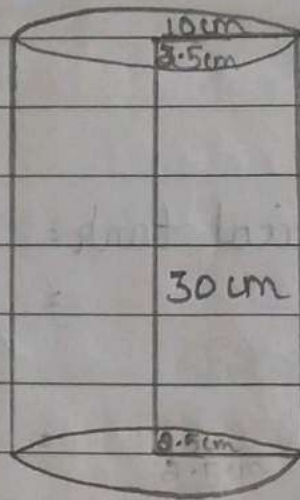
Ans \Rightarrow i) 59.4 m^2

ii) 95.04 m^2 \checkmark

$$\begin{array}{r} 11 \overline{) 8712} \\ 77 \\ \hline 101 \\ 99 \\ \hline 22 \\ 22 \\ \hline 0 \end{array}$$

$$\begin{array}{r} \textcircled{1} \\ 79 \\ \hline \textcircled{1} \textcircled{1} \\ 158 \end{array}$$

10. Refer text book pg: 217



Soln:

given:

height of lampshade = 30 cm

radius of lampshade = 10 cm

margin for folding ^{over} top and bottom = 2.5 cm

$$\begin{aligned}\text{Total height} &= 30 \text{ cm} + 2.5 \text{ cm} + 2.5 \text{ cm} \\ &= 35 \text{ cm}\end{aligned}$$

C.S.A of a cylindrical lampshade = $2\pi rh$

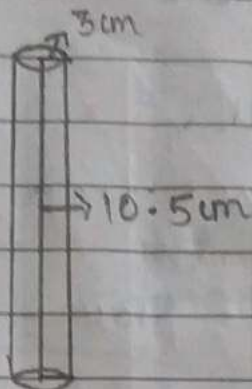
$$= 2 \times 22 \times 10 \times 35$$

$$= 440 \times 35$$

$$= 2200 \text{ cm}^2$$

Ans \Rightarrow 2200 cm² of cloth is used.

11. Refer text book pg: 217



PAGE No.

DATE:

Apple

$$\begin{array}{r}
 198 \\
 \times 7 \\
 \hline
 1386 \\
 1386 \\
 \times 7 \\
 \hline
 1584 \\
 1584 \\
 \times 7 \\
 \hline
 198
 \end{array}$$

Soln:

given:

height of pen stand = 10.5 cm

Radius of base of a pen stand = 3 cm

Area of cardboard Required for 1 pen stand = C.S.A of a cylinder +

area of base

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

$$= (2 \times 22 \times 3 \times 10.5) + (22 \times 3^2)$$

$$= (22 \times 9) + (22 \times 9)$$

$$= 198 + (198)$$

$$= \frac{1386 + 198}{7}$$

$$= \frac{1584}{7} \text{ cm}^2$$

Area of cardboard needed to make 35 pen stands = $\frac{5}{35} \times \frac{1584}{7}$

$$= 7920 \text{ cm}^2$$

Ans = 7920 cm² of cardboard is required ✓