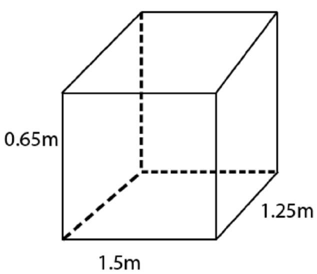
Exercise 13.1 Page No: 213

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.

Solution:



Given: length (l) of box = 1.5m
Breadth (b) of box = 1.25 m
Depth (h) of box = 0.65m

(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.

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 ceiling at the rate of Rs 7.50 per m^2 .
Solution:
Length (l) of room = 5m
Breadth (b) of room = 4m
Height (h) of room = 3m
It can be observed that four walls and the ceiling of the room are to be white washed.
Total area to be white washed = Area of walls + Area of ceiling of room
= 2lh + 2bh + lb
$= [2 \times 5 \times 3 + 2 \times 4 \times 3 + 5 \times 4]$

= (30 + 24 + 20)
= 74
Area = 74 m^2
Also,
Cost of white wash per m^2 area = Rs.7.50 (Given)
Cost of white washing 74 m^2 area = Rs.(74 × 7.50)
= Rs. 555

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, b, and h respectively.
Area of four walls = 2lh + 2 bh
= 2 (l + b) h
Perimeter of the floor of hall = 2(l + b)
= 250 m
Area of four walls = 2(l + b) h = 250h m^2
Cost of painting per square meter area = Rs.10
Cost of painting 250h square meter area = Rs (250 h x 10) = Rs.2500h
However, it is given that the cost of paining the walls is Rs. 15000.
15000 = 2500h
Or h = 6
Therefore, the height of the hall is 6 m.

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?

Solution:

Total surface area of one brick = 2(lb + bh +lb)
= [2(22.5 × 10 + 10 × 7.5 + 22.5 × 7.5)] cm^2
= 2(225 + 75 + 168.75) cm^2
= (2 × 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 × 937.5) cm^2 = 937.5n cm^2
As per given instructions, area that can be painted by the paint of the container = 9.375 m^2 = 93750 cm^2
So we have, 93750 = 937.5n
n = 100
Therefore, 100 bricks can be painted out by the paint of the container.

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:

From the question statement, we have
Edge of a cube = 10 cm
Length, l = 12.5 cm
Breadth, b = 10cm
Height, h = 8 cm
(i) Find the lateral surface area for both the figures
Lateral surface area of cubical box = 4 $(\text{edge})^2$
$= 4(10)^2$
$= 400\ cm^2$ …(1)

Lateral surface area of cubodal box = 2[lh + bh]
$= [2(12.5 \times 8 + 10 \times 8)]$
$= (2 \times 180) = 360$
Therefore, Lateral surface area of cubodal box is $360\ cm^2$. …(2)

From (1) and (2), lateral surface area of the cubical box is more than the lateral surface area of the cubodial box. The difference between both the lateral surfaces is, $40\ cm^2$.
(Lateral surface area of cubical box - Lateral surface area of cubodial box$=400cm^2 – 360cm^2 = 40\ cm^2$)
(ii) Find the total surface area for both the figures
The total surface area of the cubical box $= 6\ (\text{edge})^2 = 6\ (10\ cm)^2 = 600\ cm^2$ …(3)

Total surface area of cuboidal box
$= 2[lh + bh + lb]$
$= [2(12.5 \times 8 + 10 \times 8 + 12.5 \times 100]$
$= 610$
This implies, Total surface area of cuboidal box is $610\ cm^2$ ..(4)

From (3) and (4), the total surface area of the cubical box is smaller than that of the cuboidal box. And their difference is $10cm^2$.

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

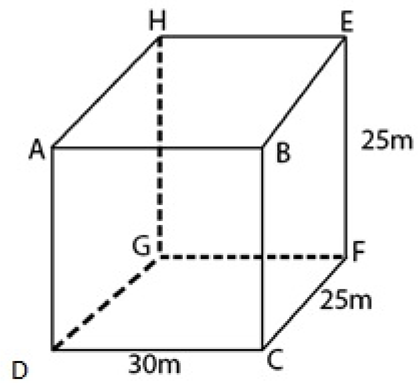
6. A small indoor greenhouse (herbarium) is made entirely of glass panes (including base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high.
(i) What is the area of the glass?
(ii) How much of tape is needed for all the 12 edges?

Solution:

Length of greenhouse, say l = 30cm
Breadth of greenhouse, say b = 25 cm
Height of greenhouse, say h = 25 cm

(i) Total surface area of greenhouse = Area of the glass = 2[lb + lh + bh]
= [2(30 × 25 + 30 × 25 + 25 × 25)]
= [2(750 + 750 + 625)]
= (2 × 2125) = 4250
Total surface area of the glass is 4250 cm^2

(ii)



From figure, tape is required along sides 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)] (after substituting the values)
= 320
Therefore, 320 cm tape is required for all the 12 edges.

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 × 20cm × 5cm and the smaller of dimension 15cm × 12cm × 5cm. 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:
Let l, b and h be the length, breadth and height of the box.
Bigger Box:
l = 25cm
b = 20 cm
h = 5 cm
Total surface area of bigger box = 2(lb + lh + bh)
= [2(25 × 20 + 25 × 5 + 20 × 5)]
= [2(500 + 125 + 100)]
= 1450 cm^2

Extra area required for overlapping 1450 x 5/100 cm2
= 72.5 cm^2
While considering all over laps, total surface area of bigger box
= (1450 + 72.5)cm^2 = 1522.5 cm^2

Area of cardboard sheet required for 250 such bigger boxes
= (1522.5 × 250) cm^2 = 380625 cm^2

Smaller Box:
Similarly, total surface area of smaller box = [2(15 × 12 + 15 × 5 + 12 × 5] cm^2
= [2(180 + 75 + 60)] cm^2
= (2 × 315) cm^2
= 630 cm^2
Therefore, extra area required for overlapping 630 x 5/100 cm2 = 31.5 cm2
Total surface area of 1 smaller box while considering all overlaps
= (630 + 31.5) cm2 = 661.5 cm^2
Area of cardboard sheet required for 250 smaller boxes = (250 × 661.5) cm^2 = 165375 cm^2

In Short:

Box	Dimensions (in cm)	Total surface area (in cm^2)	Extra area required for overlapping (in cm^2)	Total surface area for all overlaps (in cm^2)	Area for 250 such boxes (in cm^2)
Bigger Box	l = 25 b = 20 c = 5	1450	1450 x 5/100 = 72.5	(1450 + 72.5) = 1522.5	(1522.5 × 250) = 380625
Smaller Box	l = 15 b = 12 h =5	630	630 x 5/100 = 31.5	(630 + 31.5) = 661.5	(250 × 661.5) = 165375

Now, Total cardboard sheet required = (380625 + 165375) cm^2
= 546000 cm^2
Given: Cost of 1000 cm^2 cardboard sheet = Rs.4

Therefore, Cost of 546000 cm^2 cardboard sheet = Rs. (546000 x 4)/1000 = Rs. 2184

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

8. Praveen 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 2.5m, with base dimensions 4m × 3m?

Solution:
Let l, b and h be the length, breadth and height of the shelter.
Given:
l = 4m
b = 3m
h = 2.5m
Tarpaulin will be required for the top and four wall sides of the shelter.
Using formula, Area of tarpaulin required = 2(lh + bh)+lb
Put the values of l, b and h, we get
$= [2(4 \times 2.5 + 3 \times 2.5) + 4 \times 3]\ m^2$
$= [2(10 + 7.5) + 12] m^2$
$= 47\ m^2$
Therefore, 47 m^2 tarpaulin will be required