

NCERT Solutions for Class 9 Maths Chapter 11 Surface Areas and Volumes Ex 11.1

Question 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 costs Rs 20

Solution.

- (i) Box is to be open at top

Area of sheet required = $2lh + 2bh + lb$

$$= [2 \times 1.5 \times 0.65 + 2 \times 1.25 \times 0.65 + 1.5 \times 1.25] \text{ m}^2$$

$$= (1.95 + 1.625 + 1.875) \text{ m}^2 = 5.45 \text{ m}^2$$

- (ii) Cost of sheet per m^2 area = Rs 20

Cost of sheet of 5.45 m^2 area = Rs (5.45×20)

$$= \text{Rs } 109$$

Question 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

Solution.

It can be observed that four walls and the ceiling of the room are to be whitewashed

The floor of the room is not to be white-washed

Area to be white-washed = Area of walls + Area of ceiling of room

$$= 2lh + 2bh + lb$$

$$= [2 \times 5 \times 3 + 2 \times 4 \times 3 + 5 \times 4] \text{ m}^2$$

$$= (30 + 24 + 20) \text{ m}^2$$

$$= 74 \text{ m}^2$$

Cost of white-washing per m^2 area = Rs 7.50

Cost of white-washing 74 m^2 area = Rs (74×7.50)

$$= \text{Rs } 555$$

Question 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.

[Hint: Area of the four walls = Lateral surface area]

Solution.

Let length, breadth, and height of the rectangular hall be l m, b m, and h m respectively

$$\text{Area of four walls} = 2lh + 2bh = 2(l + b) h$$

$$\text{Perimeter of the floor of hall} = 2(l + b)$$

$$= 250 \text{ m}$$

$$\text{Area of four walls} = 2(l + b) h$$

$$= 250h \text{ m}^2$$

$$\text{Cost of painting per } \text{m}^2 \text{ area} = \text{Rs } 10$$

$$\text{Cost of painting } 250h \text{ m}^2 \text{ area} = \text{Rs } (250h \times 10)$$

$$= \text{Rs } 2500h$$

However, it is given that the cost of painting the walls is Rs 15000

$$15000 = 2500h$$

$$h = 6$$

Therefore, the height of the hall is 6 m

Question 4.

The paint in a certain container is sufficient to paint an area equal to 9.375 m^2
How many bricks of dimensions $22.5 \text{ cm} \times 10 \text{ cm} \times 7.5 \text{ cm}$ can be painted out of this container?

Solution.

Total surface area of one brick = $2(lb + bh + lh)$

$$= [2(22.5 \times 10 + 10 \times 7.5 + 22.5 \times 7.5)] \text{ cm}^2$$

$$= 2(225 + 75 + 168.75) \text{ cm}^2$$

$$= (2 \times 468.75) \text{ cm}^2$$

$$= 937.5 \text{ cm}^2$$

Let n bricks can be painted out by the paint of the container

$$\text{Area of } n \text{ bricks} = (n \times 937.5) \text{ cm}^2$$

$$= 937.5n \text{ cm}^2$$

$$\text{Area that can be painted by the paint of the container} = 9.375 \text{ m}^2$$

$$= 93750 \text{ cm}^2$$

$$93750 = 937.5n$$

$$n = 100$$

Therefore, 100 bricks can be painted out by the paint of the container

Question 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?

Solution.

(i) Edge of cube = 10 cm

Length (l) of box = 12.5 cm

Breadth (b) of box = 10 cm

Height (h) of box = 8 cm

$$\text{Lateral surface area (Cubical box)} = 4(\text{edge})^2$$

$$= 4(10 \text{ cm})^2$$

$$= 400 \text{ cm}^2$$

Lateral surface area (Cuboidal box) = $2[lh + bh]$

$$= [2(12.5 \times 8 + 10 \times 8)] \text{ cm}^2$$

$$= (2 \times 180) \text{ cm}^2$$

$$= 360 \text{ cm}^2$$

Clearly, the lateral surface area of the cubical box is greater than the lateral surface area of the cuboidal box

$$\text{Lateral surface area of cubical box} - \text{Lateral surface area of cuboidal box} = 400 \text{ cm}^2 - 360 \text{ cm}^2 = 40 \text{ cm}^2$$

Therefore, the lateral surface area of the cubical box is greater than the lateral surface area of the cuboidal box by 40 cm^2

$$(ii) \text{ Total surface area of cubical box} = 6(\text{edge})^2$$

$$= 6(10 \text{ cm})^2$$

$$= 600 \text{ cm}^2$$

$$\text{Total surface area of cuboidal box} = 2[lh + bh + lb]$$

$$= [2(12.5 \times 8 + 10 \times 8 + 12.5 \times 100)] \text{ cm}^2$$

$$= 610 \text{ cm}^2$$

Clearly, the total surface area of the cubical box is smaller than that of the cuboidal box

$$\text{Total surface area of cuboidal box} - \text{Total surface area of cubical box} = 610 \text{ cm}^2 - 600 \text{ cm}^2$$

$$= 10 \text{ cm}^2$$

Therefore, the total surface area of the cubical box is smaller than that of the cuboidal box by 10 cm^2

Question 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?

Solution.

(i) Length (l) of green house = 30 cm

Breadth (b) of green house = 25 cm

Height (h) of green house = 25 cm

Total surface area of green house

$$= 2[lb + lh + bh]$$

$$= [2(30 \times 25 + 30 \times 25 + 25 \times 25)] \text{ cm}^2$$

$$= [2(750 + 750 + 625)] \text{ cm}^2$$

$$= (2 \times 2125) \text{ cm}^2$$

$$= 4250 \text{ cm}^2$$

Therefore, the area of glass is 4250 cm^2

(ii) It can be observed that tape is required alongside AB, BC, CD, DA, EF, FG, GH, HE, AH, BE, DG, and CF

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

$$= [4(30 + 25 + 25)] \text{ cm}$$

$$= 320 \text{ cm}$$

Therefore, 320 cm tape is required for all the 12 edges

Question 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 $25 \text{ cm} \times 20 \text{ cm} \times 5 \text{ cm}$ and the smaller of dimensions $15 \text{ cm} \times 12 \text{ cm} \times 5 \text{ cm}$ 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

Solution.

Length (l) of bigger box = 25 cm

Breadth (b₁) of bigger box = 20 cm

Height (h₁) of bigger box = 5 cm

Total surface area of bigger box = $2(lb + lh + bh)$

$$= [2(25 \times 20 + 25 \times 5 + 20 \times 5)] \text{ cm}^2$$

$$= [2(500 + 125 + 100)] \text{ cm}^2$$

$$= 1450 \text{ cm}^2$$

$$\text{Extra area required for overlapping} = \left(\frac{1450 \times 5}{100}\right) \text{ cm}^2$$

$$= 72.5 \text{ cm}^2$$

While considering all overlaps, total surface area of 1 bigger box = $(1450 + 72.5) \text{ cm}^2$

$$= 1522.5 \text{ cm}^2$$

Area of cardboard sheet required for 250 such bigger boxes = $(1522.5 \times 250) \text{ cm}^2$

$$= 380625 \text{ cm}^2$$

Similarly, total surface area of smaller box

$$= [2(15 \times 12 + 15 \times 5 + 12 \times 5)] \text{ cm}^2$$

$$= [2(180 + 75 + 60)] \text{ cm}^2$$

$$= (2 \times 315) \text{ cm}^2$$

$$= 630 \text{ cm}^2$$

Therefore, extra area required for overlapping

$$= \left(\frac{630 \times 5}{100}\right) \text{ cm}^2$$

$$= 31.5 \text{ cm}^2$$

Total surface area of 1 smaller box while considering all overlaps = $(630 + 31.5) \text{ cm}^2$

$$= 661.5 \text{ cm}^2$$

Area of cardboard sheet required for 250 smaller boxes = $(250 \times 661.5) \text{ cm}^2$

$$= 165375 \text{ cm}^2$$

Total cardboard sheet required

$$= (380625 + 165375) \text{ cm}^2$$

$$= 546000 \text{ cm}^2$$

Cost of 1000 cm^2 cardboard sheet = Rs 4

Cost of 546000 cm^2 cardboard sheet

$$= \text{Rs } \left(\frac{546000 \times 4}{1000} \right)$$

$$= \text{Rs } 2184$$

Therefore, the cost of cardboard sheet required for 250 such boxes of each kind will be Rs 2184

Question 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 dimensions 4 m $\times$ 3 m?

Solution.

Length (l) of shelter = 4 m

Breadth (b) of shelter = 3 m

Height (h) of shelter = 2.5 m

Tarpaulin will be required for the top and four wall sides of the shelter

Area of Tarpaulin required = $2(lh + bh) + lb$

$$= [2(4 \times 2.5 + 3 \times 2.5) + 4 \times 3] \text{ m}^2$$

$$= [2(10 + 7.5) + 12] \text{ m}^2$$

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

Therefore, 47 m^2 Tarpaulin will be required