Exercise 13.1

Surface Area and Volume

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Sum 13.1 A plastic box 1.5m long, 1.25m wide and 65cm deep is to be made. It is opened at the top. Ignoring the thickness of the plastic sheet, determine (i) The area of the sheet required for making the box.

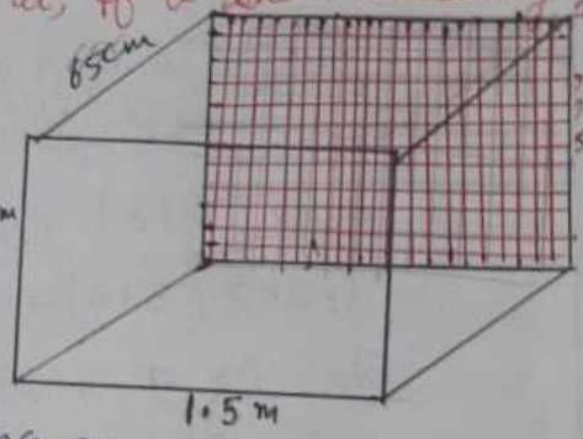
(ii) The cost of sheet for it, if a sheet measuring $1m^2$ costs Rs 20.

Sol:-

$l = 1.5m$

$b = 1.25m$

$h = 65cm = \frac{65}{100} = 0.65m$



Area of sheet = Curved surface area + $l \times b$

$= 2h(l+b) + l \times b$

$= 2 \times 0.65(1.5+1.25) + 1.5 \times 1.25$

$= 1.30 \times 2.75 + 1.875$

$= 3.575 + 1.875$

$= 5.450 m^2 = 5.45 m^2$

Cost of sheet for $1m^2$, Rs 20

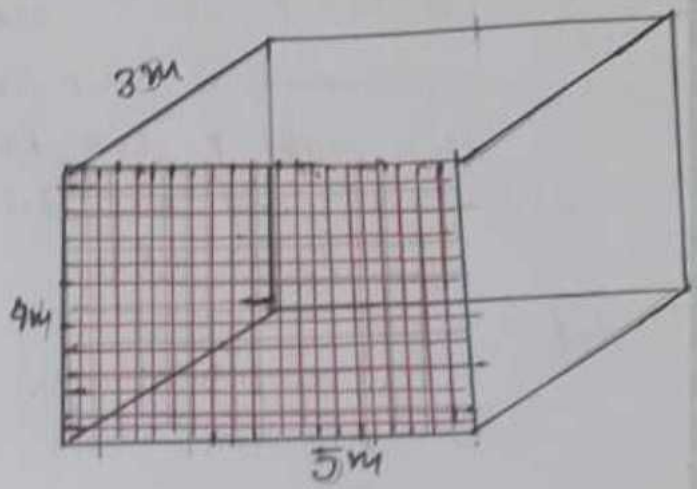
Cost of sheet for $5.45m^2$ = Rs 20×5.45

= Rs 109. Ans

2 Sum: 13.1 The length, breadth and height of a room are 5m, 4m, 3m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of Rs 7.50 per m^2.

Sol :-

Length of a room = 5 m
breadth of room = 4 m
height of room = 3 m



Area = Curved surface area + area of ceiling

$= 2h(l+b) + l \times b$

$= 2 \times 3 (5+4) + 5 \times 4$

$= 6 \times 9 + 20$

$= 54 + 20 = 74\ m^2$

Cost of white washing the walls & ceiling of $1\ m^2$ = Rs 7.50

Cost of white washing the walls & ceiling of $74\ m^2$ = Rs 7.50×74

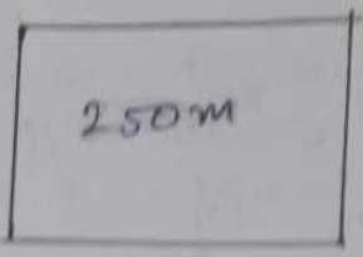
= Rs 555

Exercise 13.1

Q.1 The floor of a rectangular hall has a perimeter 250 m. If the cost of painting the four walls at the rate of Rs 10 per m^2 is Rs 15000. Find the height of the hall.

Sol: Perimeter of hall = 250 m

$2(l + b) = 250$



Area of four walls = $2(l + b)h$

$= 250h\ m^2$.

Cost of painting the four walls at $1\ m^2$ = Rs 10

Cost of painting the four walls at $250h\ m^2$ = Rs $10 \times 250h$

Rs 15000 = Rs $2500h$

$\frac{15000}{2500} = h$

$6\frac{30}{50} = h$

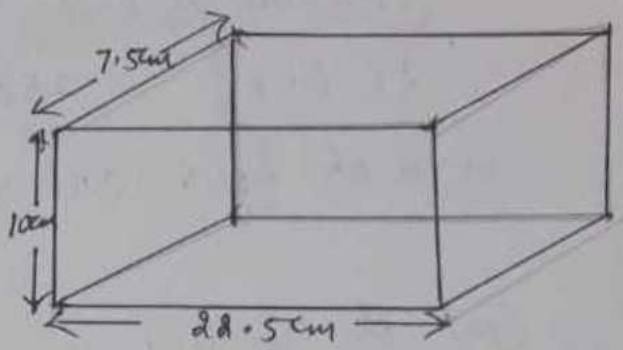
$\frac{3}{5}$

$6\text{m} = h$. Ans

4 Sum: 13.1 The paint in a certain container is sufficient to paint an area equal to $9.375 m^2$. How many bricks of dimensions 22.5cm x 10cm x 7.5cm can be painted out of this container?

Sol:

Length = 22.5cm
Breadth = 10cm
Height = 7.5cm



Total Surface area of brick $= 2[lb + bh + hl]$

$= 2[22.5 \times 10 + 10 \times 7.5 + 7.5 \times 22.5]$

$= 2[225 + 75 + 168.75]\ cm^2$

$= 2\ (468.75)\ cm^2$

$= 937.5\ cm^2 = \frac{937.5}{100 \times 100}\ m^2$

$= 0.09375\ m^2$

Required no. of bricks $= \frac{9.375\ m^2}{0.09375\ m^2}$

$= \frac{\cancel{9375}}{\cancel{1000}} \times \frac{\cancel{100000}}{\cancel{9375}}$

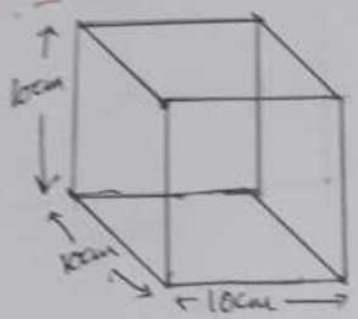
$= 100.$ Ans.

Eg:-
A Cubical box has each edge 10cm and another Cuboidal box is 12.5 cm long, 10cm wide and 8cm high.

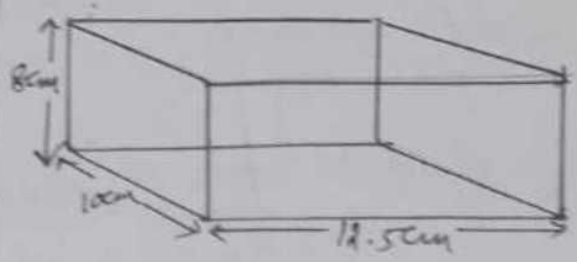
(i) which box has the greater lateral surface area and by how much?

(ii) which box has the smaller total surface area and by how much?

Sol :-



Edge of Cube = 10cm



Length of Cuboid = 12.5cm
Breadth of Cuboid = 10cm
Height of Cuboid = 8cm

Lateral Surface area of Cube = $4a^2$
$= 4 \times (10)^2$
$= 4 \times (10)^2 = 4 \times 10 \times 10 = 400 cm^2$

Lateral surface area of Cuboid = $2h(l+b)$
$= 2 \times 8 (12.5 + 10)\ cm^2$
$= 16 \times 22.5\ cm^2$
$= 360\ cm^2$

Cubical box have greater LSA by $(400 cm^2 - 360 cm^2)$
$= 40 cm^2$

Total Surface area of Cube = $6a^2$
$= 6 \times (10)^2$
$= 6 \times 10 \times 10 = 600 cm^2$

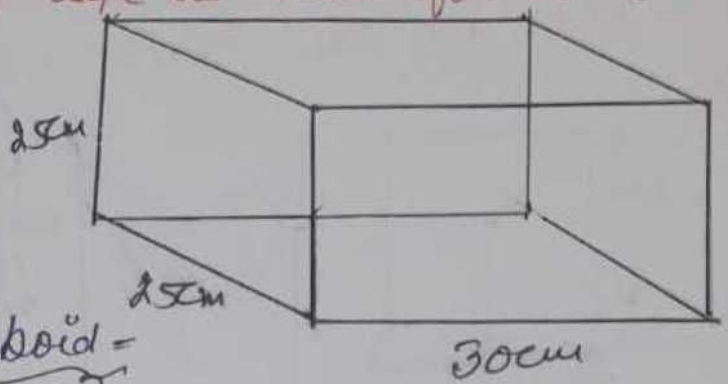
Total Surface area of Cuboid = $2[lb + bh + hl]$
$= 2[12.5 \times 10 + 10 \times 8 + 8 \times 12.5]\ cm^2$
$= 2[125 + 80 + 100]$
$= 2[305] = 610 cm^2$

Cubical box have smaller TSA by $(610 cm^2 - 600 cm^2)$
$= 10 cm^2$. Ans.

6 Exam / 13.1 : A small indoor greenhouse is made entirely of glass panes (including base) held together with tape. It is 30cm long, 25cm wide and 25cm high.

(i) What is the area of the glass?

(ii) How much of tape is needed for all the 12 edges?



Sol:-

length = 30cm

breadth = 25cm

height = 25cm

Total Surface area of Cuboid =

$= 2\{lb + bh + hl\}$

$= 2[30\times25 + 25\times25 + 25\times30]$

$= 2[750 + 625 + 750] = 2[2125]\,cm^2 = 4250\,cm^2$

Tape is needed for all 12 edges $= 4l + 4b + 4h$

Tape is needed for all 12 edges $= 4(l + b + h)$

Length of tape $= 4(30 + 25 + 25)$

$= 4(80)$

$= 320$ cm Ans

7 Sum 10.1 Shanti Sweets stall was placing an order for making Cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions 25cm x 20cm x 5cm and the smaller of dimensions 15cm x 12cm x 5cm. For all the overlaps 5% of the total surface area is required extra. If the cost of the cardboard is ₹4 for 1000 cm² find the cost of cardboard required for supplying 250 boxes of each kind.

Sol Length of bigger box = 25cm
Breadth of bigger box = 20cm
height of bigger box = 5cm

Total surface area of bigger box = $2[lb + bh + hl]$

$= 2[25 \times 20 + 20 \times 5 + 5 \times 25]\ cm^2$

$= 2[500 + 100 + 125]\ cm^2$

$= 2[725] = 1450\ cm^2$

5% for overlap $= 1450 \times \frac{5}{100} = 72.5$

Total area $\rightarrow (1450 + 72.5)\ cm^2 = 1522.5\ cm^2$

Total area of 250 boxes $= 1522.5 \times 250 = 380625\ cm^2$

Length of smaller box = 15cm, breadth of smaller box = 12cm
height of smaller box = 5cm

Total surface area of smaller box $= 2[lb + bh + hl]$

$= 2[15 \times 12 + 12 \times 5 + 5 \times 15]$

$= 2[180 + 60 + 75]\ cm^2$

$= 2(315) = 630\ cm^2$

5% for overlap $= 630 \times \frac{5}{100} = 31.5\ cm^2$

Total area of 1 small box $= (630 + 31.5)\ cm^2 = 661.5\ cm^2$

Total area of 250 small box $= 661.5 \times 250\ cm^2 = 165375\ cm^2$

Total Card board $= 380625 + 165375 = 546000\ cm^2$

7 Sum
13.1

Cost of the Cardboard for $1000 cm^2$ = Rs 4

Cost of the Cardboard for $1 cm^2$ = Rs $\frac{4}{1000}$

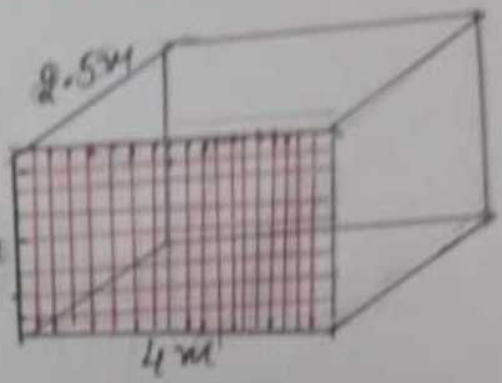
Cost of the Cardboard for $546000 cm^2$ = $\frac{4}{1000} \times 546000$

= Rs 2184 Ans.

Ex 13.1 Parveen wanted to make a temporary shelter for her car, by making a box-like structure with tarpaulin that covers all the four sides and the top of the car (with the front face as a flap which can be rolled up). Assuming that the stitching margins are very small, and therefore negligible, how much tarpaulin would be required to make the shelter of height 2.5 m, with base dimensions 4 m × 3 m?

Sol:

$l = 4\text{m}, b = 3\text{m}, h = 2.5\text{m}$



Total area = CSA + Top area

$= 2h(l+b) + l \times b$

$= 2 \times 2.5(4+3) + 4 \times 3$

$= 5 \times 7 + 12$

$= (35 + 12)\ \text{m}^2$

$= 47\ \text{m}^2$ Ans.