Chapter 11 - Mensuration Exercise Ex. 11.1

Solution 1

Perimeter of square = 4 (Side of the square) = 4 (60 m) = 240 m

Perimeter of rectangle = 2 (Length + Breadth)

= 2 (80 m + Breadth)

= 160 m + 2 × Breadth

It is given that the perimeter of the square and the rectangle are the same.

160 m + 2 × Breadth = 240 m

Breadth of the rectangle = $\left(\frac{80}{2}\right)$ m = 40 m

Area of square = $(\text{Side})^2 = (60 \text{ m})^2 = 3600 \text{ m}^2$

Area of rectangle = Length × Breadth = $(80 \times 40) \text{ m}^2 = 3200 \text{ m}^2$

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

Solution 2

Area of the square plot = $(25 \text{ m})^2 = 625 \text{ m}^2$

Area of the house = (15 m) × (20 m) =300 m^2

Area of the remaining portion = Area of square plot − Area of the house

= $625 \text{ m}^2 - 300 \text{ m}^2 = 325 \text{ m}^2$

The cost of developing the garden around the house is Rs 55 per m^2.

Total cost of developing the garden of area 325 m^2 = Rs (55 × 325)

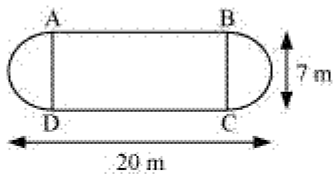
= Rs 17,875

Solution 3

Length of the rectangle = [20 − (3.5 + 3.5)] metres = 13 m

Circumference of 1 semi-circular part = $\pi r = \left(\frac{22}{7}\times 3.5\right)$ m = 11 m

Circumference of both semi-circular parts = (2 × 11) m = 22 m



Perimeter of the garden = AB + Length of both semi-circular regions BC and

DA + CD

= 13 m + 22 m + 13 m = 48 m

Area of the garden = Area of rectangle + 2 × Area of two semi-circular regions

$$=\left[(13\times 7)+2\times\frac{1}{2}\times\frac{22}{7}\times(3.5)^2\right]\ m^2$$
$$=(91+38.5)\ m^2$$
$$=129.5\ m^2$$

Solution 4

Area of parallelogram = Base × Height

Hence, area of one tile = 24 cm × 10 cm = 240 cm^2

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

$\frac{10800000}{240}$ = 45000 tiles

Thus, 45000 tiles are required to cover a floor of area 1080 m^2.

Solution 5

(a)Radius (r) of semi-circular part $= \left(\frac{2.8}{2}\right)$ cm $= 1.4$ cm

Perimeter of the given figure = 2.8 cm + πr

$= 2.8 \text{ cm} + \left(\frac{22}{7} \times 1.4\right) \text{ cm}$

$= 2.8 \text{ cm} + 4.4 \text{ cm}$

$= 7.2 \text{ cm}$

(b)Radius (r) of semi-circular part $= \left(\frac{2.8}{2}\right)$ cm $= 1.4$ cm

Perimeter of the given figure = 1.5 cm + 2.8 cm + 1.5 cm +π (1.4 cm)

$= 5.8 \text{ cm} + \frac{22}{7}(1.4 \text{ cm})$

$= 5.8 \text{ cm} + 4.4 \text{ cm}$

$= 10.2 \text{ cm}$

(c)Radius (r) of semi-circular part $= \left(\frac{2.8}{2}\right)$ cm $= 1.4$ cm

Perimeter of the figure(c) = 2 cm + πr + 2 cm

$= 4 \text{ cm} + \frac{22}{7} \times (1.4 \text{ cm})$

$= 4 \text{ cm} + 4.4 \text{ cm}$

$= 8.4 \text{cm}$

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

Chapter 11 - Mensuration Exercise Ex. 11.2

Solution 1

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

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

Solution 2

It is given that, area of trapezium = 34 cm^2 and height = 4 cm

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

Area of trapezium = $\frac{1}{2}$ x (Sum of parallel sides) × (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.

Solution 3

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

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

AB = 120 m − 105 m = 15 m

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

$$= \left[\frac{1}{2}(40+48)\times(15)\right]\text{ m}^2$$
$$= \left(\frac{1}{2}\times 88\times 15\right)\text{ m}^2$$
$$= 660\text{ m}^2$$

Solution 4

It is given that,

Length of the diagonal, $d = 24$ m

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

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

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

$= \frac{1}{2}(24\,\text{m})(21\,\text{m})$

$= 252\,\text{m}^2$

Thus, the area of the field is 252 m^2.

Solution 5

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

Therefore, area of the given rhombus

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

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

Solution 6

Let the length of the other diagonal of the rhombus be x.
A rhombus is a special case of a parallelogram.
We know that,
Area of a parallelogram = Base × Height
⇒ Area of a rhombus = 5 × 4. 8 = 24 cm^2
Also, Area of a rhombus = $\frac{1}{2}$(Product of its diagonals)
⇒ 24 = $\frac{1}{2}(8 \times x)$
⇒ x = $\frac{24 \times 2}{8} = 6$ cm
Thus, the length of the other diagonal of a rhombus is 6 cm.

Solution 7

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 cm^2

Area of 3000 tiles = (675 × 3000) cm^2 = 2025000 cm^2 = 202.5 m^2

The cost of polishing is Rs 4 per m^2.

Cost of polishing 202.5 m^2 area = Rs (4 × 202.5) = Rs 810

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

Solution 8

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)

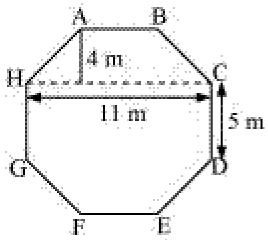
$$\Rightarrow 10500\ \text{m}^2 = \frac{1}{2}(l+2l)\times(100\ \text{m})$$

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

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

Thus, length of the field along the river = (2 × 70) m = 140 m

Solution 9



Side of regular octagon = 5 cm

Area of trapezium ABCH = Area of trapezium DEFG

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

Area of rectangle HGDC = 11 × 5 = 55 m^2

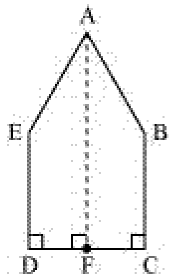
Area of octagon = Area of trapezium ABCH + Area of trapezium DEFG

+ Area of rectangle HGDC

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

Solution 10

Jyoti's way of finding area is as follows.

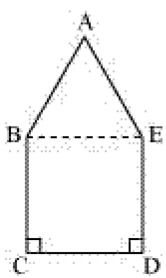


Area of pentagon = 2 (Area of trapezium ABCF)

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

$= 337.5 \text{ m}^2$

Kavita's way of finding area is as follows.



Area of pentagon = Area of ΔABE + Area of square BCDE

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

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

$$= (112.5 + 225) \text{ m}^2$$

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

Solution 11

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 cm − 20 cm = 8 cm

IB = CL = 4 cm

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

Area of section BEFC = Area of section DGHA

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

Area of section ABEH = Area of section CDGF

Chapter 11 - Mensuration Exercise Ex. 11.3

Solution 1

We know that,

Total surface area of the cuboid = 2 ($lh + bh + lb$)

Total surface area of the cube = 6 $(l)^2$

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

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

= (2 × 7400) cm^2

= 14800 cm^2

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

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

Solution 2

Total surface area of suitcase = 2[(80) (48) + (48) (24) + (24) (80)]

= 2[3840 + 1152 + 1920]

= 13824 cm^2

Total surface area of 100 suitcases = (13824 × 100) cm^2 = 1382400 cm^2

Required tarpaulin = Length × Breadth

1382400 cm^2 = Length × 96 cm

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

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

Solution 3

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

Let the length of each side of cube be l.

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

600 cm^2 = $6l^2$

l^2 = 100 cm^2

l = 10 cm

Thus, the side of the cube is 10 cm.

Solution 4

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 × 1.5 × (2 + 1) + (2) (1)] m^2

= [3(3) + 2] m^2

= (9 + 2) m^2

= 11 m^2

Solution 5

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 ×10] m^2

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

= 500 m^2

It is given that 100 m^2 area can be painted from each can.

Number of cans required to paint an area of 500 m^2

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

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

Solution 6

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.

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

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.

Solution 7

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^2 sheet of metal is required.

Solution 8

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)

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

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

$= 322\text{ cm}$

Solution 9

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

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

$= 1980 \text{ m}^2$

Solution 10

Height of the label = 20 cm − 2 cm − 2 cm = 16 cm

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

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

Area of the label = 2π (Radius) (Height)

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

Chapter 11 - Mensuration Exercise Ex. 11.4

Solution 1

(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.

Solution 2

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

We know that,

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.

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

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

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

$$= \left(\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14\right) \text{ cm}^3$$
$$= 539 \text{ cm}^3$$

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.

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

$$= \left[2\times\frac{22}{7}\times\frac{7}{2}\left(\frac{7}{2}+14\right)\right]\ \text{cm}^2$$
$$= \left[22\times\left(\frac{7+28}{2}\right)\right]\ \text{cm}^2$$
$$= \left(22\times\frac{35}{2}\right)\ \text{cm}^2$$
$$= 385\ \text{cm}^2$$

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.

Solution 3

Base area of the cuboid = Length × Breadth = 180 cm^2

Volume of cuboid = Length × Breadth × Height

900 cm^3 = 180 cm^2 × Height

$$\text{Height} = \frac{900}{180}\ \text{cm}$$

Thus, the height of the cuboid is 5 cm.

Solution 4

Volume of cuboid = 60 cm × 54 cm × 30 cm = 97200 cm^3

Side of the cube = 6 cm

Volume of the cube = $(6)^3$ cm^3 = 216 cm^3

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

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

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

Solution 5

Diameter of the base = 140 cm

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

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.

Solution 6

Radius of cylinder = 1.5 m

Length of cylinder = 7 m

Volume of cylinder $= \pi r^2 h$

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

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

Required quantity = (49.5×1000) L = 49500 L

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

Solution 7

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

Initial surface area = $6l^2$

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

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.

Solution 8

Volume of cuboidal reservoir = 108 m^3 = (108 × 1000) L = 108000 L

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

That is, (60 × 60) L = 3600 L per hour

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

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