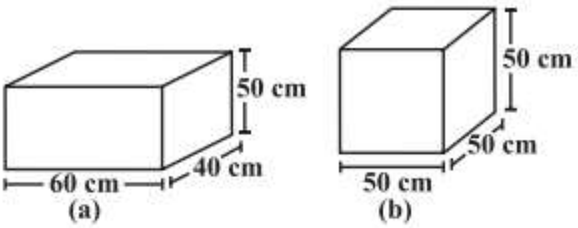
Mensuration: Exercise 11.3

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



***Sol.* (a) Given:** Dimensions of cuboid, length (l) = 60 cm, breadth (b) = 40 cm and height (h) = 50 cm
Since, surface area of cuboidal box = 2 ($lb + bh + hl$)
$= 2\,(60 \times 40 + 40 \times 50 + 50 \times 60)\ \text{cm}^2$
$= 2\,(2400 + 2000 + 3000)\ \text{cm}^2$
$= 14800\ \text{cm}^2$

(b) Given: Dimensions of cube, length (l) = 50 cm
Since, surface area of cube box = 6 $(side)^2$
$= 6\,(50)^2\ \text{cm}^2$
$= 15000\ \text{cm}^2$

Since, surface area of cuboidal box (a) is less than cube box (b).
Thus, cuboidal box (a) requires lesser amount of material than cube box (b) to make.

Q.2 A suitcase with measures 80 cm × 48 cm × 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. Given: Dimension of suitcase, length (l) = 80 cm, breadth (b) = 48 cm and height (h) = 24 cm
Since, surface area of suitcase = 2 ($lb + bh + hl$)
$= 2\,(80 \times 48 + 48 \times 24 + 24 \times 80)\ \text{cm}^2$
$= 2\,(3840 + 1152 + 1920)\ \text{cm}^2$
$= 13824\ \text{cm}^2$

Since, surface area of one suitcase = $13824\ \text{cm}^2$
So, total surface area of 100 suitcases = $(13824 \times 100)\ \text{cm}^2$
$= 1382400\ \text{cm}^2$

Now, area of tarpaulin cloth will be equal to total surface area of suitcase.
So, Length x Breadth = $1382400\ \text{cm}^2$

$$\text{Length} = \frac{1382400}{96}\ \text{cm}$$
$= 14400$ cm
$= 144$ m

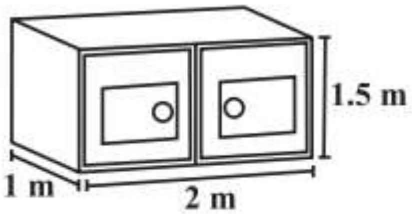
Thus, tarpaulin is required of length 144 m to cover 100 suitcases.

Q.3 Find the side of a cube whose surface area is 600 cm².

***Sol.* Given:** surface area of cube = $600\ \text{cm}^2$
Let a be the length of each side of cube.
Now, surface area of cube box = 6 $(\text{side})^2$
$600\ \text{cm}^2 = 6\,(a)^2$
$(a)^2 = 100\ \text{cm}^2$
$a = 10$ cm.

Thus, the length of side of the cube, a = 10 cm

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



***Sol.* Given:** Dimension of cabinet, length (l) = 2 m, breadth (b) = 1 m and height (h) = 1.5 m

Since, surface area of cabinet = $2h(l + b) + lb$

$= [2 \times 1.5\,(2 + 1) + 2 \times 1]\ m^2$

$= [3\,(3) + 2]\ m^2$

$= (9 + 2)\ m^2$

$= 11\ m^2$

Thus, she covered the area of $11\ m^2$ all except the bottom of the cabinet.

Q.5 Daniel 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 m² of area is painted. How many cans of paint will she need to paint the room?

***Sol.* Given:** Dimension of cuboidal hall, length (l) = 15 m, breadth (b) = 10 m and height (h) = 7 m

So, area of the hall to be painted will be = area of the wall + area of the ceiling

$= 2h(l + b) + lb$

$= [2 \times 7\,(15 + 10) + 15 \times 10]\ m^2$

$= [14\,(25) + 150]\ m^2$

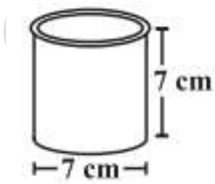
$= 500\ m^2$

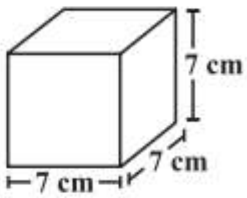
Since, area can be painted from each can = $100\ m^2$

So, no. of cans required to paint $500\ m^2 = \dfrac{500}{100} = 5$

Thus, number of can will be needed to paint the room = 5 cans

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





Sol. Since from the figure, the height of both the figures is same and both the shape of both the figures are different. One is a cylinder and the other is a cube.

So, lateral surface area of the cube = 4 (side)^2

$= 4\,(7\ cm)^2$

$= 196\ cm^2$

Lateral surface area of the cylinder = $2\pi rh$

$$= \left[2 \times \frac{22}{7} \times \frac{7}{2} \times 7\right] cm^2$$

$= 154\ cm^2$

From above calculation, lateral surface area of the cube is greater than that of the cylinder.
Thus, cube box has greater lateral surface area.

Q.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.* Given:** Dimension of tank, radius (r) = 7 m and height (h) = 3 m

Since, total surface area of cylinder = $2\pi r(r+h)$

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

$= 440\ \text{m}^2$

Thus, required metal sheet = $440\ \text{m}^2$

Q.8 The lateral surface area of a hollow cylinder is 4224 cm². It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet?

***Sol.* Given:** lateral surface area of a hollow cylinder = $4224\ \text{cm}^2$

and height (h) = 33 cm

Now, area of cylinder = area of rectangular sheet

$4224\ \text{cm}^2 = 33\ \text{cm} \times \text{length}$

So, Length = $\dfrac{4224\ \text{cm}^2}{33\ \text{cm}}$

= 128 cm

Since, perimeter of the rectangular sheet = 2 (length + width)

= [2 (128 + 33)] cm

= 322 cm

Thus, the perimeter of rectangular sheet = 322 cm.

Q.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.* Given:** Dimension of road roller, diameter of road roller = 84 cm

So, radius of road roller (r) = $\dfrac{d}{2} = \dfrac{84}{2} = 42$ cm and length = 1m

Since in 1 revolution, covered area of the road = $2\pi rh$

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

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

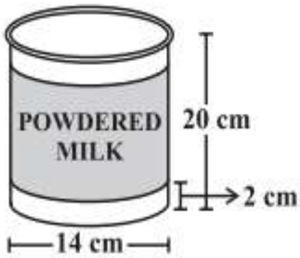
$$= \frac{264}{100}\ \text{m}^2$$

So in 750 revolutions, covered area of the road = $\left(750\times\dfrac{264}{100}\right)\text{m}^2$

$= 1980\ \text{m}^2$

Thus, the area of the road = $1980\ \text{m}^2$

Q.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 area of the label.



Sol. **Given:** Dimension of container, Base diameter (d) = 14 cm, radius r = 14/2 = 7 cm and height (h) = 20 cm

And, the height of the label = 20 cm – (2 cm + 2 cm)

= 16 cm

Since, radius of label will be equal to radius of cylindrical container.

Radius of the label (r) = $\frac{d}{2} = \frac{14}{2} = 7$ cm

Now, area of the label = $2\pi rh$

= $2 \times \frac{22}{7} \times 7 \times 16$ cm²

= 704 cm²

Thus, the area of the label = 704 cm²