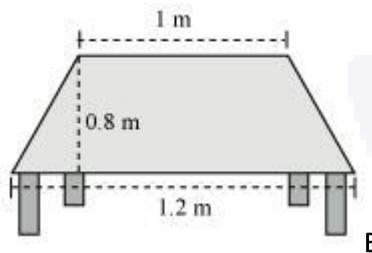


CLASS VIII: Maths  
Chapter 9: Mensuration

Questions and Solutions | Exercise 9.1 - NCERT Books

Q1. The shape of the top surface of a table is a trapezium. Find its area if its parallel sides are 1 m and 1.2 m and perpendicular distance between them is 0.8 m.



Answer :

$$\text{Area of trapezium} = \frac{1}{2} (\text{Sum of parallel sides}) \times (\text{Distances between parallel sides})$$

$$= \left[ \frac{1}{2} (1+1.2)(0.8) \right] \text{m}^2 = 0.88 \text{ m}^2$$

Q2 :

The area of a trapezium is  $34 \text{ cm}^2$  and the length of one of the parallel sides is 10 cm and its height is 4 cm. Find the length of the other parallel side.

Answer :

It is given that, area of trapezium =  $34 \text{ cm}^2$  and height = 4 cm

Let the length of one parallel side be  $a$ . We know that,

$$\text{Area of trapezium} = \frac{1}{2} (\text{Sum of parallel sides}) \times (\text{Distances between parallel sides})$$

$$34 \text{ cm}^2 = \frac{1}{2} (10 \text{ cm} + a) \times (4 \text{ cm})$$

$$34 \text{ cm} = 2(10 \text{ cm} + a)$$

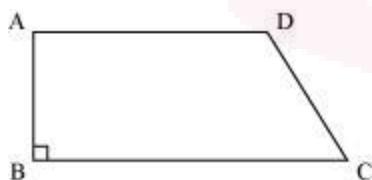
$$17 \text{ cm} = 10 \text{ cm} + a$$

$$a = 17 \text{ cm} - 10 \text{ cm} = 7 \text{ cm}$$

Thus, the length of the other parallel side is 7 cm.

**Q3 :**

Length of the fence of a trapezium shaped field ABCD is 120 m. If BC = 48 m, CD = 17 m and AD = 40 m, find the area of this field. Side AB is perpendicular to the parallel sides AD and BC.



**Answer :**

Length of the fence of trapezium ABCD = AB + BC + CD + DA

$$120 \text{ m} = AB + 48 \text{ m} + 17 \text{ m} + 40 \text{ m}$$

$$AB = 120 \text{ m} - 105 \text{ m} = 15 \text{ m}$$

$$\text{Area of the field ABCD} = \frac{1}{2} (AD + BC) \times AB$$

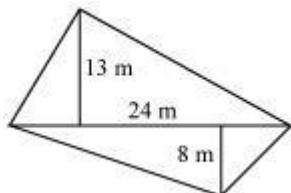
$$= \left[ \frac{1}{2} (40 + 48) \times (15) \right] \text{ m}^2$$

$$= \left( \frac{1}{2} \times 88 \times 15 \right) \text{ m}^2$$

$$= 660 \text{ m}^2$$

Q4 :

The diagonal of a quadrilateral shaped field is 24 m and the perpendiculars dropped on it from the remaining opposite vertices are 8 m and 13 m. Find the area of the field.



Answer :

It is given that,

Length of the diagonal,  $d = 24 \text{ m}$

Length of the perpendiculars,  $h_1$  and  $h_2$ , from the opposite vertices to the diagonal are  $h_1 = 8 \text{ m}$  and  $h_2 = 13 \text{ m}$

$$\text{Area of the quadrilateral} = \frac{1}{2}d(h_1 + h_2)$$

$$= \frac{1}{2}(24 \text{ m}) \times (13 \text{ m} + 8 \text{ m})$$

$$\begin{aligned} &= \frac{1}{2}(24 \text{ m})(21 \text{ m}) \\ &= 252 \text{ m}^2 \end{aligned}$$

Thus, the area of the field is  $252 \text{ m}^2$ .

Q5 :

The diagonals of a rhombus are 7.5 cm and 12 cm. Find its area.

Answer :

$$\text{Area of rhombus} = \frac{1}{2} (\text{Product of its diagonals})$$

Therefore, area of the given rhombus

$$= \frac{1}{2} \times 7.5 \text{ cm} \times 12 \text{ cm}$$

$$= 45 \text{ cm}^2$$

Q6 :

Find the area of a rhombus whose side is 6 cm and whose altitude is 4 cm. If one of its diagonals is 8 cm long, find the length of the other diagonal.

Answer :

Let the length of the other diagonal of the rhombus be  $x$ .

A rhombus is a special case of a parallelogram.

The area of a parallelogram is given by the product of its base and height.

Thus, area of the given rhombus = Base  $\times$  Height = 6 cm  $\times$  4 cm = 24 cm $^2$

$$\text{Also, area of rhombus} = \frac{1}{2} (\text{Product of its diagonals})$$

$$\Rightarrow 24 \text{ cm}^2 = \frac{1}{2} (8 \text{ cm} \times x)$$

$$\Rightarrow x = \left( \frac{24 \times 2}{8} \right) \text{ cm} = 6 \text{ cm}$$

Thus, the length of the other diagonal of the rhombus is 6 cm.

Q7 :

The floor of a building consists of 3000 tiles which are rhombus shaped and each of its diagonals are 45 cm and 30 cm in length. Find the total cost of polishing the floor, if the cost per m $^2$  is Rs 4.

Answer :

Area of rhombus =  $\frac{1}{2}$  (Product of its diagonals)

Area of each tile

$$= \left( \frac{1}{2} \times 45 \times 30 \right) \text{ cm}^2$$

$$= 675 \text{ cm}^2$$

$$\text{Area of 3000 tiles} = (675 \times 3000) \text{ cm}^2 = 2025000 \text{ cm}^2 = 202.5 \text{ m}^2$$

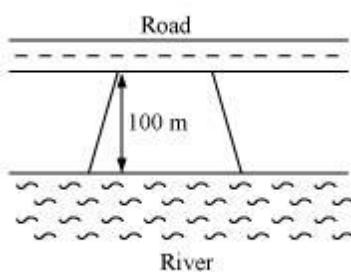
The cost of polishing is Rs 4 per  $\text{m}^2$ .

$$\text{Cost of polishing } 202.5 \text{ m}^2 \text{ area} = \text{Rs } (4 \times 202.5) = \text{Rs } 810$$

Thus, the cost of polishing the floor is Rs 810.

Q8 :

Mohan wants to buy a trapezium shaped field. Its side along the river is parallel to and twice the side along the road. If the area of this field is  $10500 \text{ m}^2$  and the perpendicular distance between the two parallel sides is 100 m, find the length of the side along the river.



Answer :

Let the length of the field along the road be  $l$  m. Hence, the length of the field along the river will be  $2l$  m.

Area of trapezium =  $\frac{1}{2}$  (Sum of parallel sides) (Distance between the parallel sides)

$$\Rightarrow 10500 \text{ m}^2 = \frac{1}{2}(l + 2l) \times (100 \text{ m})$$

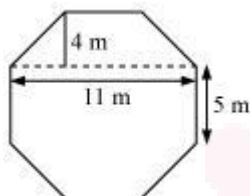
$$3l = \left( \frac{2 \times 10500}{100} \right) \text{ m} = 210 \text{ m}$$

$$l = 70 \text{ m}$$

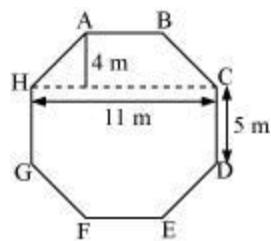
Thus, length of the field along the river =  $(2 \times 70) \text{ m} = 140 \text{ m}$

Q9 :

Top surface of a raised platform is in the shape of a regular octagon as shown in the figure. Find the area of the octagonal surface.



Answer :



Side of regular octagon = 5 cm

Area of trapezium ABCH = Area of trapezium DEFG

$$\text{Area of trapezium ABCH} = \left[ \frac{1}{2}(4)(11+5) \right] \text{ m}^2 = \left( \frac{1}{2} \times 4 \times 16 \right) \text{ m}^2 = 32 \text{ m}^2$$

Area of rectangle HGDC =  $11 \times 5 = 55 \text{ m}^2$

Area of octagon = Area of trapezium ABCH + Area of trapezium DEFG

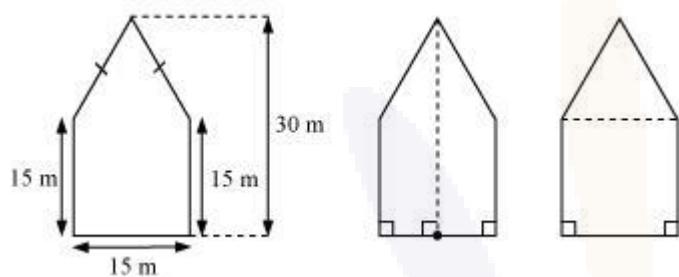
+ Area of rectangle HGDC

$$= 32 \text{ m}^2 + 32 \text{ m}^2 + 55 \text{ m}^2 = 119 \text{ m}^2$$

Q10 :

There is a pentagonal shaped park as shown in the figure.

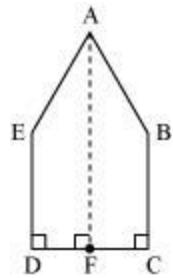
For finding its area Jyoti and Kavita divided it in two different ways.



Find the area of this park using both ways. Can you suggest some other way of finding its area

Answer :

Jyoti's way of finding area is as follows.

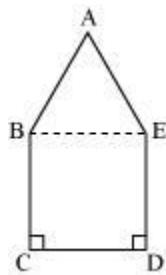


Area of pentagon = 2 (Area of trapezium ABCF)

$$= \left[ 2 \times \frac{1}{2} (15 + 30) \left( \frac{15}{2} \right) \right] \text{m}^2$$

$$= 337.5 \text{ m}^2$$

Kavita's way of finding area is as follows.

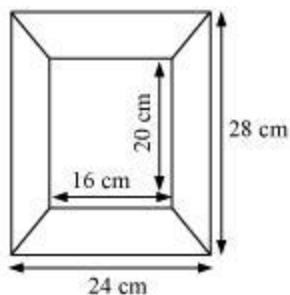


Area of pentagon = Area of  $\triangle ABE$  + Area of square BCDE

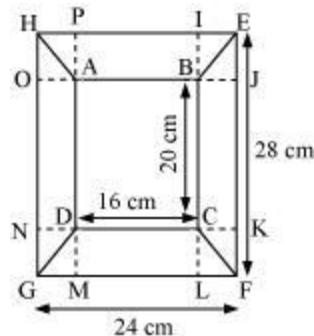
$$\begin{aligned}
 &= \left[ \frac{1}{2} \times 15 \times (30 - 15) + (15)^2 \right] \text{m}^2 \\
 &= \left( \frac{1}{2} \times 15 \times 15 + 225 \right) \text{m}^2 \\
 &= (112.5 + 225) \text{ m}^2 \\
 &= 337.5 \text{ m}^2
 \end{aligned}$$

Q11 :

Diagram of the adjacent picture frame has outer dimensions = 24 cm x 28 cm and inner dimensions 16 cm x 20 cm. Find the area of each section of the frame, if the width of each section is same.



Answer :



Given that, the width of each section is same. Therefore,

$$IB = BJ = CK = CL = DM = DN = AO = AP$$

$$IL = IB + BC + CL$$

$$28 = IB + 20 + CL$$

$$IB + CL = 28 \text{ cm} - 20 \text{ cm} = 8 \text{ cm}$$

$$IB = CL = 4 \text{ cm}$$

$$\text{Hence, } IB = BJ = CK = CL = DM = DN = AO = AP = 4 \text{ cm}$$

Area of section BEFC = Area of section DGHA

$$= \left[ \frac{1}{2} (20+28)(4) \right] \text{ cm}^2 = 96 \text{ cm}^2$$

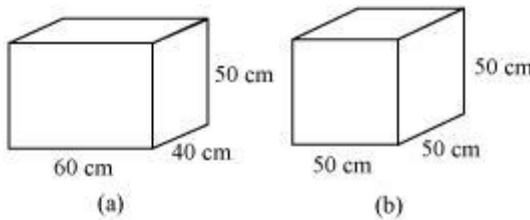
$$\begin{aligned} \text{Area of section ABEH} &= \text{Area of section CDGF} \\ \Rightarrow \text{Area of section ABEH} &= \text{Area of section CDGF} \\ &= [12(16+24)(4)] = 80 \end{aligned}$$

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### Questions and Solutions | Exercise 9.2 - NCERT Books

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



**Answer :**

We know that,

$$\text{Total surface area of the cuboid} = 2(lh + bh + lb)$$

$$\text{Total surface area of the cube} = 6(l)^2$$

$$\text{Total surface area of cuboid (a)} = [2\{(60)(40) + (40)(50) + (50)(60)\}] \text{ cm}^2$$

$$= [2(2400 + 2000 + 3000)] \text{ cm}^2$$

$$= (2 \times 7400) \text{ cm}^2$$

$$= 14800 \text{ cm}^2$$

$$\text{Total surface area of cube (b)} = 6(50 \text{ cm})^2 = 15000 \text{ cm}^2$$

Thus, the cuboidal box (a) will require lesser amount of material.

**Q2 :**

A suitcase with measures  $80 \text{ cm} \times 48 \text{ cm} \times 24 \text{ cm}$  is to be covered with a tarpaulin cloth. How many metres of tarpaulin of width 96 cm is required to cover 100 such suitcases

**Answer :**

$$\text{Total surface area of suitcase} = 2[(80)(48) + (48)(24) + (24)(80)]$$

$$= 2[3840 + 1152 + 1920]$$

$$= 13824 \text{ cm}^2$$

$$\text{Total surface area of 100 suitcases} = (13824 \times 100) \text{ cm}^2 = 1382400 \text{ cm}^2$$

$$\text{Required tarpaulin} = \text{Length} \times \text{Breadth}$$

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

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

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

**Q3 :**

Find the side of a cube whose surface area is  $600 \text{ cm}^2$ .

**Answer :**

Given that, surface area of cube =  $600 \text{ cm}^2$

Let the length of each side of cube be  $l$ .

Surface area of cube =  $6 (\text{Side})^2$

$$600 \text{ cm}^2 = 6l^2$$

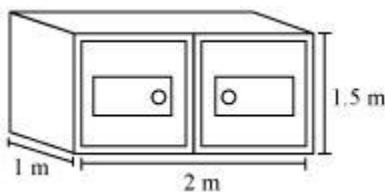
$$l^2 = 100 \text{ cm}^2$$

$$l = 10 \text{ cm}$$

Thus, the side of the cube is 10 cm.

**Q4 :**

Rukhsar painted the outside of the cabinet of measure  $1 \text{ m} \times 2 \text{ m} \times 1.5 \text{ m}$ . How much surface area did she cover if she painted all except the bottom of the cabinet



**Answer :**

Length ( $l$ ) of the cabinet = 2 m

Breadth ( $b$ ) of the cabinet = 1 m

Height ( $h$ ) of the cabinet = 1.5 m

Area of the cabinet that was painted =  $2h(l + b) + lb$

$$= [2 \times 1.5 \times (2 + 1) + (2)(1)] \text{ m}^2$$

$$= [3(3) + 2] \text{ m}^2$$

$$= (9 + 2) \text{ m}^2$$

$$= 11 \text{ m}^2$$

Q5 :

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 m<sup>2</sup> of area is painted. How many cans of paint will she need to paint the room

Answer :

Given that,

Length ( $l$ ) = 15 m, breadth ( $b$ ) = 10 m, height ( $h$ ) = 7 m

Area of the hall to be painted = Area of the wall + Area of the ceiling

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

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

$$= [14(25) + 150] \text{ m}^2$$

$$= 500 \text{ m}^2$$

It is given that 100 m<sup>2</sup> area can be painted from each can.

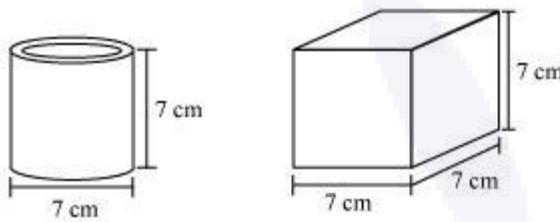
Number of cans required to paint an area of 500 m<sup>2</sup>

$$\frac{500}{100} = 5$$

Hence, 5 cans are required to paint the walls and the ceiling of the cuboidal hall.

Q6 :

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



Answer :

Similarity between both the figures is that both have the same heights.

The difference between the two figures is that one is a cylinder and the other is a cube.

$$\text{Lateral surface area of the cube} = 4l^2 = 4(7 \text{ cm})^2 = 196 \text{ cm}^2$$

$$\text{Lateral surface area of the cylinder} = 2\pi rh = \left(2 \times \frac{22}{7} \times \frac{7}{2} \times 7\right) \text{ cm}^2 = 154 \text{ cm}^2$$

Hence, the cube has larger lateral surface area.

Q7 :

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

Answer :

$$\text{Total surface area of cylinder} = 2\pi r(r + h)$$

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

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

Thus, 440 m<sup>2</sup> sheet of metal is required.

**Q8 :**

The lateral surface area of a hollow cylinder is 4224 cm<sup>2</sup>. It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet

**Answer :**

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 (Length + Width)

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

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

$$= 322 \text{ cm}$$

**Q9 :**

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.

**Answer :**

In one revolution, the roller will cover an area equal to its lateral surface area.

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

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

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

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

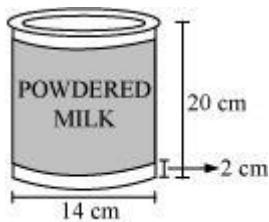
In 750 revolutions, area of the road covered

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

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

Q10 :

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.



Answer :

$$\text{Height of the label} = 20 \text{ cm} - 2 \text{ cm} - 2 \text{ cm} = 16 \text{ cm}$$

$$\text{Radius of the label} = \left( \frac{14}{2} \right) \text{ cm} = 7 \text{ cm}$$

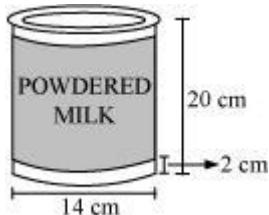
Label is in the form of a cylinder having its radius and height as 7 cm and 16 cm.

$$\text{Area of the label} = 2\pi (\text{Radius}) (\text{Height})$$

$$= \left( 2 \times \frac{22}{7} \times 7 \times 16 \right) \text{ cm}^2 = 704 \text{ cm}^2$$

Q11 :

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.



Answer :

$$\text{Height of the label} = 20 \text{ cm} - 2 \text{ cm} - 2 \text{ cm} = 16 \text{ cm}$$

$$\text{Radius of the label} = \left( \frac{14}{2} \right) \text{ cm} = 7 \text{ cm}$$

Label is in the form of a cylinder having its radius and height as 7 cm and 16 cm.

$$\text{Area of the label} = 2\pi (\text{Radius}) (\text{Height})$$

$$= \left( 2 \times \frac{22}{7} \times 7 \times 16 \right) \text{ cm}^2 = 704 \text{ cm}^2$$

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### Questions and Solutions | Exercise 9.3 - NCERT Books

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Q 1. Given a cylindrical tank, in which situation will you find surface area and in which situation volume.

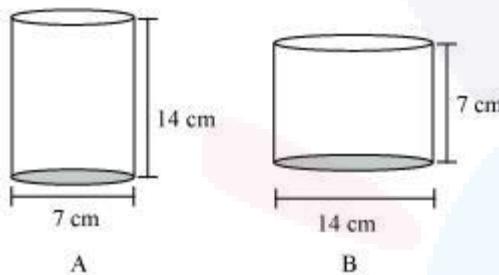
- (a) To find how much it can hold
- (b) Number of cement bags required to plaster it
- (c) To find the number of smaller tanks that can be filled with water from it.

Answer :

- (a) In this situation, we will find the volume.
- (b) In this situation, we will find the surface area.
- (c) In this situation, we will find the volume.

Q2 :

Diameter of cylinder A is 7 cm, and the height is 14 cm. Diameter of cylinder B is 14 cm and height is 7 cm. Without doing any calculations can you suggest whose volume is greater? Verify it by finding the volume of both the cylinders. Check whether the cylinder with greater volume also has greater surface area.



Answer :

The heights and diameters of these cylinders A and B are interchanged.

We know that,

$$\text{Volume of cylinder} = \pi r^2 h$$

If measures of  $r$  and  $h$  are same, then the cylinder with greater radius will have greater area.

$$\text{Radius of cylinder A} = \frac{7}{2} \text{ cm}$$

$$\text{Radius of cylinder B} = \left(\frac{14}{2}\right) \text{ cm} = 7 \text{ cm}$$

As the radius of cylinder B is greater, therefore, the volume of cylinder B will be greater.

Let us verify it by calculating the volume of both the cylinders.

$$\text{Volume of cylinder A} = \pi r^2 h$$

$$= \left( \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14 \right) \text{ cm}^3$$

$$= 539 \text{ cm}^3$$

$$\text{Volume of cylinder B} = \pi r^2 h$$

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

$$= 1078 \text{ cm}^3$$

Volume of cylinder B is greater.

$$\text{Surface area of cylinder A} = 2\pi r(r + h)$$

$$= \left[ 2 \times \frac{22}{7} \times \frac{7}{2} \left( \frac{7}{2} + 14 \right) \right] \text{ cm}^2$$

$$= \left[ 22 \times \left( \frac{7+28}{2} \right) \right] \text{ cm}^2$$

$$= \left( 22 \times \frac{35}{2} \right) \text{ cm}^2$$

$$= 385 \text{ cm}^2$$

$$\text{Surface area of cylinder B} = 2\pi r(r + h)$$

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

$$= (44 \times 14) \text{ cm}^2$$

$$= 616 \text{ cm}^2$$

Thus, the surface area of cylinder B is also greater than the surface area of cylinder A.

**Q3 :** Find the height of a cuboid whose base area is 180 cm sq. and volume is 900 cm cube?

**Solution:** Volume of cuboid = l x b x h

Base area = l x b

$$\text{Height} = \text{Volume} / \text{Area} = 900/180 = 5 \text{ cm}$$

Q.4. A cuboid is of dimensions 60 cm x 54 cm x 30 cm. How many small cubes with side 6 cm can be placed in the given cuboid

Answer :

$$\text{Volume of cuboid} = 60 \text{ cm} \times 54 \text{ cm} \times 30 \text{ cm} = 97200 \text{ cm}^3$$

$$\text{Side of the cube} = 6 \text{ cm}$$

$$\text{Volume of the cube} = (6)^3 \text{ cm}^3 = 216 \text{ cm}^3$$

$$\text{Required number of cubes} = \frac{\text{Volume of the cuboid}}{\text{Volume of the cube}}$$

$$= \frac{97200}{216} = 450$$

Thus, 450 cubes can be placed in the given cuboid.

Q.5. Find the height of the cylinder whose volume is  $1.54 \text{ m}^3$  and diameter of the base is 140 cm

Answer :

$$\text{Diameter of the base} = 140 \text{ cm}$$

$$\text{Radius (r) of the base} = \left( \frac{140}{2} \right) \text{ cm} = 70 \text{ cm} = \frac{70}{100} \text{ m}$$

$$\text{Volume of cylinder} = \pi r^2 h$$

$$1.54 \text{ m}^3 = \frac{22}{7} \times \frac{70}{100} \text{ m} \times \frac{70}{100} \text{ m} \times h$$

$$h = \left( \frac{1.54 \times 100}{22 \times 7} \right) \text{ m} = 1 \text{ m}$$

Thus, the height of the cylinder is 1 m.

**Q 6.** A milk tank is in the form of cylinder whose radius is 1.5 m and length is 7 m. Find the quantity of milk in litres that can be stored in the tank

**Answer :**

Radius of cylinder = 1.5 m

Length of cylinder = 7 m

$$\text{Volume of cylinder} = \pi r^2 h$$

$$\begin{aligned} &= \left( \frac{22}{7} \times 1.5 \times 1.5 \times 7 \right) \text{ m}^3 \\ &= 49.5 \text{ m}^3 \end{aligned}$$

$$1 \text{ m}^3 = 1000 \text{ L}$$

$$\text{Required quantity} = (49.5 \times 1000) \text{ L} = 49500 \text{ L}$$

Therefore, 49500 L of milk can be stored in the tank.

**Q 7.** If each edge of a cube is doubled,

- (i) how many times will its surface area increase
- (ii) how many times will its volume increase

**Answer :**

(i) Let initially the edge of the cube be  $l$ .

$$\text{Initial surface area} = 6l^2$$

If each edge of the cube is doubled, then it becomes  $2l$ .

$$\text{New surface area} = 6(2l)^2 = 24l^2 = 4 \times 6l^2$$

Clearly, the surface area will be increased by 4 times.

(ii) Initial volume of the cube =  $l^3$

When each edge of the cube is doubled, it becomes  $2l$ .

New volume =  $(2l)^3 = 8l^3 = 8 \times l^3$

Clearly, the volume of the cube will be increased by 8 times.

**Q 8.** Water is pouring into a cuboidal reservoir at the rate of 60 litres per minute. If the volume of reservoir is  $108 \text{ m}^3$ , find the number of hours it will take to fill the reservoir.

**Answer :**

Volume of cuboidal reservoir =  $108 \text{ m}^3 = (108 \times 1000) \text{ L} = 108000 \text{ L}$

It is given that water is being poured at the rate of 60 L per minute.

That is,  $(60 \times 60) \text{ L} = 3600 \text{ L}$  per hour

$$\text{Required number of hours} = \frac{108000}{3600} = 30 \text{ hours}$$

Thus, it will take 30 hours to fill the reservoir.