RD SHARMA

Solutions

Class 9 Maths

Chapter 18

Ex *18.1*

Q1) Find the lateral surface area and total surface area of a cuboid of length 80 cm, breadth 40 cm and height 20 cm.

Solution:

Given that:

Cuboid length (l) = 80cm

Breadth (b) = 40cm

Height (h) = 20cm

We know that,

Total Surface Area = 2[lb+bh+hl]

= 2[(80)(40)+(40)(20)+(20)(80)]

= 2[3200+800+1600]

= 2[5600]

= 11200 cm^2

Lateral Surface Area = 2[l+b]h

= 2[80+40]20

= 40[120]

= 4800 cm^2

Q2) Find the lateral surface area and total surface area of a cube of edge 10 cm.

Solution:

Cube of edge (a) = 10 cm

We know that,

Cube Lateral Surface Area = 4 a^2

= 4(10*10)

= 400 cm^2

Total Surface Area = 6 a^2

= 6*10^2

= 600 cm^2

Q3) Find the ratio of the total surface area and lateral surface area of a cube.

Solution:

Total Surface Area of the Cube (TSA) = 6 a^2

Where, a = edge of the cube

And, Lateral surface area of the Cube (LSA) = 4 a^2

Where, a = edge of the cube

Hence, Ratio of TSA and LSA = $\frac{6a^2}{4a^2} = \frac{3}{2}$ is 3:2.

Q4) Mary wants to decorate her Christmas tree. She wants to place the tree on a wooden block covered with colored paper with a picture of Santa Claus on it. She must know the exact quantity of paper to buy for this purpose. If the box has length, breadth, and height as 80 cm, 40 cm and 20 cm respectively. How many square sheets of paper of side 40 cm would she require?

Solution:

Given that:

Mary wants to paste a paper on the outer surface of the wooden block. The quantity of the paper required would be equal to the surface area of the box which is of the shape of a cuboid.

The dimensions of the wooden block are:

Length (l) = 80cm

Breadth (b) = 40cm

Height (h) = 20cm

Surface Area of the wooden box = 2[lb+bh+hl]

= 2[(80*40)+(40*20)+(20*80)]

= 2[5600]

= 11200 cm^2

The Area of each sheet of the paper = 40×40 cm^2

= 1600 cm^2

Therefore, the number of sheets required = $\frac{\text{Surface area of the box}}{\text{Area of one sheet of paper}}$

$= \frac{11200}{1600}$

$= 7$

So, she would require 7 sheets.

Q5) The length, breadth, and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of whitewashing the walls of the room and the ceiling at the rate of Rs 7.50 m^2.

Solution:

Total Area to be washed = lb+2(l+b)h

Where, length (l) = 5m

breadth (b) = 4m

height (h) = 3m

Therefore, the total area to be white washed is = (5*4)+2*(5+4)*3

= 74 m^2

Now, The cost of white washing 1 m^2 is Rs. 7.50

Therefore, the cost of white washing 74 m^2 = (74*7.50)

= Rs. 555/-

Q6) Three equal cubes are placed adjacently in a row. Find the ratio of a total surface area of the new cuboid to that of the sum of the surface areas of the three cubes.

Solution:

Length of the new cuboid = 3a

Breadth of the cuboid = a

Height of the new cuboid = a

The Total surface area of the new cuboid (TSA) = $2(lb + bh + hl)$

$$(TSA)_1 = 2(3a * a + a * a + a * 3a)$$
$$(TSA)_1 = 14a^2$$

The Total Surface area of three cubes

$$(TSA)_2 = 3 * 6a^2$$
$$(TSA)_2 = 18a^2$$

$$\text{Therefore, } \frac{(TSA)_1}{(TSA)_2} = \frac{14a^2}{18a^2}$$

$$\text{Therefore, Ratio is } 7:9$$

Q7) A 4 cm cube is cut into 1 cm cubes. Calculate the total surface area of all the small cubes.

Solution:

Edge of the cube (a) = 4cm

Volume of the cube = a^3

` = 4^3

= $64cm^3$

Edge of the cube = $1cm^3$

$$\text{Therefore, Total number of small cubes} = \frac{64cm^3}{1cm^3} = 64$$

$$\text{Therefore, Total Surface area of all the cubes} = 64 * 6 * 1 = 384cm^2$$

Q8) The length of a hall is 18 m and the width 12 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height of the hall.

Solution:

Length of the hall = 18m

Width of the hall = 12m

Now given,

Area of the floor and the flat roof = sum of the areas of four walls

$$\Rightarrow 2 * lb = 2 * lh + 2 * bh$$

$$\Rightarrow lb = lh + bh$$

$\Rightarrow h = \frac{lb}{l+b} = \frac{18*12}{18+12} = \frac{216}{30} = 7.2m$

Q9) Hameed has built a cubical water tank with lid for his house, with each other edge 1.5 m long. He gets the outer surface of the tank excluding the base, covered with square tiles of side 25 cm. Find how much he would spend for the tiles if the cost of tiles is Rs 360 per dozen.

Solution:

Given that

Hameed is getting 5 outer faces of the tank covered with tiles, he would need to know the surface area of the tank, to decide on the quantity of tiles required.

Edge of the cubical tank (a) = 1.5m = 150cm

So, surface area of the tank = $5 * 150 * 150cm^2$

Area of each square tile = $\frac{\text{Surface Area of Tank}}{\text{Area of each Tile}}$

$= \frac{5\times150\times150}{25\times25}$

= 180

Cost of 1 dozen tiles, i.e., cost of 12 tiles = Rs 360

Therefore, cost of one tile = $Rs. \frac{360}{12} = Rs.30$

So, the cost of 180 tiles = $180 * 30 = Rs.5400$

Q10) Each edge of a cube is increased by 50%. Find the percentage increase in the surface area of the cube.

Solution:

Let 'a' be the edge of the cube

Therefore the surface area of the cube = $6a^2$

i.e., $S_1 = 6a^2$

We get a new edge after increasing the edge by 50%

The new edge = $a + \frac{50}{100} * a$

= $\frac{3}{2} * a$

Considering the new edge, the new surface area is = $6 * (\frac{3}{2}a)^2$

i.e., $S_2 = 6 * \frac{9}{4}a^2$

$S_2 = \frac{27}{2}a^2$

Therefore, increase in the Surface Area = $\frac{27}{2}a^2 - 6a^2$

$= \frac{15}{2}a^2$

So, increase in the surface area = $\frac{\frac{15}{2}a^2}{6a^2} * 100$

$= \frac{15}{12} * 100$

=125%

Q11) The dimensions of a rectangular box are in the ratio of 2 : 3 : 4 and the difference between the cost of covering it with a sheet of paper at the rates of Rs 8 and Rs 9.50 per m^2 is Rs 1248. Find the dimensions of the box.

Solution:

Let the ratio be 'x'

Length (l) = 2x

Breadth (b) = 3x

Height (h) = 4x

Therefore, Total Surface area = 2[lb+bh+hl]

$= 2(6x^2 + 12x^2 + 8x^2)$

$= 52x^2 m^2$

When the cost is at Rs.8 per m^2

Therefore, the total cost of $52x^2$ = $8 * 52x^2$

=Rs. $416x^2$

Taking the cost at Rs. 9.5 per m^2,

Total cost of $52x^2 m^2$ = $9.5 * 52x^2$

= Rs. $494x^2$

Therefore, the Difference in cost = Rs. $494x^2$– Rs. $416x^2$

1248 = Rs. $78x^2$

$x^2 = \frac{1248}{78}$

$x^2 = 16$

x = 4

Q12) A closed iron tank 12 m long, 9 m wide and 4 m deep is to be made. Determine the cost of iron sheet used at the rate of Rs 5 per meter sheet, a sheet being 2 m wide.

Solution:

Length (l) = 12m

Breadth (b) = 9m

Height (h) = 4m

Total surface area of the tank = 2[lb+bh+hl]

= 2[12*9+9*4+12*4]

= 2[108+36+48]

= $384m^2$

The Length of the Iron sheet = $\frac{\text{Area of the Iron Sheet}}{\text{Width of the Iron Sheet}}$

= $\frac{384}{2}$

=192m.

Cost of the Iron Sheet = Length of the Iron Sheet*Cost rate

= 192*5

=Rs. 960

Q13) Ravish wanted to make a temporary shelter for his car by making a box-like structure with the tarpaulin that covers all the four sides and the top of the car (with the front face of a flap which can be rolled up). Assuming that the stitching margins are very small, and therefore negligible, how many tarpaulins would be required to make the shelter of height 2.5 m with base dimensions 4 m x 3m?

Solution:

Given That,

Shelter length = 4m

Breadth = 3m

Height = 2.5m

The tarpaulin will be required for top and four sides of the shelter.

The Area of tarpaulin required = 2h(l+b)+lb

$\Rightarrow 2 * 2.5(4 + 3) + 4 * 3$

$\Rightarrow 5(7) + 12$

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

Q14) An open box is made of wood 3 cm thick. Its external length, breadth and height are 1.48m, 1.16 m and 8.3 dm. Find the cost of painting the inner surface of Rs 50 per sq. metre.

Solution:

Given Data:

Outer Dimensions

Length = 148cm

Breadth = 116cm

Height = 83cm

Inner Dimensions

Length = 148-(2*3) = 142cm

Breadth = 116-(2*3) = 110cm

Height = 83-3 = 80

Surface Area of the Inner region = 2h(l+b)+lb

= 2*80(142+110)+142*110

= 2*80*252+142*110

= 55940cm^2

= $5.2904 m^2$

Hence, the cost of Painting the Surface Area of the Inner region= 5.2904*50

= Rs. 279.70

Q15) The cost of preparing the walls of a room 12 m long at the rate of Rs 1.35 per square meter is Rs 340.20 and the cost of matting the floor at 85 paise per square meter is Rs 91.80. Find the height of the room.

Solution:

Given that,

Length of the room = 12m

Let the height of the room be 'h'

Area of 4 walls = 2(l+b)*h

According to the question

2(l+b)*h*1.35=340.20
2(12+b0*h*1.35=340.20
(12+b)*h= $\frac{170.10}{1.35} = 126$ .....(1)

Also Area of the Floor = l*b

$\text{Therefore}, l * b * 0.85 = 91.80$

$\Rightarrow 12 * b * 0.85 = 91.80$

$\Rightarrow b = 9m$ .....(2)

Substituting b=9m in equation (1)

(12+9)*h=126 ; h = 6m

Q16) The dimensions of a room are 12.5 m by 9 m by 7 m. There are 2 doors and 4 windows in the room; each door measures 2.5 m by 1.2 m and each window 1.5 m by 1 m. Find the cost of painting the walls at Rs 3.50 per square meter.

Solution:

Given Length of the room = 12.5m

Breadth of the room = 9m

Height of the room = 7m

Therefore, total surface area of the four walls = 2(l+b)*h

= 2(12.5+9)*7

= 301 m^2

Area of 2 doors = 2 (2.5*1.2)

= 6 m^2

Area of 4 windows = 4 (1.5*1)

= 6 m^2

Area to be painted on 4 walls = 301 – (6+6)

= 301 – 12

= 289 m^2

Therefore, Cost of painting = 289*3.50

= Rs. 1011.5

Q17) The length and breadth of a hall are in the ratio 4 : 3 and its height is 5.5 meters. The cost of decorating its walls (including doors and windows) at Rs 6.60 per square meter is Rs 5082. Find the length and breadth of the room.

Solution:

Let the length be 4a and breadth be 3a

Height = 5.5m [Given]

As mentioned in the question, the cost of decorating 4 walls at the rate of Rs. 6.60 per m^2 is Rs. 5082.

Area of four walls * rate = Total cost of Painting
2(l+b)*h*6.6 = 5082
2(4a+3a)*5.5*6.6 = 5082

$$7a = \frac{5082}{2*5.5*6.6}$$

$$7a = 70$$

$$a = \frac{70}{7}$$

$$a = 10$$

Length = 4a = 4*10 = 40m

Breadth = 3a = 3*10 = 30m

Q18) A wooden bookshelf has external dimensions as follows: Height = 110 cm, Depth = 25 cm, Breadth = 85cm (See figure 18.5). The thickness of the plank is 5cm everywhere. The external faces are to be polished and the inner faces are to be painted. If the rate of polishing is 20 paise per cm^2. Find the total expenses required for polishing and painting the surface of the bookshelf.

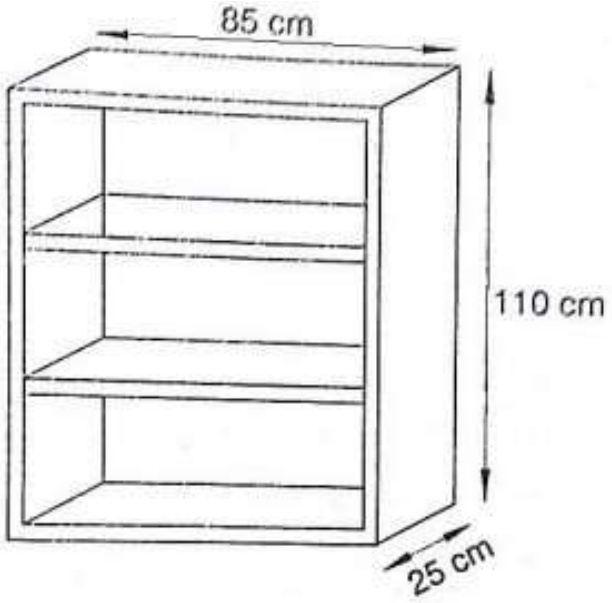

Fig. 18.5

Solution:

External length of book shelf = 85cm

Breadth = 25cm

Height = 110cm

External surface area of shelf while leaving front face of shelf

lh+2(lb+bh)
[85*110+2(85*25+25*110)]
19100 cm^2

Area of Front face = [85*110 – 75*100+2(75*5)] cm^2

= 1850+750 cm^2

= 2600 cm^2

Area to be polished = 19100+2600 cm^2

= 21700 cm^2

Cost of polishing 1cm^2 area = Rs. 0.20

Cost of polishing 21700cm^2 area = 21700*0.20

= Rs. 4340

Now, Length(l), breadth(b), height(h) of each row of book shelf is 75cm, 20cm and 30cm = $(\frac{110-20}{3})$ respectively

Area to be painted in 1 row = 2(l+h)b+lh

[2(75+30)*20+75*30)] cm^2
(4200+2250) cm^2
6450 cm^2

Area to be painted in 3 rows = 3*6450

= Rs. 19350 cm^2

Cost of painting 1cm^2 area = Rs. 0.10

Cost of painting 19350cm^2 area = 19350*0.10

= Rs.1935

Total expense required for polishing and painting the surface of the bookshelf = 4340+1935

= Rs.6275

Q19) The paint in a certain container is sufficient to paint on an area equal to 9.375 m^2, How many bricks of dimension 22.5cm x 10cm x 7.5cm can be painted out of this container?

Solution:

The paint in the container can paint the area,

A = 9.375 m^2

= 93750 cm^2 [Since 1 m = 100 cm]

Dimensions of a single brick,

Length (l) = 22.5 cm

Breadth (b) = 10 cm

Height (h) = 7.5 cm

We need to find the number of bricks that can be painted.

Surface area of a brick

A' = 2 (lb + bh + hl)

= 2 (22.5 * 10 + 10 * 7.5 + 7.5 * 22.5)

= 2 (225 + 75 + 168.75) = 937.50 cm^2

Number of bricks that can be painted = $\frac{A}{A'}$

= $\frac{93750}{937.5}$ = 100

Hence 100 bricks can be painted out of the container.