CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 13

Surface Areas and Volumes(Ex. 13.1)

1. A plastic box 1.5 m long, 1.25 m wide and 65 cm deep is to be made. It is to be open 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 $1m^2$ cost Rs.20.

Ans. (i) Given: Length l = 1.5 m, Breadth b = 1.25 m and Depth h = 65 cm = 0.65 m

Area of the sheet required for making the box open at the top = $2(bh+hl)+lb$

= $2(1.25\times0.65+0.65\times1.5)+1.5\times1.25$

= $2(0.8125+0.975)+1.875$

= $2\times1.7875+1.875$

= 3.575 + 1.875 = 5.45 m^2

(ii) Since, Cost of 1 m^2 sheet = Rs. 20

∴ Cost of 5.45 m^2 sheet = 20 x 5.45 = Rs. 109

2. The length, breadth and height of a room are 5 m, 4 m and 3 m 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.

Ans. Given: Length (l) = 5 m, Breadth (b) = 4 m and Height (h) = 3 m

∵ Area of the four walls = Lateral surface area = $2(bh+hl) = 2h(b+l)$

= 2 x 3 (4 + 5)

= 2 x 9 x 3 = 54 m^2

Area of ceiling = $l \times b$ = 5 x 4 = 20 m^2

∴ Total area of walls and ceiling of the room = 54 + 20 = 74 m^2

Now Cost of white washing for 1 m^2 = Rs. 7.50

∴ Cost of white washing for 74 m^2 = 74 x 7.50 = Rs. 555

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3. 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.

Ans. Given: Perimeter of rectangular wall

= $2(l+b)$ = 250 m .....(i)

Now Area of the four walls of the room

$$= \frac{\text{Total cost to paint walls of the room}}{\text{Cost to paint 1 m}^2 \text{ of the walls}}$$

$$= \frac{15000}{10} = 1500 \text{ m}^2 \text{ .....(ii)}$$

∵ Area of the four walls = Lateral surface area

$\Rightarrow 2(bh+hl) = 2h(b+l) = 1500$

$\Rightarrow 250 \times h = 1500$ [using eq. (i) and (ii)

$\Rightarrow h = \frac{1500}{250}$ = 6 m

Hence required height of the hall is 6 m.

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

Ans. Given: Length of the brick (l) = 22.5 cm,

Breadth (b) = 10 cm and Height (h) = 7.5 m

∴ Surface area of the brick

= $2(lb+bh+hl)$

= 2 (22.5 x 10 + 10 x 7.5 + 7.5 x 22.5)

= 2 (225 + 75 + 168.75)

= 937.5 cm^2

= 0.09375 m^2 [1 cm = 0.01 m]

Now No. of bricks to be painted = $\frac{\text{Total area to be painted}}{\text{Area of one brick}} = \frac{9.375}{0.09375}$ = 100

Hence 100 bricks can be painted.

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5. A cubical box has each edge 10 cm and a cuboidal box is 10 cm wide, 12.5 cm long and 8 cm high.

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

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

Ans. (i) Lateral surface area of a cube = 4 $(side)^2$ = 4 x $(10)^2$ = 400 cm^2

Lateral surface area of a cuboid = $2h(l+b)$ = 2 x 8 (12.5 + 10) = 16 x 22.5 = 360 cm^2

∴ Lateral surface area of cubical box is greater by (400 – 360) = 40 cm^2

(ii) Total surface area of a cube = 6 $(side)^2$ = 6 x $(10)^2$ = 600 cm^2

Total surface area of cuboid = $2(lb+bh+hl)$

= 2 (12.5 x 10 + 10 x 8 + 8 x 12.5)

= 2 (125 + 80 + 100)

= 2 x 305 = 610 cm^2

∴ Total surface area of cuboid box is greater by (610 – 600) = 10 cm^2

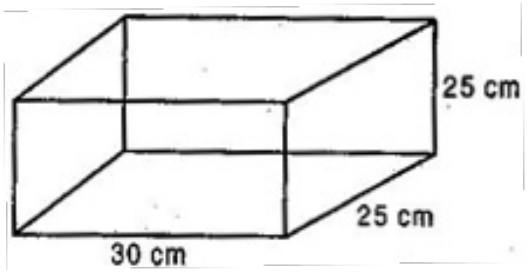
6. A small indoor green house (herbarium) is made entirely of glass panes (including base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high.

(i) What is the surface area of the glass?

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

Ans. (i) Given: Length of glass herbarium (l) = 30 cm,

Breadth (b) = 25 cm and Height (h) = 25 m



Total surface area of the glass

= $2(lb+bh+hl)$

= 2 (30 x 25 + 25 x 25 + 25 x 30)

= 2 (750 + 625 + 750)

= 2 x 2125 = 4250 cm^2

Hence 4250 cm^2 of the glass is required to make a herbarium.

(ii) Tape is used at 12 edges.

$\Rightarrow$ Tape is used at 4 lengths, 4 breadths and 4 heights.

$\Rightarrow$ Total length of the tape = $4(l+b+h)$

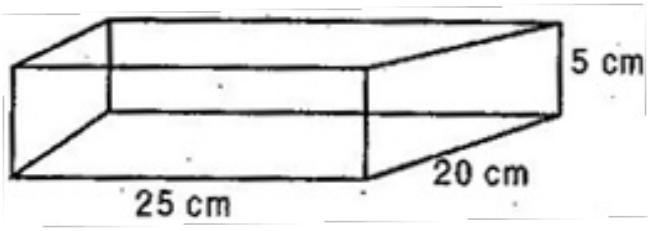
= 4 (30 + 25 + 25) = 320 cm

Hence 320 cm of the tape if needed to fix 12 edges of herbarium.

7. 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 25 cm by 20 cm by 5 cm and the smaller of dimensions 15 cm by 12 cm by 5 cm. 5% of the total surface area is required extra, for all the overlaps. If the cost of the card board is Rs. 4 for 1000 cm^2, find the cost of cardboard required for supplying 250 boxes of each kind.

Ans. Given: Length of bigger cardboard box (L) = 25 cm

Breadth (B) = 20 cm and Height (H) = 5cm



Total surface area of bigger cardboard box

= 2 (LB + BH + HL)

= 2 (25 x 20 + 20 x 5 + 5 x 25)

= 2 (500 + 100 + 125)

= 1450 cm^2

5% extra surface of total surface area is required for all the overlaps.

$\Rightarrow$ 5% of 1450 = $\frac{5}{100} \times 1450$ = 72.5 cm^2

Now, total surface area of bigger cardboard box with extra overlaps

= 1450 + 72.5 = 1522.5 cm^2

$\Rightarrow$ Total surface area with extra overlaps of 250 such boxes

= 250 x 1522.5 = 380625 cm^2

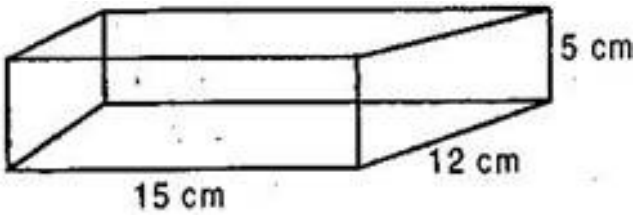
Since, Cost of the cardboard for 1000 cm^2 = Rs. 4

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

∴ Cost of the cardboard for 380625 cm^2

= Rs. $\frac{4}{1000} \times 380625$ = Rs. 1522.50

Now length of the smaller box (l) = 15 cm,



Breadth (b) = 12 cm and Height (h) = 5 cm

Total surface area of the smaller cardboard box

= $2(lb+bh+hl)$

= 2 (15 x 12 + 12 x 5 + 5 x 15)

= 2 (180 + 60 +75) = 2 x 315 = 630 cm^2

5% of extra surface of total surface area is required for all the overlaps.

∴ 5% of 630 = $\frac{5}{100} \times 630$ = 31.5 cm^2

Total surface area with extra overlaps = 630 + 31.5 = 661.5 cm^2

Now Total surface area with extra overlaps of 250 such smaller boxes

= 661.5 x 250 = 165375 cm^2

Cost of the cardboard for 1000 cm^2 = Rs. 4

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

Cost of the cardboard for 165375 cm^2 = Rs. $\frac{4}{1000} \times 165375$ = Rs. 661.50

∴ Total cost of the cardboard required for supplying 250 boxes of each kind

= Total cost of bigger boxes + Total cost of smaller boxes

= Rs. 1522.50 + Rs. 661.50

= Rs. 2184

8. 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 simensions 4 m x 3 m?

Ans. Given: Length of base (l) = 4 m, Breadth (b) = 3 m and Height (h) = 2.5 m

Tarpaulin required to make shelter

= Surface area of 4 walls + Area of roof

= $2h(l+b)+lb$

= 2 (4 + 3) 2.5 + 4 x 3

= 35 + 12 = 47 m^2

Hence 47 m^2 of the tarpaulin is required to make the shelter for the car.