SpeedLabs

MATHS

CBSE 9th

TEEVRA EDUTECH PVT. LTD.

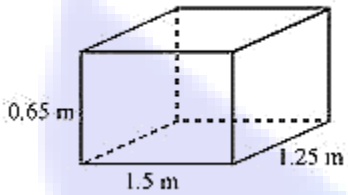
SURFACE AREAS AND VOLUMES
Exercise- 13.1

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.

Ans -



It is given that, length (l) of box = 1.5 m

Breadth (b) of box = 1.25 m

Depth (h) of box = 0.65 m

(i) Box is to be open at top.

Area of sheet required

$= 2lh + 2bh + lb$

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

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

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

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

= Rs 109

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.

Ans - It is given that

Length (l) of room = 5 m

Breadth (b) of room = 4 m

Height (h) of room = 3 m

It can be observed that four walls and the ceiling of the room are to be white-washed. The floor of the room is not to be white-washed.

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

$= 2lh + 2bh + lb$

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

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

$= 74\ m^2$

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

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

= Rs 555

Q.3 The floor of a rectangular hall has a perimeter 250 m. If the cost of panting 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.]

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

Area of four walls $= 2lh + 2bh$

$= 2(l + b)\ h$

Perimeter of the floor of hall $= 2(l + b)$

= 250 m

$\therefore$ Area of four walls $= 2(l + b)\ h = 250h\ m^2$

Cost of painting per m^2 area = Rs 10

Cost of painting 250h m^2 area = Rs $(250h \times 10)$ = Rs 2500h

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

$\therefore 15000 = 2500h$

$h = 6$

Therefore, the height of the hall is 6 m.

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?

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

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

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

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

$= 937.5\ cm^2$

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

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

Area that can be painted by the paint of the container = 9.375 m2 = 93750 cm^2

$\therefore 93750 = 937.5n$

$n = 100$

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

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?

Ans - **(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

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

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

$= 400\text{ cm}^2$

Lateral surface area of 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

Lateral surface area of cubical box − 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) Total surface area of cubical box $= 6(\text{edge})^2 = 6(10\text{ cm})^2 = 600\text{ cm}^2$

Total surface area of cuboidal box

$= 2[lh + bh + lb]$

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

$= 610\text{ cm}^2$

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

Total surface area of cuboidal box − 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.

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?

Ans - 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

$= 2[lb + lh + bh]$

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

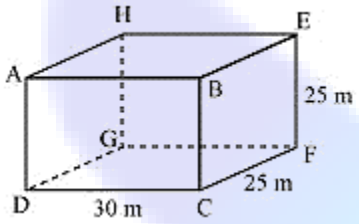
$= [2(750 + 750 + 625)]\ cm^2$

$= (2 \times 2125)\ cm2$

$= 4250\ cm^2$

Therefore, the area of glass is $4250\ cm^2$.

(ii)



It can be observed that tape is required along side 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)] cm

= 320 cm

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

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 dimensions 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.

Ans - Length (l1) 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)

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

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

$= 1450\ cm^2$

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

$= 72.5\ cm^2$

While considering all overlaps, total surface area of 1 bigger box

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

Area of cardboard sheet required for 250 such bigger boxes

$= (1522.5 \times 250)\ cm^2 = 380625\ cm^2$

Similarly, total surface area of smaller box $= [2(15 \times 12 + 15 \times 5 + 12 \times 5]\ cm^2$

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

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

$= 630\ cm^2$

Therefore, extra area required for overlapping $\left(\frac{630 \times 5}{100}\right) cm^2 = 31.5\ cm^2$

Total surface area of 1 smaller box while considering all overlaps

$= (630 + 31.5)\ cm^2 = 661.5\ cm^2$

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

$= 165375\ cm^2$

Total cardboard sheet required $= (380625 + 165375)\ cm^2$

$= 546000\ cm^2$

Cost of 1000 cm2 cardboard sheet = Rs 4

Cost of 546000 cm2 cardboard sheet $= \left(\frac{546000 \times 4}{1000}\right) =$ Rs 2184

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

Q.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 × 3 m?

Ans - 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 $= 2(lh + bh) + l\,b$

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

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

$= 47\ m^2$

Therefore, 47 m^2 tarpaulin will be required.