# Surface Area and Volume exercise 1

**Question 1**
A plastic box 1.5 m long, 1.25 m wide and 65 cm deep are to be made. It is opened 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:**
Length of open plastic box =*l*=1.5 m
Breadth of open plastic box =b=1.25 m
Height of open plastic box =h=65 cm
Converting into meter
=65/100= 0.65 m

The area of the sheet required for making the open plastic box =lb+2bh+2hl
(Because it is open from the top)
$=(1.5)(1.25)+2(1.25)(0.65)+2(0.65)(1.5)=1.875+1.625+1.95=5.45\ m^2$

Cost of one sheet of 1 $m^2$ = Rs 20
Cost of 5.45 $m^2$ =20 X 5.45=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:**
**The room dimension are given below**
Length (l) of room = 5 m
Breadth (b) of room = 4 m
Height (h) of room = 3 m
Imp point:
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
$= [2 \times 5 \times 3 + 2 \times 4 \times 3 + 5 \times 4]\ m^2$
$= (30 + 24 + 20)\ m^2$
$= 74\ m^2$
Now Cost of white-washing per $m^2$ area = Rs 7.50

So Cost of white-washing 74 $m^2$ area = Rs (74 × 7.50)
= 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 m2 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 rectangular hall be L ,B and H respectively.
Area of four walls = 2LH + 2BH = 2(L + B) H
Perimeter of floor of hall = 2(L+ B ) = 250 m
So Area of four walls = 2(L + B) h = 250H $m^2$
Now Cost of painting 1 $m^2$area = Rs 10
Cost of painting 250H $m^2$ area = Rs (250H X 10) = Rs 2500H
Now
It is given that the cost of paining the walls is Rs 15000.
So
15000 = 2500H
H = 6
Thus, the height of hall is 6 m.

**Question 4**
The paint in a certain container is sufficient to paint an area equal to 9.375 m2. How many bricks of dimensions 22.5 cm × 10 cm × 7.5 cm can be painted out of this container?
**Solution:**
We know from question Paint in a container can paint area =9.375 $m^2$
Converting into $cm^2$ as all other dimension are given in that
=(9.375×100×100) $cm^2$=93750 $cm^2$
Now Dimensions of a brick is given as
22.5 cm × 10 cm × 7.5 cm

Surface Area of a brick can be calculated as (Brick is a cuboid)
=2(lb+bh+hl)=2((22.5)(10)+(10)(7.5)+(7.5)(22.5))
=2(225+75+168.75)=2(468.75)=937.5 $cm^2$
Now Number of bricks which can be painted=(Total area which can be painted)/(Surface area of a brick)
= 93750/937.5 =100

**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)

**Dimension of Cube**

Edge of cube (a) = 10 cm

**Dimension of Cuboidal**

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 is given by $4(a)^2$

$= 4(10\ cm)^2$

$= 400\ cm^2$

Lateral surface area of cuboidal box is given by $2[lh + bh]$

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

$= (2 \times 180)\ cm^2$

$= 360\ cm^2$

It is apparent from the data, 400 > 360

The difference =Lateral surface area of cubical box − Lateral surface area of cuboidal box = $400\ cm^2$ − 360 cm2 = $40\ cm^2$

So Lateral surface area of cubical box is greater than Lateral surface area of cuboidal box by $40\ cm^2$

(ii) Total surface area of cubical box = $6(a)^2 = 6(10\ cm)^2 = 600\ cm^2$

Total surface area of cuboidal box

$= 2[lh + bh + lb]$

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

$= 610\ cm^2$

It is apparent from the data, 610 > 600

Difference=Total surface area of cuboidal box − Total surface area of cubical box = $610\ cm^2 - 600\ cm^2 = 10\ cm^2$

So Lateral surface area of cuboidal box is greater than Lateral surface area of cubical 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:**

We have

L=30 cm

B=25 cm

H=25 cm

Area of glass = $2(LB+BH+LH) = 4250\ cm^2$

Length of tape=4(L+B+H)=320 cm

**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 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 cm2, find the cost of cardboard required for supplying 250 boxes of each kind.

**Solution:**

**Bigger cardboard dimension**

$L$=25 cm,B=20 cm,H=5 cm

Surface area of bigger cardboard box =2($LB$+BH+LH)=2((25)(20)+(20)(5)+(5)(25))

=2(500+100+125)=2(725)=1450 $cm^2$

Surface Area of 250 bigger cardboard boxes =250×1450=362500 $cm^2$ (1)

**Smaller Cardboard dimensions**

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

Surface area of smaller cardboard box
=2(lb+bh+hl)=2((15)(12)+(12)(5)+(5)(15))
=2(180+60+75)=2(315)=630 $cm^2$

Surface Area of 250 smaller cardboard boxes =250×630=157500 $cm^2$ (2)

**Total surface area**

=surface area of 250 smaller and 250 bigger boxes
=362500+157500=520000 $cm^2$
Also It is given that 5 % extra of total surface area is needed for the overlaps.
Therefore,
**Total surface area needed for making boxes including overlaps**
=520000+5% of 520000
=520000+26000=546000 $cm^2$

Now lets us calculate the cost of the cardboard
Given 1000 $cm^2$ of cardboard costs Rs 4

So 1 $cm^2$ of cardboard would cost Rs 4/1000

Therefore
546000 $cm^2$ of cardboard would cost Rs (4×546000)/1000= Rs 2184

**Question 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 2.5 m, with base dimensions 4 m × 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) + l b
= [2(4 × 2.5 + 3 × 2.5) + 4 × 3] $m^2$
= [2(10 + 7.5) + 12] $m^2$
= 47 $m^2$
Therefore, 47 $m^2$ tarpaulins will be required.