



# VIDYA BHAWAN, BALIKA VIDYAPEETH,

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Affiliated to CBSE up to +2 Level

Class: 9<sup>th</sup>

Subject: Mathematics

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### Surface Areas and Volumes

1 There are two cuboidal boxes as shown in the figure below. Which box requires the lesser amount of material to make?

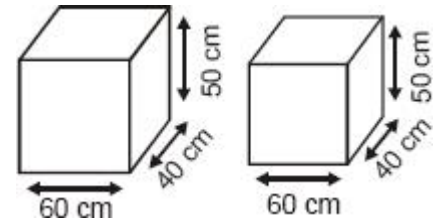
Sol. Total surface area of first box

$$\begin{aligned} &= 2(lb + bh + lh) \\ &= 2(60 \times 40 + 40 \times 50 + 60 \times 50) \text{ cm}^2 \\ &= 200(24 + 20 + 30) \text{ cm}^2 \\ &= 200 \times 74 \text{ cm}^2 = 14800 \text{ cm}^2 \end{aligned}$$

Total surface area of second box

$$\begin{aligned} &= 6 (\text{Edge})^2 = 6 \times 50 \times 50 \text{ cm}^2 \\ &= 15000 \text{ cm}^2 \end{aligned}$$

Since the total surface area of first box is less than that of the second, therefore the first box i.e., (a) requires the least amount of material to make.



2. A suitcase of measures 80 cm x 48 cm x 24 cm is to be covered with a tarpaulin cloth. How many metres of tarpaulin of width 96 cm is required to cover 100 such suitcases?

Sol. Total surface area of suitcase

$$\begin{aligned} &= 2[(80)(48) + (48)(24) + (24)(80)] \\ &= 2[3840 + 1152 + 1920] \\ &= 13824 \text{ cm}^2 \end{aligned}$$

Total surface area of 100 suitcase

$$= (13824 \times 100) \text{ cm}^2 = 1382400 \text{ cm}^2$$

Required tarpaulin = Length  $\times$  Breadth

$$1382400 \text{ cm}^2 = \text{Length} \times 96 \text{ cm}$$

$$\text{Length} = \left( \frac{1382400}{96} \right) \text{ cm} = 14400 \text{ cm} = 144 \text{ m}$$

Thus 144 m of tarpaulin is required to cover 100 suitcases.

3. Find the side of a cube whose surface area is 600 cm<sup>2</sup>.

Sol. Let a be the side of the cube having surface area 600 cm<sup>2</sup>.

$$\therefore 6a^2 = 600 \Rightarrow a^2 = 100 \Rightarrow a = 10$$

Hence, the side of the cube = 10 cm.

4. Rukhsar painted the outside of the cabinet of measure 1 m x 2m x 1.5 m. How much surface area did she cover if she painted all except the bottom of the cabinet.

Sol. Here l = 2m, b = 1m and h = 1.5 m

Area to be painted

$$\begin{aligned} &= 2bh + 2lh + lb \\ &= (2 \times 1 \times 1.5 + 2 \times 2 \times 1.5 + 2 \times 1) \text{ m}^2 \\ &= (3 + 6 + 2) \text{ m}^2 = 11 \text{ m}^2 \end{aligned}$$

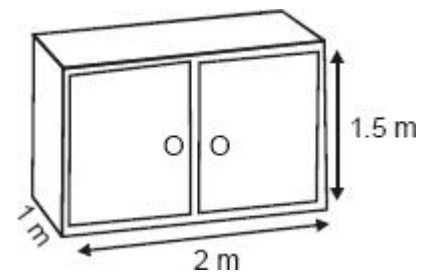
5. Deniel is painting the walls and ceiling of a cuboidal hall with length, breadth and height of 15 m, 10 m and 7 m respectively. From each can of paint 100 m<sup>2</sup> of area is painted.

How many cans of paint will she need to paint the room?

Sol. Here l = 15m, b = 10 m and h = 7 m

Area to be painted

$$= 2bh + 2lh + lb$$



$$= 2 \times 10 \times 7 + 2 \times 15 \times 7 + 15 \times 10) \text{m}^2$$

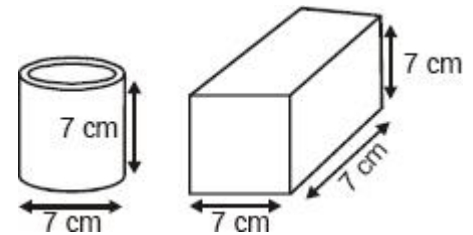
$$= (140 + 210 + 150) \text{m}^2 = 500 \text{m}^2$$

Since each can of paint covers  $100 \text{ m}^2$ , therefore number of cans required  $= \frac{500}{100} = 5$ .

6. Describe how the two figures at the right are alike and how they are different. Which box has larger lateral surface area.

Sol. Try yourself

7. A closed cylindrical tank of radius 7 m and height 3 m is made from a sheet of metal. How much sheet of metal is required?



Sol. Here,  $r = 7 \text{ m}$  and  $h = 3 \text{ m}$ .

Sheet of metal required to make a closed cylinder = Total surface area of the cylinder. =  $(2\pi rh + 2\pi r^2)$  sq. units.

$$= \left( 2 \times \frac{22}{7} \times 7 \times 3 + 2 \times \frac{22}{7} \times 7 \times 7 \right) \text{m}^2$$

$$= (132 + 308) \text{m}^2 = 440 \text{m}^2$$

8. The lateral surface area of a hollow cylinder is  $4224 \text{ cm}^2$ . It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet.

Sol. A hollow cylinder is cut along its height to form a rectangular sheet.

Area of cylinder = Area of rectangular sheet  $4224 \text{ cm}^2 = 33 \text{ cm} \times \text{Length}$

$$\text{Length} = \frac{4224 \text{ cm}^2}{33 \text{ cm}} = 128 \text{ cm}$$

Thus, the length of the rectangular sheet is 128 cm. Perimeter of the rectangular sheet

$$= 2 (\text{Length} + \text{Width})$$

$$= [2(128 + 33)] \text{ cm}$$

$$= (2 \times 161) \text{ cm}$$

$$= 322 \text{ cm}$$

9. A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of a road roller is 84 cm and length is 1 m.

Sol. In one revolution, the roller will cover an area equal to its lateral surface area. Thus, in 1 revolution, area of the road covered =  $27\pi rh$

$$= 2 \times \frac{22}{7} \times 42 \text{ cm} \times 1 \text{ m}$$

$$= 2 \times \frac{22}{7} \times \frac{42}{100} \text{ m} \times 1 \text{ m} = \frac{264}{100} \text{ m}^2$$

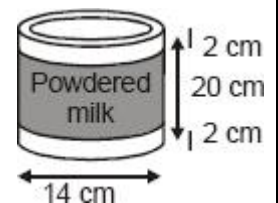
In 750 revolutions, area of the road covered

$$= \left( 750 \times \frac{264}{100} \right) \text{m}^2 = 1980 \text{m}^2$$



10. A company packages its milk powder in cylindrical container whose base has a diameter of 14 cm and height 20 cm. Company places a label around the surface of the container (as shown in the figure). if the label is placed 2 cm from top and bottom, what is the surface area of the label.

Sol. Since the company places a label around the surface of the cylindrical container of radius 7 cm and height 20 cm such that it is placed 2 cm from top and bottom.



We have to find the curved surface of a cylinder of radius 7 cm and height  $(20 \times 4) \text{ cm}$  i.e., 16 cm.

This curved surface area

$$= \left( 2 \times \frac{22}{7} \times 7 \times 16 \right) \text{cm}^2$$

$$= 704 \text{ cm}^2$$