

Exercise 13.9

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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<sup>2</sup> and the rate of painting is 10 paise per cm<sup>2</sup>, find the total expenses required for polishing and painting the surface of the bookshelf.

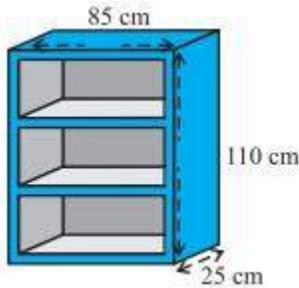


Fig. 13.31

**Solution:**

External dimensions of book self,

Length,  $l = 85\text{cm}$

Breadth,  $b = 25\text{ cm}$

Height,  $h = 110\text{ cm}$

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

$$= lh + 2(lb + bh)$$

$$= [85 \times 110 + 2(85 \times 25 + 25 \times 110)] = (9350 + 9750) = 19100$$

External surface area of shelf is  $19100\text{ cm}^2$

$$\text{Area of front face} = [85 \times 110 - 75 \times 100 + 2(75 \times 5)] = 1850 + 750$$

So, area is  $2600\text{ cm}^2$

$$\text{Area to be polished} = (19100 + 2600)\text{ cm}^2 = 21700\text{ cm}^2.$$

Cost of polishing  $1\text{ cm}^2$  area = Rs 0.20

Cost of polishing  $21700\text{ cm}^2$  area Rs.  $(21700 \times 0.20) = \text{Rs } 4340$

Dimensions of row of the book shelf

Length( $l$ ) =  $75\text{ cm}$

Breadth ( $b$ ) =  $20\text{ cm}$  and

Height( $h$ ) =  $30\text{ cm}$

$$\text{Area to be painted in one row} = 2(l+h)b + lh = [2(75+30) \times 20 + 75 \times 30] = (4200 + 2250) = 6450$$

So, area is  $6450\text{ cm}^2$ .

Area to be painted in

$$3 \text{ rows} = (3 \times 6450) \text{ cm}^2 = 19350 \text{ cm}^2.$$

Cost of painting 1 cm<sup>2</sup> area = Rs. 0.10

$$\text{Cost of painting } 19350 \text{ cm}^2 \text{ area} = \text{Rs } (19350 \times 0.1) = \text{Rs } 1935$$

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

**Answer:** The cost for polishing and painting the surface of the book shelf 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 for this purpose, and are to be painted silver. Each support is a cylinder of radius 1.5 cm and height 7 cm and is to be painted black. Find the cost of paint required if silver paint costs 25 paise per cm<sup>2</sup> and black paint costs 5 paise per cm<sup>2</sup>.**

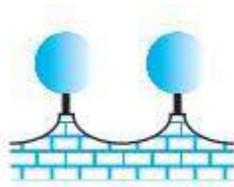


Fig. 13.32

**Solution:**

Diameter of wooden sphere = 21 cm

Radius of wooden sphere,  $r = \text{diameter} / 2 = (21/2) \text{ cm} = 10.5 \text{ cm}$

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

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

So, surface area is 1386 cm<sup>2</sup>

Radius of the circular end of cylindrical support = 1.5 cm

Height of cylindrical support = 7 cm

Curved surface area =  $2\pi rh$

$$= 2 \times (22/7) \times 1.5 \times 7 = 66$$

So, CSA is 66 cm<sup>2</sup>

Now,

Area of the circular end of cylindrical support =  $\pi r^2$

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

$$= 7.07$$

Area of the circular end is 7.07 cm<sup>2</sup>

Again,

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

Area to be painted is 11031.44 cm<sup>2</sup>

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

Area to be painted black =  $(8 \times 66) \text{ cm}^2 = 528 \text{ cm}^2$

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 percent does its curved surface area decrease?**

**Solution:**

Let the diameter of the sphere be “d”.

Radius of sphere,  $r_1 = d/2$

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

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

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

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

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

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

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

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

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

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