Mathematics

(www.tiwariacademy.com)

(Chapter – 13) (Surface Areas and Volumes)

(Class – IX)

EXERCISE 13.1

Q.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 1 m^2 *costs Rs* 20.

Sol. Here, l = 1.5 m, b = 1.25 m, h = 65 cm = 0.65 m.

Since the box is open at the top, it has only five faces.

(i) So, surface area of the box = $lb + 2(bh + hl)$

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

$= 1.875 + 2\ (1.7875)\ m^2$

$= (1.875 + 3.575)\ m^2 = 5.45\ m^2$

Hence, 5.45 m^2 of sheet is required **Ans.**

(ii) Cost of 1 m^2 of the sheet = Rs 20

$\therefore$ cost of 5.45 m^2 of the sheet = Rs $20 \times 5.45\ m^2$ **= Rs 109 Ans.**

Q.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.

Sol. Here, l = 5 m, b = 4 m, h = 3 m

Surface area of the walls of the room and the ceiling

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

$= [2 \times 3\ (5 + 4) + 5 \times 4]\ m^2$

$= (6 \times 9 + 20)\ m^2 = 74\ m^2$

Cost of white washing = Rs 7.50 per m^2

$\therefore$ total cost of white washing the walls and the ceiling of the room

= Rs 74×7.50 **= Rs 555 Ans.**

Q.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.*

Sol. Let length, breadth and height of the hall be l, b and h respectively.

Perimeter of the floor of the hall = $2\ (l + b)$ = 250 m.

Area of the four walls of the hall = $2h\ (l + b)$ ... (i)

Also, area of the four walls of the hall = $\frac{15000}{10}\ m^2$

$= 1500\ m^2$ ... (ii)

From (i) and (ii), we have

$2h\ (l + b) = 1500$

$\Rightarrow h \times 250 = 1500$ $[\because 2(l + b) = 250]$

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

Hence, height of the hall is **6 m Ans.**

Mathematics

(www.tiwariacademy.com)

(Chapter – 13) (Surface Areas and Volumes)

(Class – IX)

Q.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* × 10 *cm* × 7.5 *cm can be painted out of this container?*

Sol. Here, l = 22.5 cm, b = 10 cm, h = 7.5 cm.

Total surface area of 1 brick = 2 ($lb + bh + hl$)

= 2(22.5 × 10 + 10 × 7.5 + 7.5 × 22.5) cm^2

= 2(225 + 75 + 168.75) cm^2 = 937.5 cm^2

$= \frac{937.5}{100 \times 100}$ m^2 = 0.09375 m^2.

$\therefore$ required number of bricks = $\frac{9.375}{0.09375}$ **= 100 Ans.**

Q.5. *A cubical box has each edge* 10 *cm and another cuboidal box is* 12.5 *cm long,* 10 *cm wide 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 by how much?

Sol. Here, a = 10 cm, l = 12.5 cm, b = 10 cm, h = 8 cm

(i) Lateral surface area of the cubical box = $4a^2$

= 4 × $(10)^2$ cm^2 = 400 cm^2

Lateral surface area of the cuboidal box = $2h$ ($l + b$)

= 2 × 8 (12.5 + 10) cm^2

= 16 × 22.5 cm^2 = 360 cm^2

Difference in the lateral surface areas of the two boxes

= (400 – 360) cm^2 = 40 cm^2.

Hence, the cubical box has greater lateral surface area by 40 cm^2. **Ans.**

(ii) Total surface area of the cubical box = $6a^2$

= 6 × $(10)^2$ cm^2 = 600 cm^2

Total surface area of the cuboidal box = 2($lb + bh + hl$)

= 2(12.5 × 10 + 10 × 8 + 8 × 12.5) cm^2

= 2(125 + 80 + 100) cm^2

= 2 × 305 cm^2 = 610 cm^2

Difference in the total surface areas of the two boxes = (610 – 600) cm^2

= 10 cm^2

Hence, the cubical box has smaller total surface area by **10 cm^2 Ans.**

Q.6. *A small indoor greenhouse (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 area of the glass?

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

Sol. Here, l = 30 cm, b = 25 cm, h = 25 cm.

(i) Total surface area of the herbarium = 2($lb + bh + hl$)

= 2(30 × 25 + 25 × 25 + 25 × 30) cm^2

= 2(750 + 625 + 750) cm^2

= 2 × 2125 cm^2 = 4250 cm^2

Hence, area of the glass **= 4250 cm^2 Ans.**

(ii) A cuboid has 12 edges. These consist of 4 lengths, 4 breadths and 4 heights.

Mathematics

(www.tiwariacademy.com)

(Chapter – 13) (Surface Areas and Volumes)

(Class – IX)

$\therefore$ length of the tape required = $4l + 4b + 4h$
= $(4 \times 30 + 4 \times 25 + 4 \times 25)$ cm
= $(120 + 100 + 100)$ cm **= 320 cm Ans.**

Q.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 × 20 cm × 5 cm and the smaller of dimesnsions 15 cm × 12 cm × 5 cm. For all the overlaps, 5% of the total surface area is required extra. If the cost of the cardboard is Rs 4 for 1000 cm^2, find the cost of cardboard required for supplying 250 boxes of each kind.*

Sol. For bigger boxes :

l = 25 cm, b = 20 cm, h = 5 cm

Total surface area of 1 bigger box = $2(lb + bh + hl)$
= $2(25 \times 20 + 20 \times 5 + 5 \times 25)$ cm^2
= $2\ (500 + 100 + 125)$ cm^2 = 1450 cm^2

Area of cardboard required for overlaps

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

Total area of cardboard needed for 1 bigger box
= $(1450 + 72.5)$ cm^2 = 1522.5 cm^2

Total area of cardboard needed for 250 bigger boxes = 1522.5×250 cm^2
= 380625 cm^2.

For smaller boxes :

l = 15 cm, b = 12 cm, h = 5 cm

Total surface area of 1 smaller box = $2\ (lb + bh + hl)$
= $2(15 \times 12 + 12 \times 5 + 5 \times 15)$ cm^2
= $2\ (180 + 60 + 75)$ cm^2 = 630 cm^2

Area of cardboard required for overlaps

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

Total area of cardboard needed for 1 smaller box = $(630 + 31.5)$ cm^2
= 661.5 cm^2

Total area of cardboard needed for 250 smaller boxes
= 661.5×250 cm^2 = 165375 cm^2

Now, total area of cardboard needed for 500 boxes (250 bigger and 250 smaller boxes) = $(380625 + 165375)$ cm^2 = 546000 cm^2

Cost of 1000 cm^2 of cardboard = Rs 4

$\therefore$ Cost of 546000 cm^2 of cardboard = Rs $\frac{4}{1000} \times 546000$ **= Rs 2184 Ans.**

Q.8. *Parveen wanted to make a temporary shelter for her car, by making a box-like structuer 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 dimesions 4 m × 3 m?*

Sol. Here, l = 4 m, b = 3 m, h = 2.5 m

The tarpaulin is needed to cover 5 faces only (excluding the floor)

Mathematics

(www.tiwariacademy.com)

(Chapter – 13) (Surface Areas and Volumes)

(Class – IX)

Surface area of the shelter = $lb + 2\,(bh + hl)$

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

$= 12\ m^2 + 2(7.5 + 10)\ m^2$

$= (12 + 35)\ m^2 = 47\ m^2$

Hence, 47 m^2 of tarpaulin is required to make the shelter **Ans.**