EXERCISE 13.9 PAGE NO: 236

1. A wooden bookshelf has external dimensions as follows: Height = 110cm, Depth = 25cm,

Breadth = 85cm (see fig. 13.31). 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 and the rate of painting is 10 paise per cm^2, find the total expenses required for polishing and painting the surface of the bookshelf.

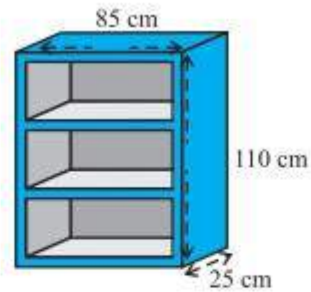

Fig. 13.31

Solution:

External dimensions of book self:

Length, l = 85cm

Breadth, b = 25 cm

Height, h = 110 cm

External surface area of the shelf while leaving out the front face of the shelf.

= lh+2(lb+bh)

= [85×110+2(85×25+25×110)] = (9350+9750) = 19100

External surface area of the shelf is 19100 cm^2

Area of front face = [85×110-75×100+2(75×5)] = 1850+750

So, the area is 2600 cm^2

Area to be polished = (19100+2600) cm^2 = 21700 cm^2.

Cost of polishing 1 cm^2 area = Rs 0.20

Cost of polishing 21700 cm^2 area Rs. (21700×0.20) = Rs 4340

Dimensions of the row of the bookshelf

Length(l) = 75 cm

Breadth (b) = 20 cm and

Height(h) = 30 cm

Area to be painted in one row= 2(l+h)b+lh = [2(75+30)× 20+75×30] = (4200+2250) = 6450

So, the area is 6450 cm^2.

Area to be painted in 3 rows = (3×6450)cm^2 = 19350 cm^2.

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

Cost of painting 19350 cm^2 area = Rs (19350 x 0.1) = Rs 1935

Total expense required for polishing and painting = Rs. (4340+1935) = Rs. 6275

Answer: The cost for polishing and painting the surface of the bookshelf is Rs. 6275.

2. The front compound wall of a house is decorated by wooden spheres of diameter 21 cm, placed on small supports as shown in fig. 13.32. Eight such spheres are used forth is the purpose and are to be painted silver. Each support is a cylinder of radius 1.5cm and height 7cm and is to be painted black. Find the cost of paint required if silver paint costs 25 paise per $cm^{2,}$ and black paint costs 5 paise per cm^2.

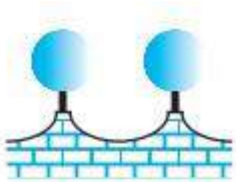

Fig. 13.32

Solution:

Diameter of the wooden sphere = 21 cm

Radius of the wooden sphere, r = diameter/ 2 = (21/2) cm = 10.5 cm

Formula: Surface area of the wooden sphere = $4\pi r^2$

= $4\times(22/7)\times(10.5)^2$ = 1386

So, the surface area is 1386 cm^3

Radius of the circular end of cylindrical support = 1.5 cm

Height of the cylindrical support = 7 cm

Curved surface area = $2\pi rh$

= 2×(22/7)×1.5×7 = 66

So, CSA is 66 cm^2

Now,

Area of the circular end of cylindrical support = πr^2

= $(22/7)\times 1.5^2$

= 7.07

Area of the circular end is 7.07 cm^2

Again,

Area to be painted silver = [8 ×(1386-7.07)] = 8×1378.93 = 11031.44

Area to be painted is 11031.44 cm^2

Cost for painting with silver colour = Rs(11031.44×0.25) =Rs 2757.86

Area to be painted black = (8×66) cm^2 = 528 cm^2

Cost for painting with black colour =Rs (528×0.05) = Rs26.40

Therefore, the total painting cost is

= Rs(2757.86 +26.40)

= Rs 2784.26

3. The diameter of a sphere is decreased by 25%. By what per cent does its curved surface area decrease?

Solution:

Let the diameter of the sphere be "d".

Radius of the sphere, $r_1 = d/2$

New radius of the sphere, say $r_2 = (d/2)\times(1-25/100) = 3d/8$

Curved surface area of the sphere, $(CSA)_1 = 4\pi r_1^2 = 4\pi\times(d/2)^2 = \pi d^2$ …(1)

Curved surface area of the sphere when the radius is decreased $(CSA)_2 = 4\pi r_2^2 = 4\pi\times(3d/8)^2 = (9/16)\pi d^2$ …(2)

From equations (1) and (2), we have

Decrease in surface area of sphere = $(CSA)_1 - (CSA)_2$

$= \pi d^2 - (9/16)\pi d^2$

$= (7/16)\pi d^2$

$$\text{Percentage decrease in surface area of sphere} = \frac{(CSA)_1 - (CSA)_2}{(CSA)_1}\times 100$$

$= (7d^2/16d^2)\times 100 = 700/16 = 43.75\%$.

Therefore, the percentage decrease in the surface area of the sphere is 43.75%.