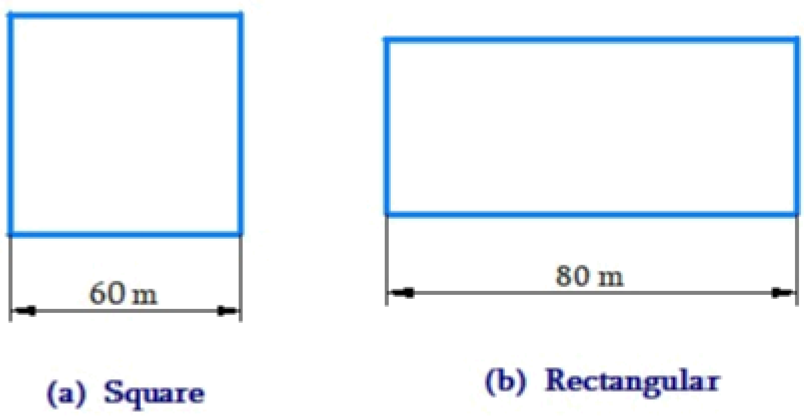
Exercise 11.1

Q1. A square and a rectangular field with measurements as given in the figure have the same perimeter. Which field has a larger area?

Answer: The perimeter of the rectangular field and square area are the same.



It is given that the perimeter of the square and the rectangular field is the same, so we can find the breadth of the rectangular field followed by the area of the rectangular field.

Side of the square = 60m

Length of the rectangle = 80m

Perimeter of the square = 4 × (side of square) = 4 × 60m = 240m

Perimeter of rectangle = 2 × (length + breadth)

Perimeter of square = Perimeter of rectangle

240 = 2 (length + breadth)

240 = 2 (80 + breadth)

240 = 160 + 2 × breadth

240 - 160 = 2 × breadth

80 = 2 × breadth

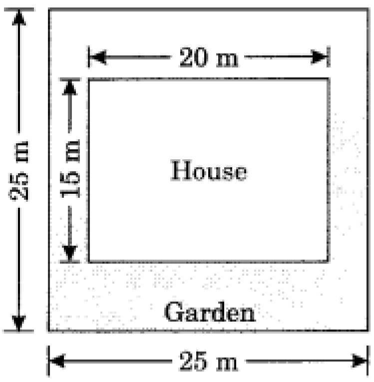
breadth = $\frac{80}{2}$ = 40 m

Area of the square = side × side = 60 × 60 = **3600 m^2**

Area of the rectangular field = length × breadth = 80 × 40 = **3200 m²**

Thus, the area of the square is larger than the area of the rectangular field.

Q2. Mrs. Kaushik has a square plot with the measurement as shown in the figure. She wants to construct a house in the middle of the plot. A garden is developed around the house. Find the total cost of developing a garden around the house at the rate of ₹ 55 per m².



Answer: The plot is square from the outside while the area of the house to be constructed is rectangular in the middle of the plot. From the diagram, we can see that the area of the garden is the difference between the area of the square plot and the area of the house.

Area of the square plot = side × side = 25 m × 25 m = 625 m²

Area of the house = length × breadth = 15 m × 20 m = 300 m²

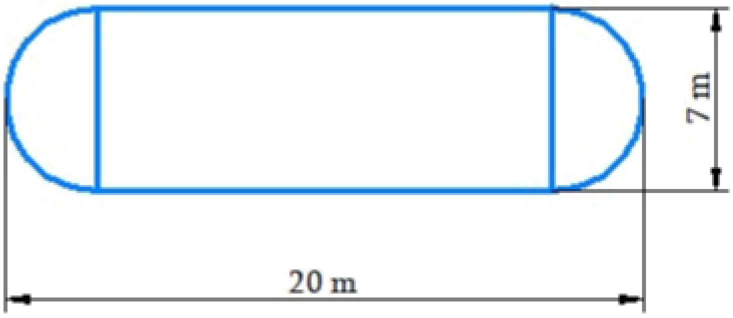
Area of the garden to be developed = (Area of the square plot) - (Area of the house) = 625 m² - 300 m² = 325 m²

Hence, the Area of the garden to be developed = 325 m²

The cost of developing a garden around the house = Rs 55 per m²

Therefore, the total cost of developing a garden of area 325 m² = 325 × 55 = **Rs 17,875**

Q3. The shape of a garden is rectangular in the middle and semi-circular at the ends as shown in the diagram. Find the area and the perimeter of this garden [Length of rectangle is 20 - (3.5 + 3.5) meters].



Answer: The garden is rectangular in the middle and semicircular at the ends. From the diagram, we can see that the area of the garden is the sum of the rectangular middle portion and two semicircles at the end.

Length of the rectangular part = Total length - radii of the two semicircles

= 20 − (3.5 + 3.5) meters = (20 − 7) meters = 13 meters

The breadth of the rectangular part = 7 meter

Area of the rectangular part = length × breadth = 13 meter × 7 meter = 91 sq. m

The diameter of the semi-circle = 7 m

Radius of the semi-circle = 7/2 m = 3.5 m

Area of the semi-circle = $1/2 \times \pi \times r^2$

Thus, the area of two semi-circles = $2 \times \frac{1}{2} \times \frac{22}{7} \times (3.5)^2 = \frac{22}{7} \times 12.25 = 38.5 \text{ m}^2$

Total area of the garden = (Area of rectangle) + (Area of two semicircle regions)

= $91 \text{ m}^2 + 38.5 \text{ m}^2 = 129.5 \text{ m}^2$

The perimeter of the garden = length of a rectangle + circumference of two semicircles + length of a rectangle

= 13 + 2(π × 3.5) + 13 [Since circumference of a semicircle = πr]

= 26 + 7π

= $26 + 7 \times \frac{22}{7}$ m

= 26 + 22 m = **48 m**

Thus, the area of the garden is 129.5 m², and the perimeter of the garden is 48 m.

4. A flooring tile has the shape of a parallelogram whose base is 24 cm and the corresponding height is 10 cm. How many such tiles are required to cover a floor of an area of 1080 m²? (If needed you can split the tiles in whatever way you want to fill up the corners)

Answer:

Given that the shape of the tile is a parallelogram.

Area of parallelogram = Base × Height

= 24 cm × 10 cm = 240 cm²

Hence, the area of one tile = 240 cm²

Area of the floor = 1080 m² (given)

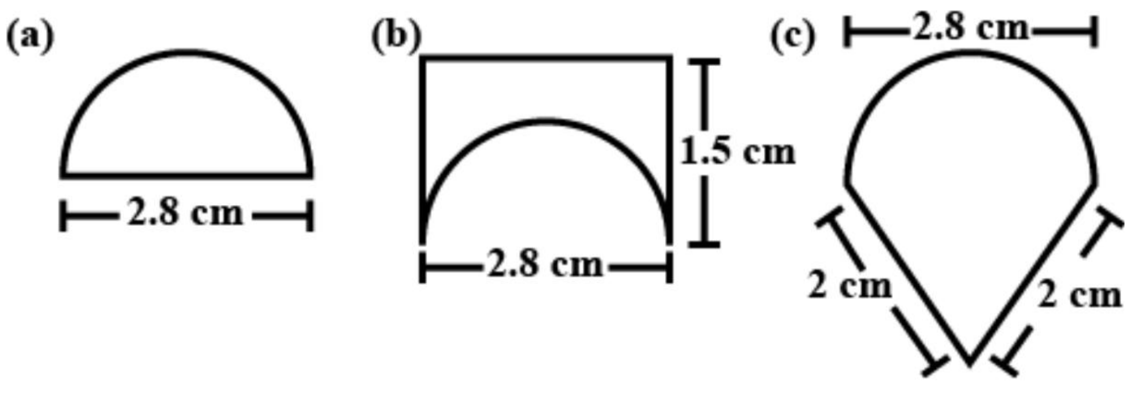
Required number of tiles = $\frac{\text{Area of the floor}}{\text{Area of one tile}}$

= $\frac{1080\ m^2}{240\ cm^2}$

= $\frac{1080 \text{ x } 10000\ cm^2}{240\ cm^2}$ = **45000 tiles**

Thus, 45000 tiles are required to cover a floor of area 1080 m².

Q5. An ant is moving around a few food pieces of different shapes scattered on the floor. For which food piece would the ant have to take a longer round? Remember, the circumference of a circle can be obtained by using the expression c = 2πr, where r is the radius of the circle



Answer:

(a) Radius of the semicircle part = $\frac{2.8}{2}$ cm = 1.4 cm

The Perimeter of the circle = 2πr

The perimeter of the semicircle = πr

The perimeter of the food piece = 2.8 cm + πr

= 2.8 cm + $\frac{22}{7}$ x 1.4 cm

= 2.8 cm + 4.4 cm = **7.2 cm**

(b) Radius of semicircle part = $\frac{2.8}{2}$ = 1.4 cm

Perimeter of the food piece = 1.5 cm + 2.8 cm + 1.5 cm + πr

= 5.8 cm + $\frac{22}{7}$ × 1.4 cm

= 5.8 cm + 4.4 cm = **10.2 cm**

(c) Radius of the food piece = $\frac{2.8}{2}$ = 1.4 cm

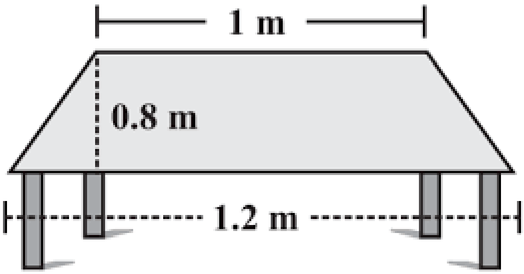
Perimeter of the food piece = 2 cm + πr + 2 cm

= 4 cm + $\frac{22}{7}$ × 1.4 cm

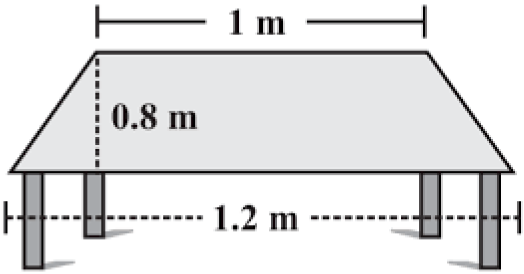
= 4 cm + 4.4 cm = **8.4 cm**

Thus, the ant will have to take a longer round for food pieces in (b) because the perimeter of the figure given in (b) is the greatest among all.

Exercise 11.2



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 the perpendicular distance between them is 0.8 m.



Answer:

Given: a = 1 m, b = 1.2 m, h = 0.8 m

Area of trapezium

$= \frac{1}{2} \times$ Sum of Parallel Sides × Distance between parallel sides

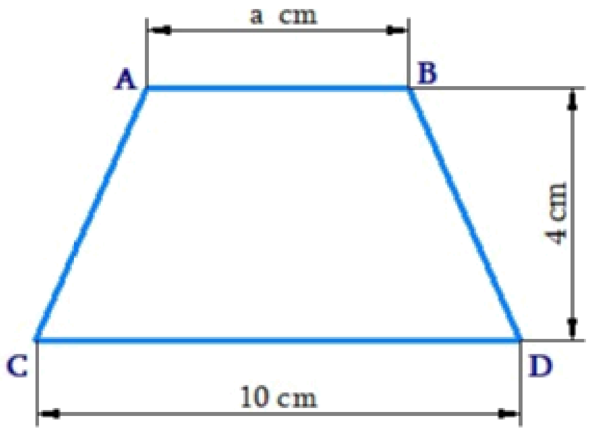
$= \frac{1}{2} \times (a + b) \times h$

$= \frac{1}{2} \times (1 + 1.2) \times 0.8$

$= \frac{1}{2} \times 2.2 \times 0.8$

$= 1.1 \times 0.8 =$ **0.88 sq. metres**

Q2. The area of a trapezium is 34 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:

Area of the trapezium ABCD $= \frac{1}{2} \times$ (Sum of parallel side) × Distance between its parallel sides

$34 = \frac{1}{2} \times (AB + CD) \times 4$ cm

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

34 = 2(10 cm + a)

$\frac{34}{2}$ = 10 cm + a

17 = 10 cm + a

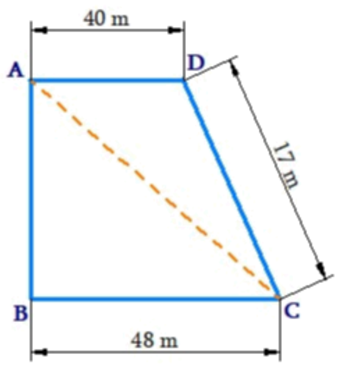
a = 17 cm − 10 cm = 7 cm

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

Q3. The 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:

Let's construct a diagram according to the given conditions.



The visual area of the given figure (trapezium) is the sum of the area of two triangles.

Length of the fence of a trapezium-shaped field ABCD = AB + BC + CD + AD

120 m = AB + 48 m + 17 m + 40 m

120 m = AB + 105 m

AB = 120 m − 105 m = 15 m

Area of the field ABCD = $\frac{1}{2}$ × [Length of the parallel side] × [Distance between two parallel sides]

$= \frac{1}{2} \times (AD + BC) \times AB$

$= \frac{1}{2} \times (40 + 48) \times 15$ m

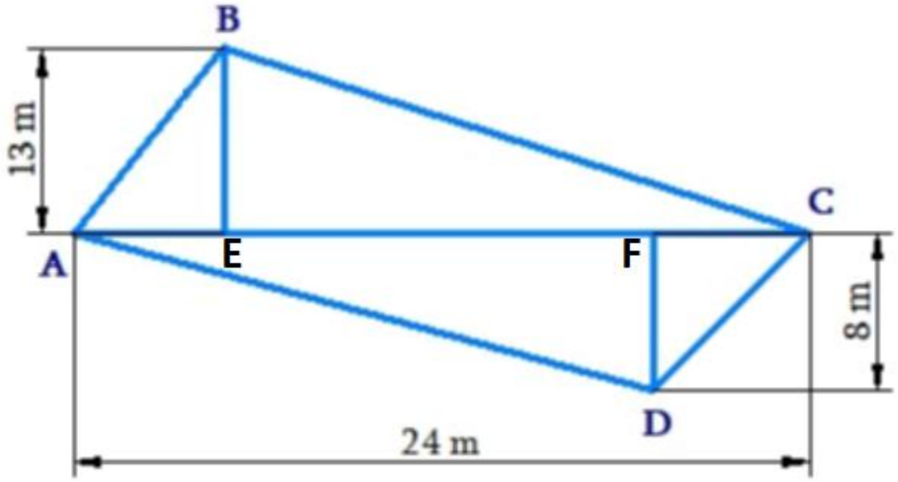
$= \frac{1}{2} \times (88 \text{ m}) \times 15$ m

= 44 m × 15 m

= **660 m²**

Thus, the area of the field ABCD is 660 m²

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: From the diagram, the area for a quadrilateral will be the sum of the area of two triangles.

Area of quadrilateral ABCD = Area of ΔABC + Area of ΔADC

$= \frac{1}{2} \times (AC \times BE) + 1/2 \times (AC \times FD)$

$= \frac{1}{2} \times AC\ (BE + FD)$

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

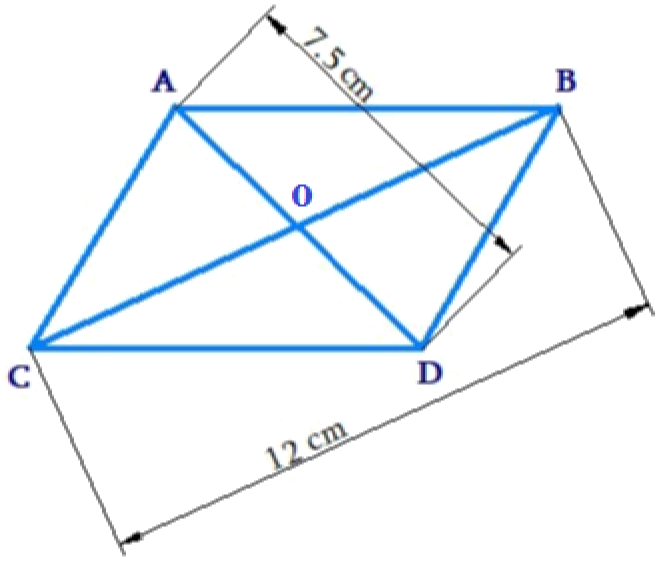
$= \frac{1}{2} \times 24 \text{ m} \times 21 \text{ m}$

= 252 m^2

Q5. The diagonals of a rhombus are 7.5 cm and 12 cm. Find its area

Answer:

Let's construct a rhombus ABCD as shown below



Let CB and AD be the diagonals of the rhombus ABCD.

AD = 7.5 cm, CB = 12 cm

Area of Rhombus ABCD = Area of ΔABC + Area of ΔDCB

$= \frac{1}{2} \times (CB \times AO) + \frac{1}{2} \times (CB \times OD)$

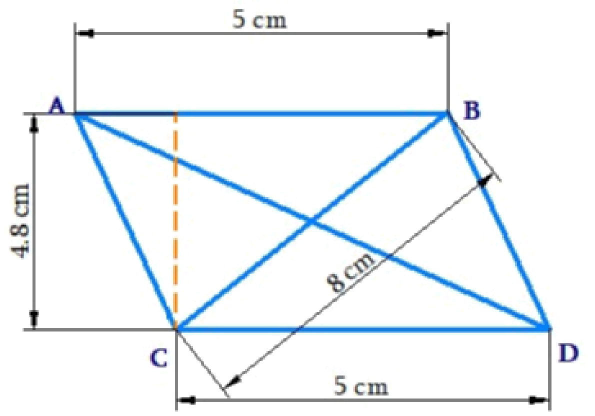
$= \frac{1}{2} \times CB \times (AO + OD)$

$= \frac{1}{2} \times CB \times AD$

$= \frac{1}{2} \times 12\text{ m} \times 7.5\text{ m} =$ **45 m²**

Q6. Find the area of a rhombus whose side is 5 cm and whose altitude is 4.8 cm. If one of its diagonals is 8 cm long, find the length of the other diagonal.

Answer: Rhombus is a special type of parallelogram and the area of a parallelogram is the product of its base and height.



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

Area of the rhombus ABDC = Base × Length = 5 cm × 4.8 cm = 24 cm^2

Also,

Area of rhombus = 1/2 × Product of its diagonals

$24 = \frac{1}{2}$ (AD × CB)

$24 = \frac{1}{2}$ (x × 8 cm)

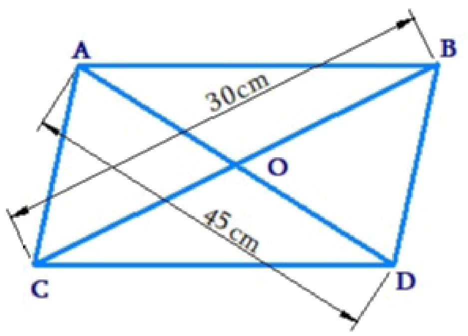
x × 4 = 24

$x = \frac{24}{4}$ = **6 cm**

Thus, the length of the other diagonal 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 ₹ 4

Answer: Let ABDC be a rhombus as shown below with AD and BC as the diagonals.



Let BC = 30 cm, AD = 45 cm

Area of rhombus ABDC = Area of ΔABC + Area of ΔDCB

$= \frac{1}{2} \times (BC \times AO) + \frac{1}{2} \times (BC \times OD)$

$= \frac{1}{2} \times BC \times (AO + OD)$

$= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 30 \text{ cm} \times 45 \text{ cm}$

= 675 cm²

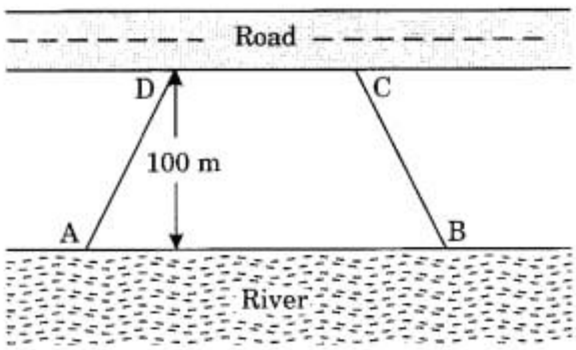
Area of each tile = 675 cm²

Area covered by 3000 tiles = (675 × 3000) cm² = 2025000 cm² = 202.5 m²

Given that the cost of polishing is Rs. 4 per m²

Cost of polishing for 202.5 m² area = Rs. 4 × 202.5 = **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 m² and the perpendicular distance between the two parallel sides is 100 m, find the length of the side along the river.



Answer: As the field is in trapezium shape, we will use the formula to find the area of trapezium

Let the side DC of the roadside (b_1 of trapezium) be x cm

The opposite parallel side AB (b_2 of trapezium) = 2x m

h = 100 m (given)

Area of the field = 10500 m^2

Area of trapezium = $\frac{1}{2}(b_1 + b_2) \times h$

$10500 = \frac{1}{2}(2x + x) \times 100$

$2 \times 10500 = 3x \times 100$

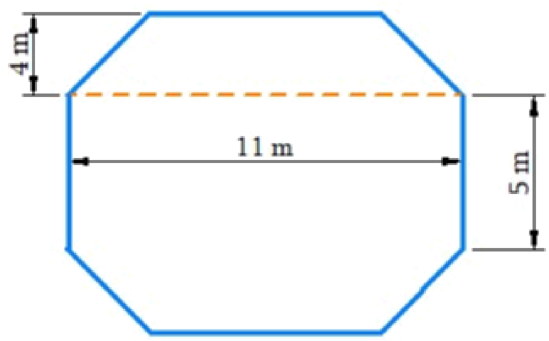
21000 = 300x

x = DC = 70 m

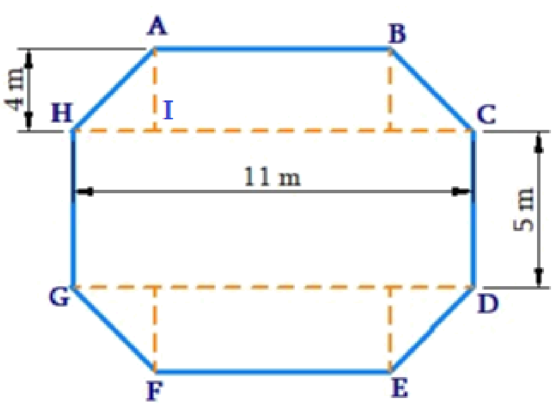
So, AB = 2x = 2 × 70 = 140 m

Thus, the length of the field riverside = 140 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:



Visually, the area of the octagonal surface will be the sum of the area of two trapezia and the area of a rectangular region.

Area of octagon ABCDEFGH = Area of trapezium ABCH + Area of rectangle HCDG + Area of trapezium EFGD

Side of the regular octagon = 5 cm

Area of trapezium ABCH = Area of trapezium EFGD

Area of trapezium ABCH = 1/2 × (AB + CH) × AI

$= \frac{1}{2} \times (5\text{ m} + 11\text{ m}) \times 4\text{ m}$

$= \frac{1}{2} \times 16\text{ m} \times 4\text{ m} = 32\text{ m}^2$

Area of trapezium ABCH = Area of trapezium EFGD = 32 m^2

Area of rectangle HCDG = HC × CD = 11 m × 5 m = 55 m^2

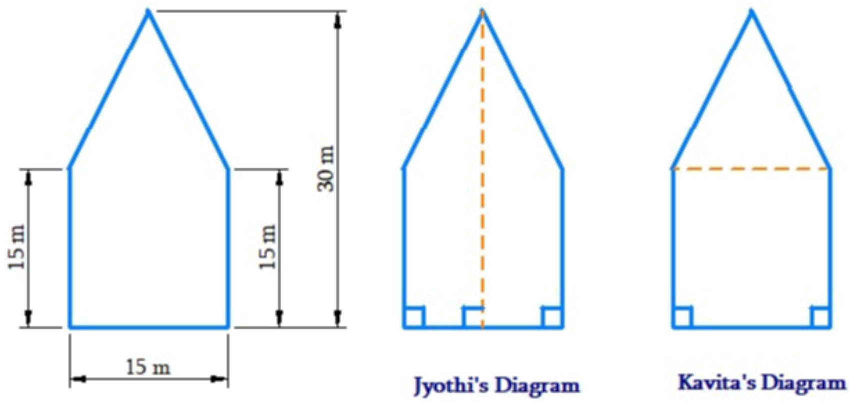
Area of ABCDEFGH = Area of trapezium ABCH + Area of rectangle HCDG + Area of trapezium EFGD

= 32 m^2+ 55 m^2+ 32 m^2 = **119 m^2**

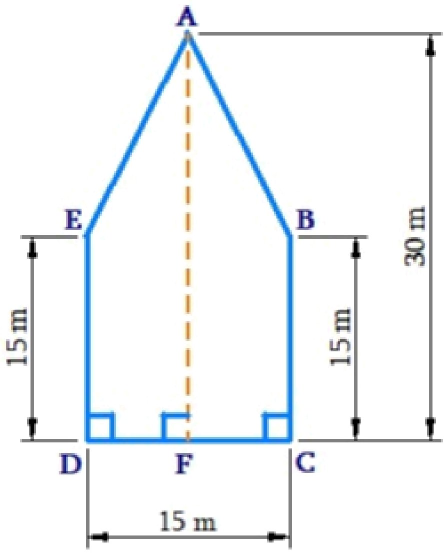
Thus, the area of the octagonal surface is 119 m^2

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: Visually the pentagon is divided into two equal trapeziums or one triangle and one square as per Jyothi's and Kavita's approach.



(i) Jyoti's way of finding the area is as follows:



Area of pentagon ABCDE = Area of trapezium ABCF + Area of trapezium AEDF

$= \frac{1}{2} \times (AF + BC) \times FC + \frac{1}{2} \times (AF + ED) \times DF$

$= \frac{1}{2} \times (30\text{ m} + 15\text{ m}) \times \frac{15}{2}\text{ m} + \frac{1}{2} \times (30 + 15\text{ m}) \times \frac{15}{2}\text{ m}$

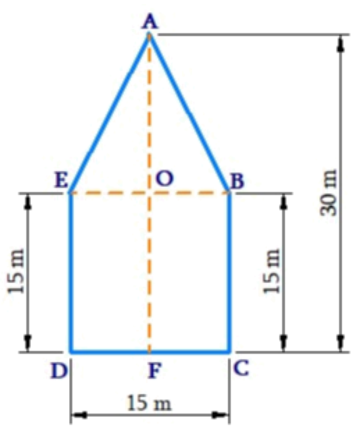
$= 2 \times \frac{1}{2}(30\text{ m} + 15\text{ m}) \times \frac{15}{2}$

$= 45\text{ m} \times 7.5\text{ m}$

$= 337.5\text{ m}^2$

Thus, the area of the pentagonal-shaped park according to Jyoti's way is 337.5 m^2

(ii) Kavitha's way of finding the area is as follows:



Area of pentagon ABCDE = Area of triangle ABE + Area of square EBCD

$= \frac{1}{2} \times BE \times (AF - OF) + FC \times BC$ [Since, AO = AF - OF]

$= \frac{1}{2} \times 15 \times (30 - 15) + (15 \times 15)$

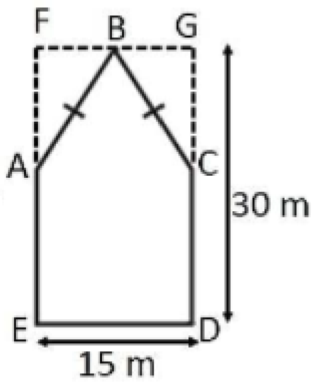
$= \left(\frac{1}{2} \times 15 \times 15\right) m^2 + 225\ m^2$

$= 112.5\ m^2 + 225\ m^2$

$= 337.5\ m^2$

Thus, the area of the pentagonal-shaped park according to Kavitha's way is $337.5\ m^2$.

Another way of finding its area is as follows.



By symmetry, Area of ΔAFB = Area of ΔCGB

Also, B is the midpoint of FG. Thus, FB = BG = 7.5 m

GC = AF = 30 - 15 = 15 m

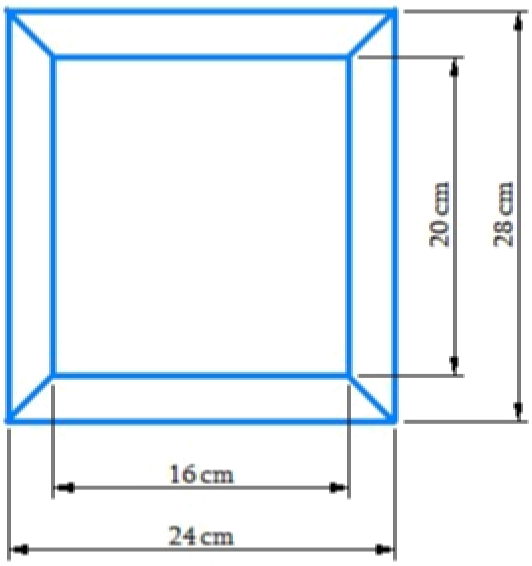
Area of pentagon ABCDE = Area of rectangle GFED – (Area of ΔAFB + Area of ΔCGB)

$= GD \times ED - 2 \times [\frac{1}{2} \times FB \times AF]$

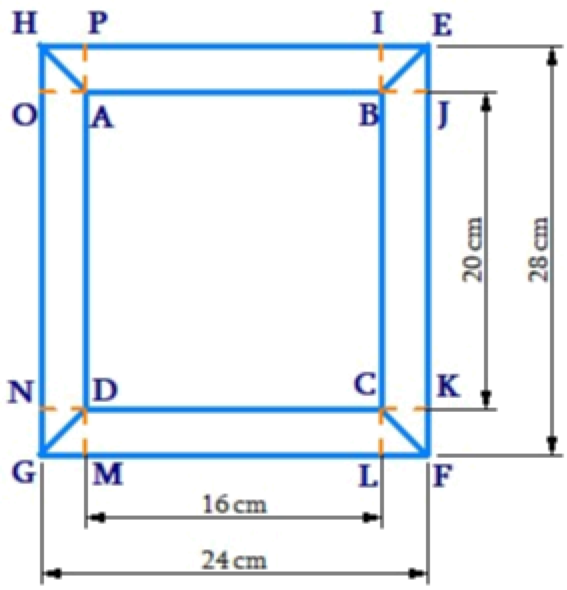
$= 30\ m \times 15\ m - 2 \times \left[\frac{1}{2} \times 7.5 \times 15\right]$

$= 450\ m^2 - 112.5\ m^2 =$ **$337.5\ m^2$**

Q11. The diagram of the adjacent picture frame has outer dimensions = 24 cm × 28 cm and inner dimensions 16 cm × 20 cm. Find the area of each section of the frame, if the width of each section is the same.



Answer: Visually, there are four trapeziums and one rectangle in the given figure as shown below.



Given that the width of each section is the same.

Therefore, IB = BJ = CK = CL = DM = DN = AP = AO ..... (1)

IL = IB + BC + CL

28 = IB + 20 + CL

28 − 20 = IB + CL

8 = IB + CL

But, IB = CL [From equation (1)]

Thus, 2IB = 8

IB = 4 cm

Hence IB = BJ = CK = CL = DM = DN = AP = AO = 4 cm

We know that, ABEH, CDGF, BEFC and ADGH are all trapezium

Area of trapezium ABEH = Area of trapezium CDGF [By symmetry]

$= \frac{1}{2} \times (AB + HE) \times IB$

$= \frac{1}{2}(16 + 24) \times 4 =$ **80 cm²**

Area of trapezium BEFC = Area of trapezium ADGH [By symmetry]

$= \frac{1}{2} \times (BC + EF) \times BJ$

$= \frac{1}{2} \times (20 + 28) \times 4 =$ **96 cm²**

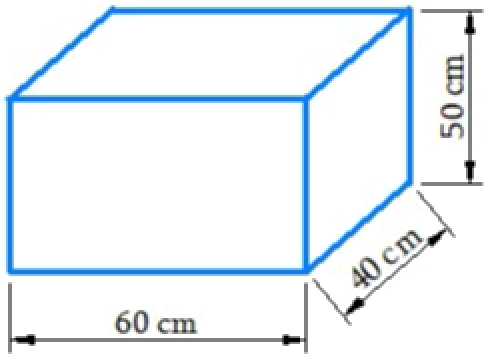
Area of rectangle ABCD = BC × DC

= 20 cm × 16 cm = **320 m²**

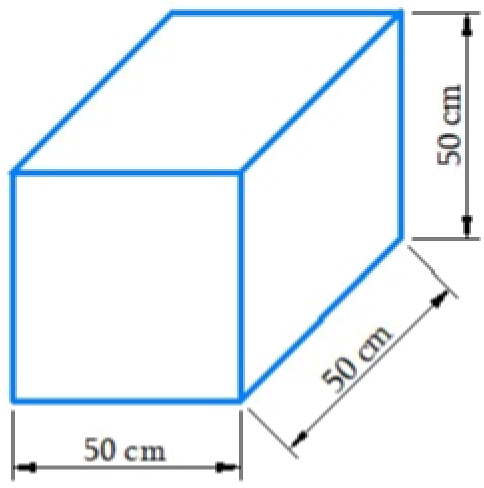
Thus, the area of section ABEH and CDGF is 80 m², the area of section BEFC and ADGH is 96 m² and the area of section ABCD is 320 m².

Exercise 11.3

Q1. There are two cuboidal boxes as shown in the adjoining figure. Which box requires a lesser amount of material to make?



(a)



(b)

Answer: The amount of material required to make boxes will be equal to their respective surface area.

The total surface area of the cuboid = Area of lateral surface + 2 × area of base = 2(lb + bh + hl) where, 'l', 'b', and 'h' are the length, breadth, and height of the cuboid respectively.

Total surface area of the cube = $6(l)^2$ where 'l' is the side of the cube

(a) l = 60 cm, b = 40 cm, h = 50 cm

Total surface area of cuboid in the given figure = 2(lb + bh + hl)

= 2(60 × 40 + 40 × 50 + 60 × 50) cm^2

= 2(2400 + 2000 + 3000) cm^2

= 14800 cm^2

(b) l = 50cm

Total surface area of cube in figure = $6 \times (l)^2$

= $6 \times (50)^2$

= 6 × 2500

= 15000 cm^2

Thus, the cuboid box (a) requires a lesser amount of material as it has a lesser surface area.

Q2. A suitcase with measures 80 cm × 48 cm × 24 cm is to be covered with a tarpaulin cloth. How many meters of tarpaulin of width 96 cm is required to cover 100 such suitcases?

Answer:

Let the length of the tarpaulin cloth = x cm

Since the suitcase is cuboidal in shape,

Total surface of the suitcase = 2(lb + bh + hl) .... (1)

Here, l = 80 cm, b = 48 cm, h = 24 cm

Thus, substituting the values in equation (1) we get,

$= 2\ [(80 \times 48) + (48 \times 24) + (24 \times 80)]\ cm^2$

$= 2\ [3840 + 1152 + 1920]\ cm^2$

$= 13824\ cm^2$

Total surface area of 100 suitcases

$= 100 \times 13824\ m^2$

$= 1382400\ cm^2$

Area of the tarpaulin cloth required = Total surface area of 100 suitcases = 1382400 cm^2

Area of the required tarpaulin cloth = Length × Breadth

$1382400\ cm^2 = x \times 96\ cm$

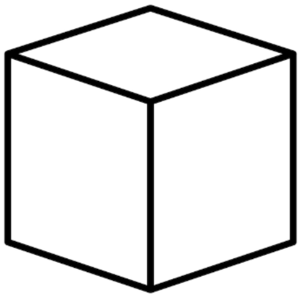
$x = \frac{1382400}{96}\ cm = 14400\ cm$

x = 144 m

Thus, the length of the tarpaulin cloth required is 144 m.

Q3. Find the side of a cube whose surface area is 600 cm²

Answer:



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

Given that, the surface area of the cube = 600 cm^2

We know that, the surface area of the cube = 6 × $(side)^2$

Therefore,

600 cm^2 = 6 × $(l)^2$

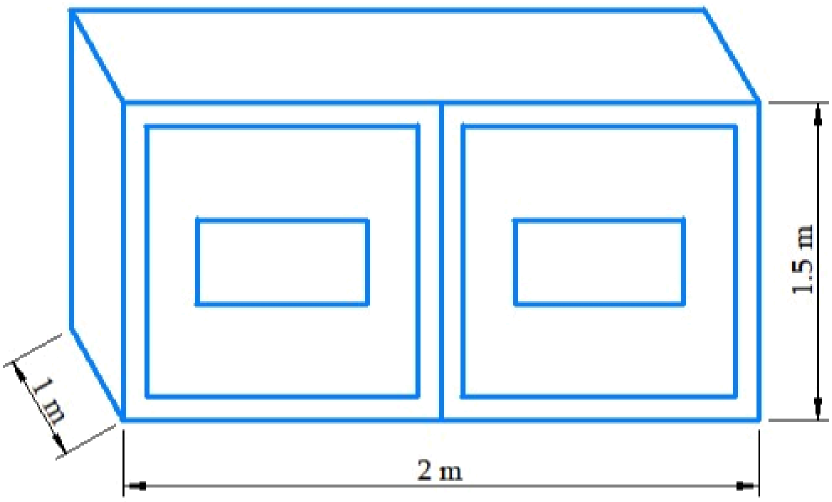
$l^2 = \frac{600}{6}$ cm^2 = 100 cm^2

$l = \sqrt{100}$ = **10 cm**

Thus, the side of the cube is 10 cm.

Q4. 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?

Answer:



The surface area of the bottom of the cuboid will be subtracted from the total surface area of the cabinet.

From the given figure,

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 bottom of cabinet = l × b

Since the cabinet is cuboidal in shape,

Total surface area of the cabinet = 2(l × b + b × h + h × l)

Area of the cabinet that was painted = (Total surface area of the cabinet) - (Area of the bottom of the cabinet)

$= 2(l \times b + b \times h + h \times l) - l \times b$

$= 2(b \times h + h \times l) + l \times b$

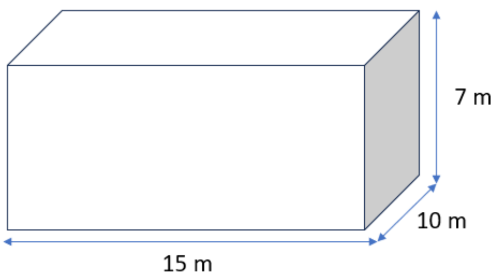
$= 2 \times (1 \times 1.5 + 1.5 \times 2) + 2 \times 1\ m^2$

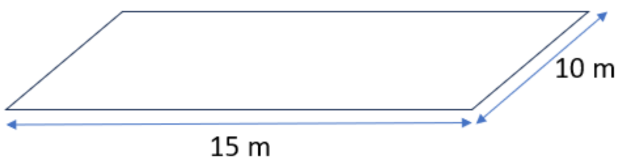
$= 2 \times 4.5 + 2\ m^2 =$ **$11\ m^2$**

Therefore, the area of the cabinet that was painted is $11\ m^2$.

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

Answer:





Area to be painted = area of the walls + area of the ceiling

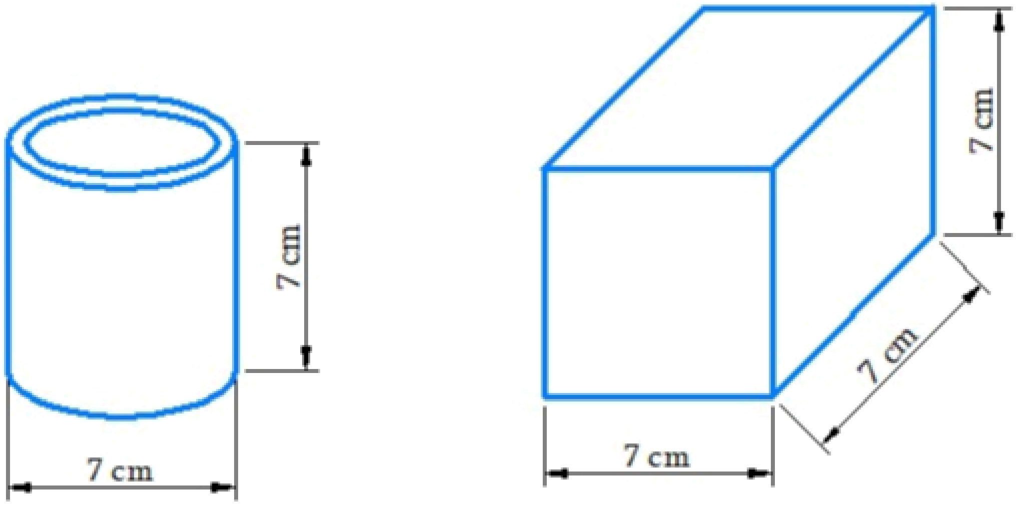
= 2 (hl + hb) + lb

= [2 × (7 × 15 + 7 × 10) + (15 × 10)] = 500 sq m

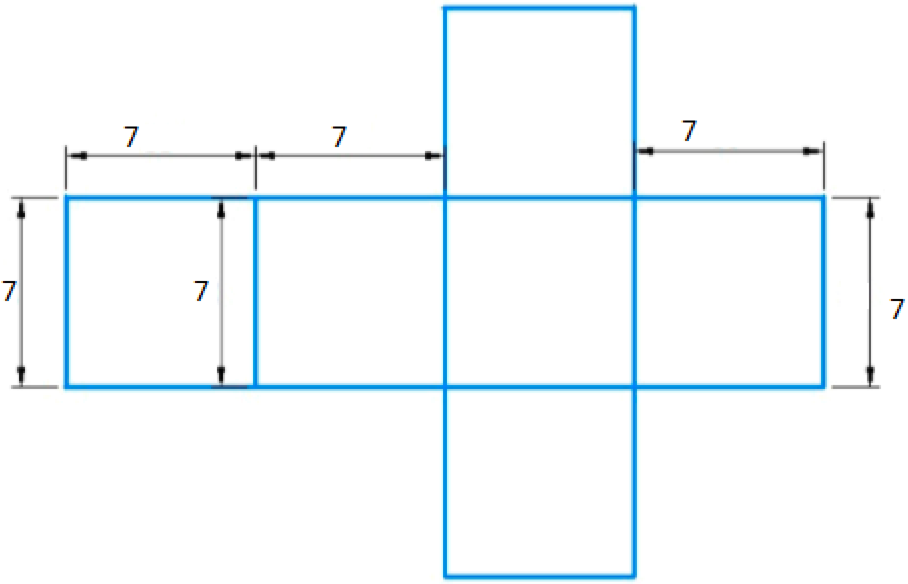
No. of cans required = $\frac{500}{5}$ = **5**

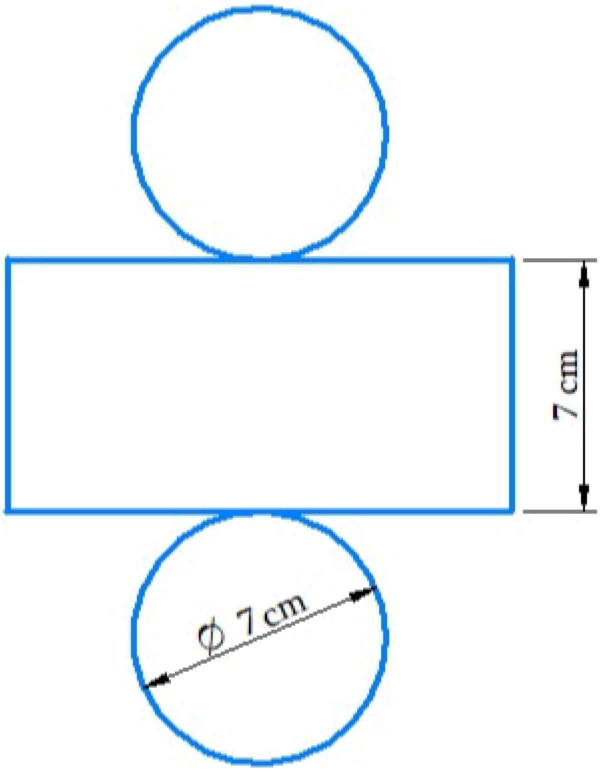
Hence, 5 cans are required to paint the walls and the ceiling of the cuboidal hall.

Q6. Describe how the two figures at the right are alike and how they are different. Which box has a larger lateral surface area?



Answer: Let's look into the open structure of the given cube and cylinder as shown below.





The length of the rectangular strip will be equal to the circumference of the circle. Visually, all the faces of a cube are square in shape. This makes the length, height, and width of a cube equal, so the area of each of the faces will be equal.

Similarly, both the figures are alike with respect to their same height which is 7cm.

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

Length of one side of cube l = 7 cm

Height of one side of cube h = 7 cm

Width of one side of cube b = 7 cm

Lateral surface area of the cube = $(h \times l + h \times b + h \times l + h \times b)$

$= (l \times l + l \times l + l \times l + l \times l)$ [$\because l = h = b$]

$= 4\,l^2 = 4 \times (7)^2 =$ **196 cm²**

Height of the cylinder h = 7 cm

The radius of the cylinder $r = \frac{7}{2}$ cm = 3.5 cm

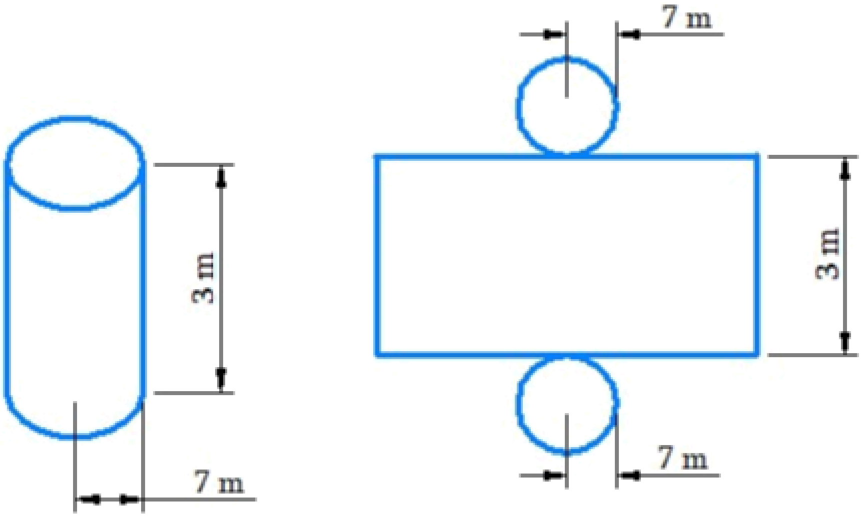
The lateral surface area of the cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 3.5 \times 7 =$ **154 cm²**

The cube with a side of 7 cm has a greater 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: Let's construct a diagram according to the given question.



Height of the cylindrical tank (h) = 3 cm

Radius of the cylindrical (r) = 7 cm

Lateral surface area of the cylinder = $2\pi rh = 2 \times \frac{22}{7} \times 7 \times 3 = 132$ m² ...(1)

Area of circular base = Area of top = πr^2

$= \frac{22}{7} \times 7$ m $\times 7$ m $= 154$ m² ...(2)

The metal sheet required will be equal to the total surface area of the cylinder.

Total surface area of cylinder = Lateral surface area of the cylinder + Area of two circular end

$= 2\pi rh + 2\pi r^2$

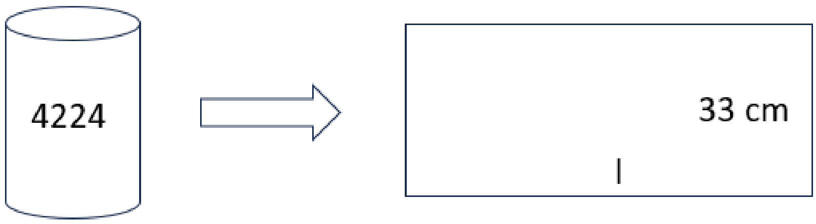
= 132 m² + 308 m² [substituting values from (1) and (2)]

= 440 m²

Thus, the amount of metal sheet required will be 440 m².

Q8. The lateral surface area of a hollow cylinder is 4224 cm². It is cut along its height and forms a rectangular sheet of width 33 cm. Find the perimeter of the rectangular sheet.

Answer:



The length of the rectangular sheet will be equal to the circumference of the circle. The lateral surface area of the cylinder will be equal to the area of the rectangular sheet.

The lateral surface area of a hollow cylinder = 4224 cm^2

Width of rectangular sheet = 33 cm

Let the length of the rectangular sheet = l

The lateral surface area of the cylinder = Area of a rectangular sheet

4224 cm^2 = b × l

4224 cm^2 = 33 cm × l

l = 4224 / 33 cm = 128 cm

Thus, the length of the rectangular sheet be 128 cm

Perimeter of the rectangular sheet = 2 × (l + b)

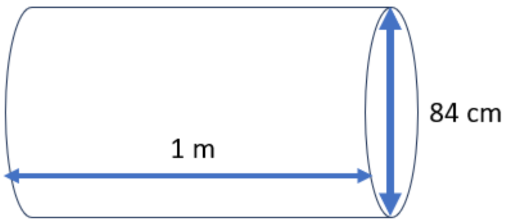
= 2 × (128 cm + 33 cm)

= 2 × 161 cm = 322 cm

Thus, the perimeter of the rectangular sheet is 322 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 the length is 1 m.

Answer: Since the wheel of a road roller is cylindrical in shape,



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

The radius of the road roller r = $\frac{84}{2}$ cm = 42 cm

Length of the road roller, h = 1 m = 100 cm

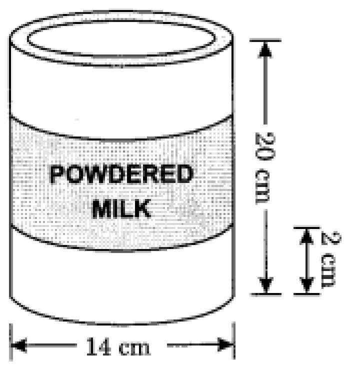
In 1 revolution, the area of the road covered = 2πrh

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

= 26400 cm^2 = 2.64 m^2

In 750 revolutions area of the road covered = 750 × 2.64 m^2 = 1980 m^2

Q10. A company packages its milk powder in a cylindrical container whose base has a diameter of 14 cm and a height of 20 cm. The 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: Visually, the area of the label on the cylinder will be equal to the lateral surface area of the container excluding the area covered by 2 cm gaps from top and bottom.

Height of the label h = 20 cm - 2 × 2 cm = 16 cm [Subtracting the 2 cm gaps from top and bottom]

Radius of the label = $\frac{14}{2}$ cm = 7 cm

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

Area of the label = Lateral surface area of the cylinder = 2πrh

= $2 \times \frac{22}{7} \times 7$ cm × 16 cm = **704 cm^2**

Thus, the area of the label is 704 cm^2.

Exercise 11.4

Q1. 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:

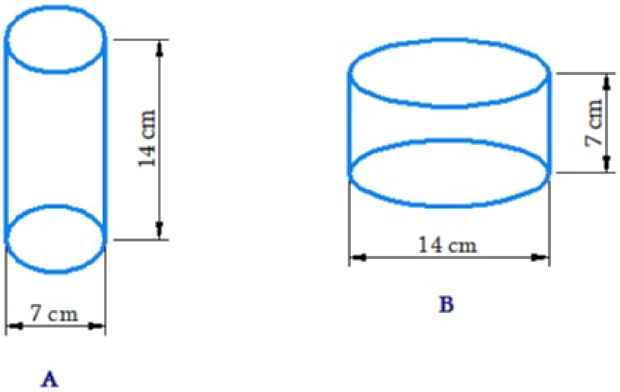
a) We have to find out the volume of the object to know the capacity of the tank.

b) We find the surface area of the region covered by a boundary, wall, or floor to know how many cement bags will be required.

c) The volume of the cylindrical tank should be found to know the number of smaller tanks that can be filled with water from it.

Q2. The diameter of cylinder A is 7 cm, and the height is 14 cm. The 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 cylinders. Check whether the cylinder with greater volume also has a greater surface area.

Answer:



From the diagram, the radius of cylinder A is half of cylinder B, so the volume of cylinder A will be less than that of cylinder B.

Let us verify the answer:

Radius of cylinder A(r) = $\frac{7}{2}$ cm = 3.5 cm

Height of cylinder A(h) = 14 cm

Volume of cylinder A = $\pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 7$ = **269.5 cm³**

Radius of cylinder B (r_1) = $\frac{14}{2}$ cm = 7 cm

Height of cylinder B (h_1) = 7 cm

Volume of cylinder B = $\pi r_1^2 h_1 = \frac{22}{7} \times 7 \times 7 \times 7$ = **1078 cm³**

CSA of cylinder A = $2\pi rh = 2 \times \frac{22}{7} \times 3.5 \times 14$ = **308 cm²**

Total surface area (TSA) of cylinder A = $2\pi r(r + h)$

$= 2\pi r^2 + 2\pi rh$

$= [2 \times \frac{22}{7} \times 3.5 \times 3.5]\ cm^2 + 308\ cm^2$ = **385 cm²**

CSA of cylinder B = $2\pi r_1 h_1 = 2 \times \frac{22}{7} \times 7 \times 7$ = **308 cm²**

Total surface area (TSA) of cylinder B = $2\pi r_1 (r_1 + h_1)$

$= 2\pi r_1^2 h_1 + 2\pi r_1 h_1$

$= (2 \times \frac{22}{7} \times 7 \times 7)$ cm² + 308 cm

= 308 cm² + 308 cm² = **616 cm²**

The curved surface area of both cylinders will be the same, but the total surface area will be greater in the cylinder with a greater radius. Thus, cylinder B has a greater volume as well as a greater surface area.

Q3. Find the height of a cuboid whose base area is 180 cm² and volume is 900 cm³?

Answer:

Given that,

Base area of cuboid = length × breadth = 180 cm²

Volume of cuboid = length × breadth × height = 900 cm³

Volume of a cuboid = Base area of cuboid × height of the cuboid

900 cm³ = 180 cm² × height

height = $\frac{900}{80}$ cm = 5 cm

Thus, the height of the cuboid is 5 cm.

Q4. A cuboid is of dimensions 60 cm × 54 cm × 30 cm. How many small cubes with sides 6 cm can be placed in the given cuboid?

Answer: We know that the volume of cuboid = l × b × h

= 60 cm × 54 cm × 30 cm = 97200 cm³

Side of the cube = 6 cm

Volume of the cube = side³ = 6³ = 216 cm³

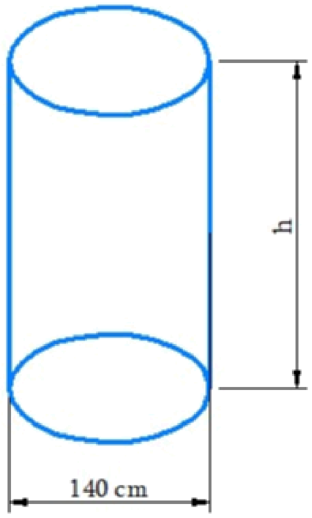
Required number of cubes = $\frac{\text{volume of cuboid}}{\text{volume of the cube}}$

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

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

Q5. Find the height of the cylinder whose volume is 1.54 m³ and the diameter of the base is 140 cm.

Answer: Let's construct a cylinder with the given dimensions as shown below.



If the height of the cylinder = h

Radius of the base (r) = $\frac{140}{2}$ cm = 70 cm = 0.7 m

Given that the volume of the cylinder is 1.54 m^3

The volume of the cylinder = $\pi r^2 h$

$1.54 = \frac{22}{7} \times 0.7 \times 0.7 \times h$

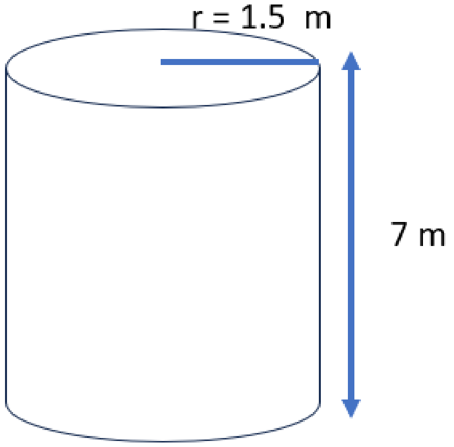
$h = \frac{1.54 \times 7}{0.7 \times 0.7 \times 22}$

h = 1 m

Thus, the height of the cylinder is 1 m.

Q6. A milk tank is in the form of a cylinder whose radius is 1.5 m and length is 7 m. Find the quantity of milk in liters that can be stored in the tank.

Answer: Given that the milk tank is in the form of a cylinder.



Radius of cylinder = 1.5 m

Length of cylinder h = 7 m

The volume of the cylinder = $\pi r^2 h = \frac{22}{7} \times (1.5)^2 \times 7 = 49.5\ m^3$

1 cubic meter = 1000 litres

So, 49.5 cubic meter = 49.5 × 1000 = 49500 litres

Thus, the quantity of milk that can be stored in the tank is 49500 litres.

Q7. 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:

Let the initial edge of the cube be 'l' cm.

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

(i) Initial surface area = $6\ l^2$

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

Ratio = $6\ l^2 : 24\ l^2$ = 1:4

Thus, **the surface is increased by 4 times**

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

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

Ratio = $l^3: 8\ l^3 = 1:8$

Thus, **the volume increases by 8 times**

Q8. Water is poured into a cuboidal reservoir at the rate of 60 liters per minute. If the volume of the reservoir is 108 m^3, find the number of hours it will take to fill the reservoir.

Answer: Given that the reservoir is cuboidal in shape.

The volume of the reservoir = 108 m^3 = 108 × 1000 litres = 108000 litres [Since 1 cubic meter = 1000 litre]

The volume of water flowing into the reservoir in 1 minute = 60 L

The volume of water pouring in the reservoir 1 hour = (60 × 60) Litres per hour = 3600 litres / hour

Thus, the required number of hours to fill the reservoir = $\frac{\text{Volume of the reservoir}}{\text{Volume of water pouring in the reservoir 1 hour}}$

⇨ $\frac{\text{Volume of the reservoir}}{\text{Volume of water pouring in the reservoir 1 hour}}$

⇨ $\frac{108000}{3600}$ hours = 30 hours

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