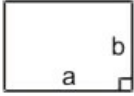
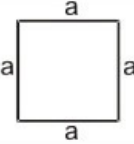
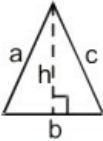
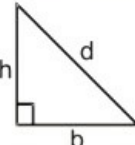
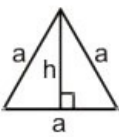
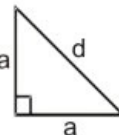
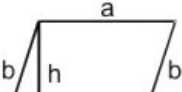
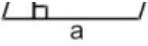
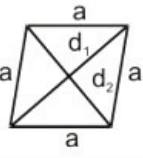
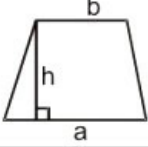
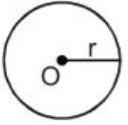
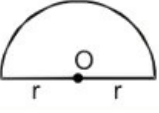




Mensuration

Exercise 20A

Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

			
Rhombus		$4a$	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \left(\frac{\theta}{360}\right) \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$

Q1

Answer :

(i) Length = 24.5 m

Breadth = 18 m

$$\begin{aligned}
 \therefore \text{Area of the rectangle} &= \text{Length} \times \text{Breadth} \\
 &= 24.5 \text{ m} \times 18 \text{ m} \\
 &= 441 \text{ m}^2
 \end{aligned}$$

(ii) Length = 12.5 m

Breadth = 8 dm = $(8 \times 10) = 80 \text{ cm} = 0.8 \text{ m}$ [since 1 dm = 10 cm and 1 m = 100 cm]

$$\begin{aligned}
 \therefore \text{Area of the rectangle} &= \text{Length} \times \text{Breadth} \\
 &= 12.5 \text{ m} \times 0.8 \text{ m} \\
 &= 10 \text{ m}^2
 \end{aligned}$$

Q2

Answer :

We know that all the angles of a rectangle are 90° and the diagonal divides the rectangle into two right angled triangles.

So, 48 m will be one side of the triangle and the diagonal, which is 50 m, will be the hypotenuse.

According to the Pythagoras theorem:

$$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$$

$$\text{Perpendicular} = \sqrt{(\text{Hypotenuse})^2 - (\text{Base})^2}$$

$$\text{Perpendicular} = \sqrt{(50)^2 - (48)^2} = \sqrt{2500 - 2304} = \sqrt{196} = 14 \text{ m}$$

\therefore Other side of the rectangular plot = 14 m

Length = 48m

Breadth = 14m

\therefore Area of the rectangular plot = $48 \text{ m} \times 14 \text{ m} = 672 \text{ m}^2$

Hence, the area of a rectangular plot is 672 m^2 .

Q3

Answer :

Let the length of the field be $4x \text{ m}$.

Breadth = $3x \text{ m}$

\therefore Area of the field = $(4x \times 3x) \text{ m}^2 = 12x^2 \text{ m}^2$

But it is given that the area is 1728 m^2 .

$$\therefore 12x^2 = 1728$$

$$\Rightarrow x^2 = \left(\frac{1728}{12}\right) = 144$$

$$\Rightarrow x = \sqrt{144} = 12$$

\therefore Length = $(4 \times 12) \text{ m} = 48 \text{ m}$

Breadth = $(3 \times 12) \text{ m} = 36 \text{ m}$

\therefore Perimeter of the field = $2(l + b) \text{ units}$

$$= 2(48 + 36) \text{ m} = (2 \times 84) \text{ m} = 168 \text{ m}$$

\therefore Cost of fencing = Rs $(168 \times 30) = \text{Rs } 5040$

Q4

Answer :

Area of the rectangular field = 3584 m²

Length of the rectangular field = 64 m

Breadth of the rectangular field = $\left(\frac{\text{Area}}{\text{Length}}\right) = \left(\frac{3584}{64}\right) \text{ m} = 56 \text{ m}$

Perimeter of the rectangular field = 2 (length + breadth)
= 2(64 + 56) m = (2 × 120) m = 240 m

Distance covered by the boy = 5 × Perimeter of the rectangular field
= 5 × 240 = 1200 m

The boy walks at the rate of 6 km/hr.

or

Rate = $\left(\frac{6 \times 1000}{60}\right) \text{ m/min} = 100 \text{ m/min.}$

∴ Required time to cover a distance of 1200 m = $\left(\frac{1200}{100}\right) \text{ min} = 12 \text{ min}$

Hence, the boy will take 12 minutes to go five times around the field.

Q5

Answer :

Given:

Length of the verandah = 40 m = 400 dm [since 1 m = 10 dm]

Breadth of the verandah = 15 m = 150 dm

∴ Area of the verandah = (400 × 150) dm² = 60000 dm²

Length of a stone = 6 dm

Breadth of a stone = 5 dm

∴ Area of a stone = (6 × 5) dm² = 30 dm²

∴ Total number of stones needed to pave the verandah = $\frac{\text{Area of the verandah}}{\text{Area of each stone}}$

$$= \left(\frac{60000}{30}\right) = 2000$$

Q6

Answer :

Area of the carpet = Area of the room

$$= (13 \text{ m} \times 9 \text{ m}) = 117 \text{ m}^2$$

Now, width of the carpet = 75 cm (given)

$$= 0.75 \text{ m} \quad [\text{since } 1 \text{ m} = 100 \text{ cm}]$$

Length of the carpet = $\left(\frac{\text{Area of the carpet}}{\text{Width of the carpet}}\right) = \left(\frac{117}{0.75}\right) \text{ m} = 156 \text{ m}$

Rate of carpeting = Rs 105 per m

∴ Total cost of carpeting = Rs (156 × 105) = Rs 16380

Hence, the total cost of carpeting the room is Rs 16380.

Q7

Answer :

Given:

Length of the room = 15 m

Width of the carpet = 75 cm = 0.75 m (since 1 m = 100 cm)

Let the length of the carpet required for carpeting the room be x m.

Cost of the carpet = Rs. 80 per m

\therefore Cost of x m carpet = Rs. $(80 \times x)$ = Rs. $(80x)$

Cost of carpeting the room = Rs. 19200

$\therefore 80x = 19200 \Rightarrow x = \left(\frac{19200}{80}\right) = 240$

Thus, the length of the carpet required for carpeting the room is 240 m.

Area of the carpet required for carpeting the room = Length of the carpet \times Width of the carpet
 $= (240 \times 0.75) \text{ m}^2 = 180 \text{ m}^2$

Let the width of the room be b m.

Area to be carpeted = $15 \text{ m} \times b \text{ m} = 15b \text{ m}^2$

$\therefore 15b \text{ m}^2 = 180 \text{ m}^2$

$\Rightarrow b = \left(\frac{180}{15}\right) \text{ m} = 12 \text{ m}$

Hence, the width of the room is 12 m.

Q8

Answer :

Total cost of fencing a rectangular piece = Rs. 9600

Rate of fencing = Rs. 24

\therefore Perimeter of the rectangular field = $\left(\frac{\text{Total cost of fencing}}{\text{Rate of fencing}}\right) \text{ m} = \left(\frac{9600}{24}\right) \text{ m} = 400 \text{ m}$

Let the length and breadth of the rectangular field be $5x$ and $3x$, respectively.

Perimeter of the rectangular land = $2(5x + 3x) = 16x$

But the perimeter of the given field is 400 m.

$\therefore 16x = 400$

$x = \left(\frac{400}{16}\right) = 25$

Length of the field = $(5 \times 25) \text{ m} = 125 \text{ m}$

Breadth of the field = $(3 \times 25) \text{ m} = 75 \text{ m}$

Q9

Answer :

$$\begin{aligned}\text{Length of the diagonal of the room} &= \sqrt{l^2 + b^2 + h^2} \\ &= \sqrt{(10)^2 + (10)^2 + (5)^2} \text{ m} \\ &= \sqrt{100 + 100 + 25} \text{ m} \\ &= \sqrt{225} \text{ m} = 15 \text{ m}\end{aligned}$$

Hence, length of the largest pole that can be placed in the given hall is 15 m.

Q10

Answer :

Side of the square = 8.5 m

$$\begin{aligned}\therefore \text{Area of the square} &= (\text{Side})^2 \\ &= (8.5 \text{ m})^2 \\ &= 72.25 \text{ m}^2\end{aligned}$$

Q11

Answer :

(i) Diagonal of the square = 72 cm

$$\begin{aligned}\therefore \text{Area of the square} &= \left[\frac{1}{2} \times (\text{Diagonal})^2\right] \text{ sq. unit} \\ &= \left[\frac{1}{2} \times (72)^2\right] \text{ cm}^2 \\ &= 2592 \text{ cm}^2\end{aligned}$$

(ii) Diagonal of the square = 2.4 m

$$\begin{aligned}\therefore \text{Area of the square} &= \left[\frac{1}{2} \times (\text{Diagonal})^2\right] \text{ sq. unit} \\ &= \left[\frac{1}{2} \times (2.4)^2\right] \text{ m}^2 \\ &= 2.88 \text{ m}^2\end{aligned}$$

Q12

Answer :

We know:

$$\text{Area of a square} = \left\{ \frac{1}{2} \times (\text{Diagonal})^2 \right\} \text{ sq. units}$$

$$\begin{aligned} \text{Diagonal of the square} &= \sqrt{2 \times \text{Area of square units}} \\ &= (\sqrt{2 \times 16200}) \text{ m} = 180 \text{ m} \end{aligned}$$

$$\therefore \text{Length of the diagonal of the square} = 180 \text{ m}$$

Q13

Answer :

$$\text{Area of the square} = \left\{ \frac{1}{2} \times (\text{Diagonal})^2 \right\} \text{ sq. units}$$

Given:

$$\text{Area of the square field} = \frac{1}{2} \text{ hectare}$$

$$= \left(\frac{1}{2} \times 10000 \right) \text{ m}^2 = 5000 \text{ m}^2 \quad [\text{since } 1 \text{ hectare} = 10000 \text{ m}^2]$$

$$\text{Diagonal of the square} = \sqrt{2 \times \text{Area of the square}}$$

$$= (\sqrt{2 \times 5000}) \text{ m} = 100 \text{ m}$$

$$\therefore \text{Length of the diagonal of the square field} = 100 \text{ m}$$

Q14

Answer :

$$\text{Area of the square plot} = 6084 \text{ m}^2$$

$$\begin{aligned} \text{Side of the square plot} &= (\sqrt{\text{Area}}) \\ &= (\sqrt{6084}) \text{ m} \\ &= (\sqrt{78 \times 78}) \text{ m} = 78 \text{ m} \end{aligned}$$

$$\therefore \text{Perimeter of the square plot} = 4 \times \text{side} = (4 \times 78) \text{ m} = 312 \text{ m}$$

312 m wire is needed to go along the boundary of the square plot once.

Required length of the wire that can go four times along the boundary = 4 × Perimeter of the square plot

$$= (4 \times 312) \text{ m} = 1248 \text{ m}$$

Q15

Answer :

Side of the square = 10 cm

Length of the wire = Perimeter of the square = $4 \times \text{Side} = 4 \times 10 \text{ cm} = 40 \text{ cm}$

Length of the rectangle (l) = 12 cm

Let b be the breadth of the rectangle.

Perimeter of the rectangle = Perimeter of the square

$$\Rightarrow 2(l + b) = 40$$

$$\Rightarrow 2(12 + b) = 40$$

$$\Rightarrow 24 + 2b = 40$$

$$\Rightarrow 2b = 40 - 24 = 16$$

$$\Rightarrow b = \left(\frac{16}{2}\right) \text{ cm} = 8 \text{ cm}$$

\therefore Breadth of the rectangle = 8 cm

Now, Area of the square = $(\text{Side})^2 = (10 \text{ cm} \times 10 \text{ cm}) = 100 \text{ cm}^2$

Area of the rectangle = $l \times b = (12 \text{ cm} \times 8 \text{ cm}) = 96 \text{ cm}^2$

Hence, the square encloses more area.

It encloses 4 cm^2 more area.

Q16

Answer :

Given:

Length = 50 m

Breadth = 40 m

Height = 10 m

Area of the four walls = $\{2h(l + b)\}$ sq. unit

$$= \{2 \times 10 \times (50 + 40)\} \text{ m}^2$$

$$= \{20 \times 90\} \text{ m}^2 = 1800 \text{ m}^2$$

Area of the ceiling = $l \times b = (50 \text{ m} \times 40 \text{ m}) = 2000 \text{ m}^2$

\therefore Total area to be white washed = $(1800 + 2000) \text{ m}^2 = 3800 \text{ m}^2$

Rate of white washing = Rs 20/sq. metre

\therefore Total cost of white washing = Rs $(3800 \times 20) = \text{Rs } 76000$

Q17

Answer :

Let the length of the room be l m.

Given:

Breadth of the room = 10 m

Height of the room = 4 m

Area of the four walls = $[2(l + b)h]$ sq units.

$$= 168 \text{ m}^2$$

$$\therefore 168 = [2(l + 10) \times 4]$$

$$\Rightarrow 168 = [8l + 80]$$

$$\Rightarrow 168 - 80 = 8l$$

$$\Rightarrow 88 = 8l$$

$$\Rightarrow l = \left(\frac{88}{8}\right) \text{ m} = 11 \text{ m}$$

\therefore Length of the room = 11 m

Q18

Answer :

Given:

Length of the room = 7.5 m

Breadth of the room = 3.5 m

Area of the four walls = $[2(l + b)h]$ sq. units.

$$= 77 \text{ m}^2$$

$$\therefore 77 = [2(7.5 + 3.5)h]$$

$$\Rightarrow 77 = [(2 \times 11)h]$$

$$\Rightarrow 77 = 22h$$

$$\Rightarrow h = \left(\frac{77}{22}\right) \text{ m} = \left(\frac{7}{2}\right) \text{ m} = 3.5 \text{ m}$$

\therefore Height of the room = 3.5 m

Q19

Answer :

Let the breadth of the room be x m.

Length of the room = $2x$ m

Area of the four walls = $\{2(l + b) \times h\}$ sq. units

$$120 \text{ m}^2 = \{2(2x + x) \times 4\} \text{ m}^2$$

$$\Rightarrow 120 = \{8 \times 3x\}$$

$$\Rightarrow 120 = 24x$$

$$\Rightarrow x = \left(\frac{120}{24}\right) = 5$$

\therefore Length of the room = $2x = (2 \times 5) \text{ m} = 10 \text{ m}$

Breadth of the room = $x = 5 \text{ m}$

\therefore Area of the floor = $l \times b = (10 \text{ m} \times 5 \text{ m}) = 50 \text{ m}^2$

Q20

Answer :

Length = 8.5 m

Breadth = 6.5 m

Height = 3.4 m

Area of the four walls = $\{2(l + b) \times h\}$ sq. units

$$= \{2(8.5 + 6.5) \times 3.4\} \text{ m}^2 = \{30 \times 3.4\} \text{ m}^2 = 102 \text{ m}^2$$

Area of one door = $(1.5 \times 1) \text{ m}^2 = 1.5 \text{ m}^2$

\therefore Area of two doors = $(2 \times 1.5) \text{ m}^2 = 3 \text{ m}^2$

Area of one window = $(2 \times 1) \text{ m}^2 = 2 \text{ m}^2$

\therefore Area of two windows = $(2 \times 2) \text{ m}^2 = 4 \text{ m}^2$

Total area of two doors and two windows = $(3 + 4) \text{ m}^2$
 $= 7 \text{ m}^2$

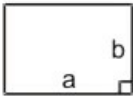
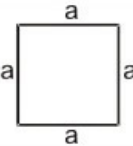
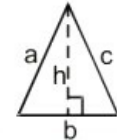
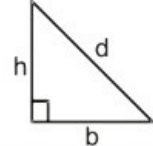
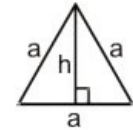
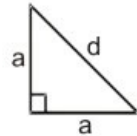
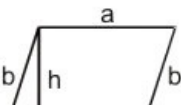
Area to be painted = $(102 - 7) \text{ m}^2 = 95 \text{ m}^2$

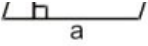
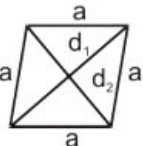
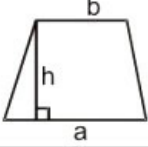
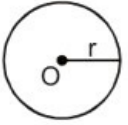
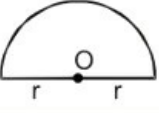
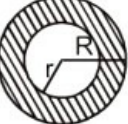

Rate of painting = Rs 160 per m^2

Total cost of painting = Rs (95×160) = Rs 15200

Mensuration

Exercise 20B

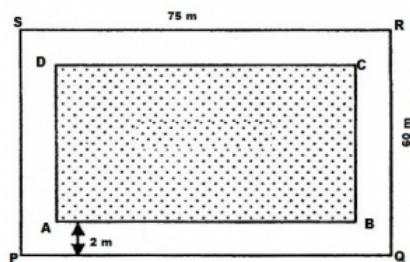
Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

			
Rhombus		$4a$	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \frac{(\theta/360)}{\times} 2\pi r$	$\frac{\theta}{360} \times \pi r^2$

Q1

Answer :

Let PQRS be the given grassy plot and ABCD be the inside boundary of the path.



Length = 75 m

Breadth = 60 m

Area of the plot = $(75 \times 60) \text{ m}^2 = 4500 \text{ m}^2$

Width of the path = 2 m

$\therefore AB = (75 - 2 \times 2) \text{ m} = (75 - 4) \text{ m} = 71 \text{ m}$

$AD = (60 - 2 \times 2) \text{ m} = (60 - 4) \text{ m} = 56 \text{ m}$

Area of rectangle ABCD = $(71 \times 56) \text{ m}^2 = 3976 \text{ m}^2$

Area of the path = (Area of PQRS - Area of ABCD)
 $= (4500 - 3976) \text{ m}^2 = 524 \text{ m}^2$

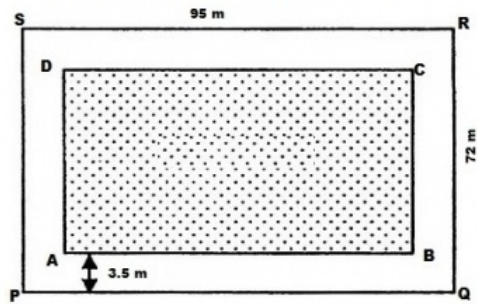
Rate of constructing the path = Rs 125 per m^2

\therefore Total cost of constructing the path = Rs $(524 \times 125) = \text{Rs } 65,500$

Q2

Answer :

Let PQRS be the given rectangular plot and ABCD be the inside boundary of the path.



Length = 95 m

Breadth = 72 m

Area of the plot = $(95 \times 72) \text{ m}^2 = 6,840 \text{ m}^2$

Width of the path = 3.5 m

$\therefore AB = (95 - 2 \times 3.5) \text{ m} = (95 - 7) \text{ m} = 88 \text{ m}$

$AD = (72 - 2 \times 3.5) \text{ m} = (72 - 7) \text{ m} = 65 \text{ m}$

Area of the path = (Area PQRS - Area ABCD)
 $= (6840 - 5720) \text{ m}^2 = 1,120 \text{ m}^2$

Rate of constructing the path = Rs. 80 per m^2

\therefore Total cost of constructing the path = Rs. $(1,120 \times 80) = \text{Rs. } 89,600$

Rate of laying the grass on the plot ABCD = Rs. 40 per m^2

\therefore Total cost of laying the grass on the plot = Rs. $(5,720 \times 40) = \text{Rs. } 2,28,800$

\therefore Total expenses involved = Rs. $(89,600 + 2,28,800) = \text{Rs. } 3,18,400$

Q3

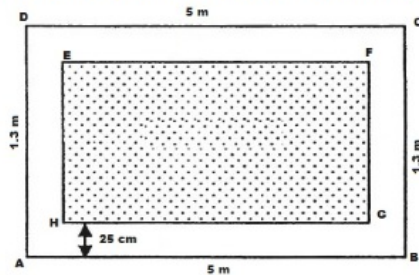
Answer :

Let ABCD be the saree and EFGH be the part of saree without border.

Length, AB = 5 m

Breadth, BC = 1.3 m

Width of the border of the saree = 25 cm = 0.25 m



\therefore Area of ABCD = $5 \text{ m} \times 1.3 \text{ m} = 6.5 \text{ m}^2$

Length, GH = $\{5 - (0.25 + 0.25)\} \text{ m} = 4.5 \text{ m}$

Breadth, FG = $\{1.3 - 0.25 + 0.25\} \text{ m} = 0.8 \text{ m}$

\therefore Area of EFGH = $4.5 \text{ m} \times 0.8 \text{ m} = 3.6 \text{ m}^2$

Area of the border = Area of ABCD - Area of EFGH
 $= 6.5 \text{ m}^2 - 3.6 \text{ m}^2$
 $= 2.9 \text{ m}^2 = 29000 \text{ cm}^2$ [since $1 \text{ m}^2 = 10000 \text{ cm}^2$]

Rate of printing the border = Rs 1 per 10 cm^2

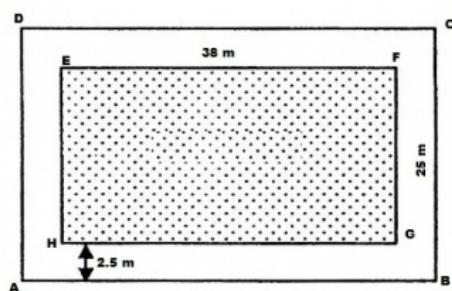
\therefore Total cost of printing the border = Rs $\left(\frac{1 \times 29000}{10}\right)$
 $= \text{Rs } 2900$

Q4

Answer :

Length, EF = 38 m

Breadth, FG = 25 m



$$\therefore \text{Area of EFGH} = 38 \text{ m} \times 25 \text{ m} = 950 \text{ m}^2$$

Length, AB = (38 + 2.5 + 2.5) m = 43 m

Breadth, BC = (25 + 2.5 + 2.5) m = 30 m

$$\therefore \text{Area of ABCD} = 43 \text{ m} \times 30 \text{ m} = 1290 \text{ m}^2$$

$$\begin{aligned} \text{Area of the path} &= \text{Area of ABCD} - \text{Area of PQRS} \\ &= 1290 \text{ m}^2 - 950 \text{ m}^2 \\ &= 340 \text{ m}^2 \end{aligned}$$

Rate of gravelling the path = Rs 120 per m^2

$$\begin{aligned} \therefore \text{Total cost of gravelling the path} &= \text{Rs } (120 \times 340) \\ &= \text{Rs } 40800 \end{aligned}$$

Q5

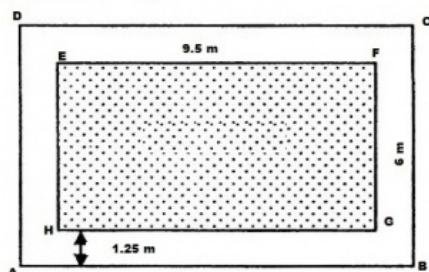
Answer :

Let EFGH denote the floor of the room.

The white region represents the floor of the 1.25 m verandah.

Length, EF = 9.5 m

Breadth, FG = 6 m



$$\therefore \text{Area of EFGH} = 9.5 \text{ m} \times 6 \text{ m} = 57 \text{ m}^2$$

Length, AB = (9.5 + 1.25 + 1.25) m = 12 m

Breadth, BC = (6 + 1.25 + 1.25) m = 8.5 m

$$\therefore \text{Area of ABCD} = 12 \text{ m} \times 8.5 \text{ m} = 102 \text{ m}^2$$

$$\begin{aligned}
 \text{Area of the verandah} &= \text{Area of ABCD} - \text{Area of EFGH} \\
 &= 102 \text{ m}^2 - 57 \text{ m}^2 \\
 &= 45 \text{ m}^2
 \end{aligned}$$

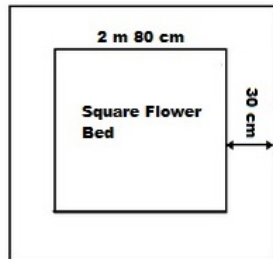
Rate of cementing the verandah = Rs 80 per m^2

$$\begin{aligned}
 \therefore \text{Total cost of cementing the verandah} &= \text{Rs } (80 \times 45) \\
 &= \text{Rs } 3600
 \end{aligned}$$

Q6

Answer :

Side of the flower bed = 2 m 80 cm = 2.80 m [since 100 cm = 1 m]



$$\therefore \text{Area of the square flower bed} = (\text{Side})^2 = (2.80 \text{ m})^2 = 7.84 \text{ m}^2$$

$$\begin{aligned}
 \text{Side of the flower bed with the digging strip} &= 2.80 \text{ m} + 30 \text{ cm} + 30 \text{ cm} \\
 &= (2.80 + 0.3 + 0.3) \text{ m} = 3.4 \text{ m}
 \end{aligned}$$

$$\text{Area of the enlarged flower bed with the digging strip} = (\text{Side})^2 = (3.4)^2 = 11.56 \text{ m}^2$$

$$\begin{aligned}
 \therefore \text{Increase in the area of the flower bed} &= 11.56 \text{ m}^2 - 7.84 \text{ m}^2 \\
 &= 3.72 \text{ m}^2
 \end{aligned}$$

Q7

Answer :

Let the length and the breadth of the park be $2x$ m and x m, respectively.

$$\text{Perimeter of the park} = 2(2x + x) = 240 \text{ m}$$

$$\Rightarrow 2(2x + x) = 240$$

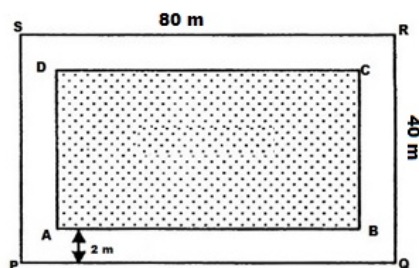
$$\Rightarrow 6x = 240$$

$$\Rightarrow x = \left(\frac{240}{6}\right) \text{ m} = 40 \text{ m}$$

$$\therefore \text{Length of the park} = 2x = (2 \times 40) = 80 \text{ m}$$

$$\text{Breadth} = x = 40 \text{ m}$$

Let PQRS be the given park and ABCD be the inside boundary of the path.



$$\text{Length} = 80 \text{ m}$$

$$\text{Breadth} = 40 \text{ m}$$

$$\text{Area of the park} = (80 \times 40) \text{ m}^2 = 3200 \text{ m}^2$$

$$\text{Width of the path} = 2 \text{ m}$$

$$\therefore AB = (80 - 2 \times 2) \text{ m} = (80 - 4) \text{ m} = 76 \text{ m}$$

$$AD = (40 - 2 \times 2) \text{ m} = (40 - 4) \text{ m} = 36 \text{ m}$$

$$\text{Area of the rectangle ABCD} = (76 \times 36) \text{ m}^2 = 2736 \text{ m}^2$$

$$\begin{aligned}
 \text{Area of the path} &= (\text{Area of PQRS} - \text{Area of ABCD}) \\
 &= (3200 - 2736) \text{ m}^2 = 464 \text{ m}^2
 \end{aligned}$$

$$\text{Rate of paving the path} = \text{Rs. } 80 \text{ per m}^2$$

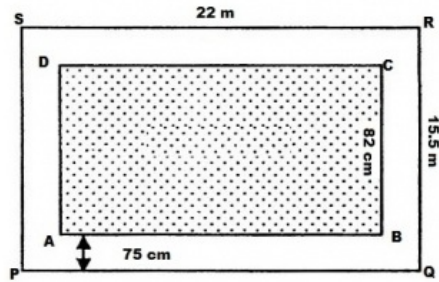
$$\therefore \text{Total cost of paving the path} = \text{Rs. } (464 \times 80) = \text{Rs. } 37,120$$

Q8

Answer :

Length of the hall, PQ = 22 m

Breadth of the hall, QR = 15.5 m



$$\therefore \text{Area of the school hall PQRS} = 22 \text{ m} \times 15.5 \text{ m} = 341 \text{ m}^2$$

$$\text{Length of the carpet, AB} = 22 \text{ m} - (0.75 \text{ m} + 0.75 \text{ m}) = 20.5 \text{ m} \quad [\text{since } 100 \text{ cm} = 1 \text{ m}]$$

$$\text{Breadth of the carpet, BC} = 15.5 \text{ m} - (0.75 \text{ m} + 0.75 \text{ m}) = 14 \text{ m}$$

$$\therefore \text{Area of the carpet ABCD} = 20.5 \text{ m} \times 14 \text{ m} = 287 \text{ m}^2$$

$$\begin{aligned} \text{Area of the strip} &= \text{Area of the school hall (PQRS)} - \text{Area of the carpet (ABCD)} \\ &= 341 \text{ m}^2 - 287 \text{ m}^2 \\ &= 54 \text{ m}^2 \end{aligned}$$

$$\text{Area of 1 m length of the carpet} = 1 \text{ m} \times 0.82 \text{ m} = 0.82 \text{ m}^2$$

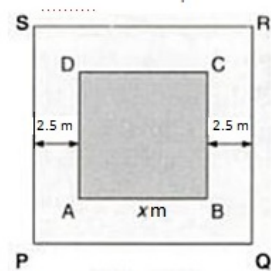
$$\therefore \text{Length of the carpet whose area is } 287 \text{ m}^2 = 287 \text{ m}^2 \div 0.82 \text{ m}^2 = 350 \text{ m}$$

$$\text{Cost of the 350 m long carpet} = \text{Rs } 60 \times 350 = \text{Rs } 21000$$

Q9

Answer :

Let ABCD be the square lawn and PQRS be the outer boundary of the square path.



Let a side of the lawn (AB) be x m.

$$\text{Area of the square lawn} = x^2$$

$$\text{Length, PQ} = (x \text{ m} + 2.5 \text{ m} + 2.5 \text{ m}) = (x + 5) \text{ m}$$

$$\therefore \text{Area of PQRS} = (x + 5)^2 = (x^2 + 10x + 25) \text{ m}^2$$

$$\text{Area of the path} = \text{Area of PQRS} - \text{Area of the square lawn (ABCD)}$$

$$\Rightarrow 165 = x^2 + 10x + 25 - x^2$$

$$\Rightarrow 165 = 10x + 25$$

$$\Rightarrow 165 - 25 = 10x$$

$$\Rightarrow 140 = 10x$$

$$\therefore x = 140 \div 10 = 14$$

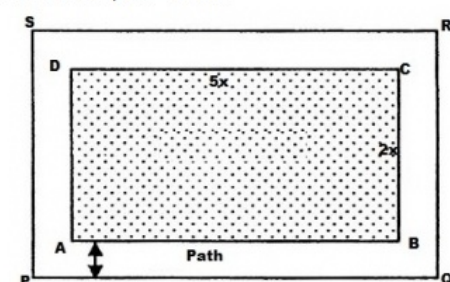
$$\therefore \text{Side of the lawn} = 14 \text{ m}$$

$$\therefore \text{Area of the lawn} = (\text{Side})^2 = (14 \text{ m})^2 = 196 \text{ m}^2$$

Q10

Answer :

$$\text{Area of the path} = 305 \text{ m}^2$$



Let the length of the park be $5x$ m and the breadth of the park be $2x$ m.

$$\therefore \text{Area of the rectangular park} = 5x \times 2x = 10x^2 \text{ m}^2$$

Width of the path = 2.5 m

$$\text{Outer length, } PQ = 5x \text{ m} + 2.5 \text{ m} + 2.5 \text{ m} = (5x + 5) \text{ m}$$

$$\text{Outer breadth, } QR = 2x + 2.5 \text{ m} + 2.5 \text{ m} = (2x + 5) \text{ m}$$

$$\text{Area of } PQRS = (5x + 5) \times (2x + 5) = (10x^2 + 25x + 10x + 25) = (10x^2 + 35x + 25) \text{ m}^2$$

$$\therefore \text{Area of the path} = [(10x^2 + 35x + 25) - 10x^2] \text{ m}^2$$

$$\Rightarrow 305 = 35x + 25$$

$$\Rightarrow 305 - 25 = 35x$$

$$\Rightarrow 280 = 35x$$

$$\Rightarrow x = 280 \div 35 = 8$$

$$\therefore \text{Length of the park} = 5x = 5 \times 8 = 40 \text{ m}$$

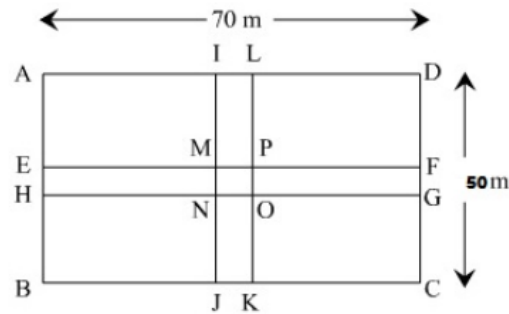
$$\text{Breadth of the park} = 2x = 2 \times 8 = 16 \text{ m}$$

Q11

Answer :

Let $ABCD$ be the rectangular park.

Let $EFGH$ and $IJKL$ be the two rectangular roads with width 5 m.



Length of the rectangular park, $AD = 70 \text{ m}$

Breadth of the rectangular park, $CD = 50 \text{ m}$

$$\therefore \text{Area of the rectangular park} = \text{Length} \times \text{Breadth} = 70 \text{ m} \times 50 \text{ m} = 3500 \text{ m}^2$$

$$\text{Area of road } EFGH = 70 \text{ m} \times 5 \text{ m} = 350 \text{ m}^2$$

$$\text{Area of road } IJKL = 50 \text{ m} \times 5 \text{ m} = 250 \text{ m}^2$$

Clearly, area of $MNOP$ is common to both the two roads.

$$\therefore \text{Area of } MNOP = 5 \text{ m} \times 5 \text{ m} = 25 \text{ m}^2$$

$$\text{Area of the roads} = \text{Area } (EFGH) + \text{Area } (IJKL) - \text{Area } (MNOP)$$

$$= (350 + 250) \text{ m}^2 - 25 \text{ m}^2 = 575 \text{ m}^2$$

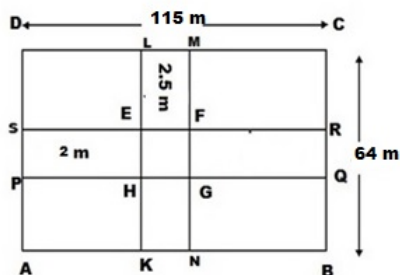
It is given that the cost of constructing the roads is Rs. 120/m².

$$\begin{aligned} \text{Cost of constructing } 575 \text{ m}^2 \text{ area of the roads} &= \text{Rs. } (120 \times 575) \\ &= \text{Rs. } 69000 \end{aligned}$$

Q12

Answer :

Let $ABCD$ be the rectangular field and $PQRS$ and $KLMN$ be the two rectangular roads with width 2 m and 2.5 m, respectively.



Length of the rectangular field, $CD = 115 \text{ m}$

Breadth of the rectangular field, $BC = 64 \text{ m}$

$$\therefore \text{Area of the rectangular lawn } ABCD = 115 \text{ m} \times 64 \text{ m} = 7360 \text{ m}^2$$

$$\text{Area of the road } PQRS = 115 \text{ m} \times 2 \text{ m} = 230 \text{ m}^2$$

$$\text{Area of the road } KLMN = 64 \text{ m} \times 2.5 \text{ m} = 160 \text{ m}^2$$

Clearly, the area of EFGH is common to both the two roads.

$$\therefore \text{Area of EFGH} = 2 \text{ m} \times 2.5 \text{ m} = 5 \text{ m}^2$$

$$\begin{aligned} \therefore \text{Area of the roads} &= \text{Area (KLMN)} + \text{Area (PQRS)} - \text{Area (EFGH)} \\ &= (230 \text{ m}^2 + 160 \text{ m}^2) - 5 \text{ m}^2 = 385 \text{ m}^2 \end{aligned}$$

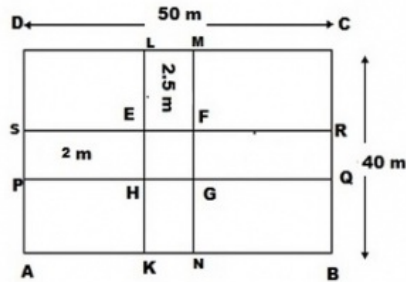
Rate of gravelling the roads = Rs 60 per m^2

$$\begin{aligned} \therefore \text{Total cost of gravelling the roads} &= \text{Rs } (385 \times 60) \\ &= \text{Rs } 23,100 \end{aligned}$$

Q13

Answer :

Let ABCD be the rectangular field and KLMN and PQRS be the two rectangular roads with width 2.5 m and 2 m, respectively.



Length of the rectangular field CD = 50 m

Breadth of the rectangular field BC = 40 m

$$\therefore \text{Area of the rectangular field ABCD} = 50 \text{ m} \times 40 \text{ m} = 2000 \text{ m}^2$$

$$\text{Area of road KLMN} = 40 \text{ m} \times 2.5 \text{ m} = 100 \text{ m}^2$$

$$\text{Area of road PQRS} = 50 \text{ m} \times 2 \text{ m} = 100 \text{ m}^2$$

Clearly, area of EFGH is common to both the two roads.

$$\therefore \text{Area of EFGH} = 2.5 \text{ m} \times 2 \text{ m} = 5 \text{ m}^2$$

$$\begin{aligned} \therefore \text{Area of the roads} &= \text{Area (KLMN)} + \text{Area (PQRS)} - \text{Area (EFGH)} \\ &= (100 \text{ m}^2 + 100 \text{ m}^2) - 5 \text{ m}^2 = 195 \text{ m}^2 \end{aligned}$$

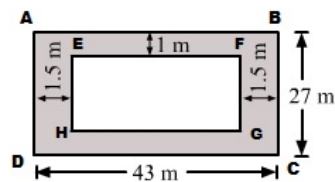
Area of the remaining portion of the field = Area of the rectangular field (ABCD) – Area of the roads

$$\begin{aligned} &= (2000 - 195) \text{ m}^2 \\ &= 1805 \text{ m}^2 \end{aligned}$$

Q14

Answer :

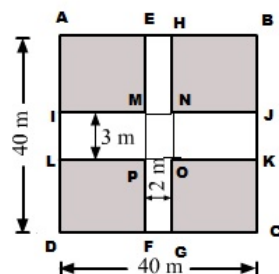
(i) Complete the rectangle as shown below:



Area of the shaded region = [Area of rectangle ABCD - Area of rectangle EFGH] sq. units

$$\begin{aligned} &= [(43 \text{ m} \times 27 \text{ m}) - \{(43 - 2 \times 1.5) \text{ m} \times (27 - 1 \times 2) \text{ m}\}] \\ &= [(43 \text{ m} \times 27 \text{ m}) - \{40 \text{ m} \times 25 \text{ m}\}] \\ &= 1161 \text{ m}^2 - 1000 \text{ m}^2 \\ &= 161 \text{ m}^2 \end{aligned}$$

(ii) Complete the rectangle as shown below:



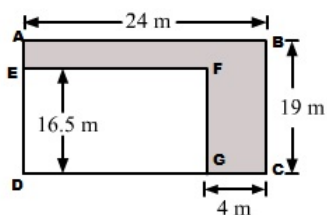
Area of the shaded region = [Area of square ABCD - {(Area of EFGH) + (Area of IJKL) - (Area of MNOP)}] sq. units

$$\begin{aligned}
 &= [(40 \times 40) - \{(40 \times 2) + (40 \times 3) - (2 \times 3)\}] \text{ m}^2 \\
 &= [1600 - \{(80 + 120 - 6)\}] \text{ m}^2 \\
 &= [1600 - 194] \text{ m}^2 \\
 &= 1406 \text{ m}^2
 \end{aligned}$$

Q15

Answer :

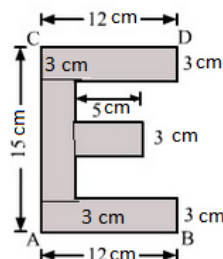
(i) Complete the rectangle as shown below:



Area of the shaded region = [Area of rectangle ABCD - Area of rectangle EFGD] sq. units

$$\begin{aligned}
 &= [(AB \times BC) - (DG \times GF)] \text{ m}^2 \\
 &= [(24 \times 19 \text{ m}) - \{(24 - 4) \times 16.5 \text{ m}\}] \\
 &= [(24 \times 19 \text{ m}) - (20 \times 16.5 \text{ m})] \\
 &= (456 - 330) \text{ m}^2 = 126 \text{ m}^2
 \end{aligned}$$

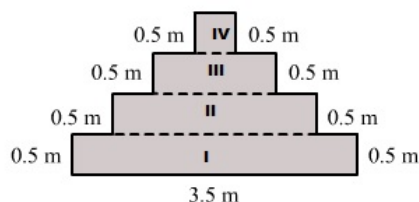
(ii) Complete the rectangle by drawing lines as shown below:



$$\begin{aligned}
 \text{Area of the shaded region} &= \{(12 \times 3) + (12 \times 3) + (5 \times 3) + \{(15 - 3 - 3) \times 3\}\} \text{ cm}^2 \\
 &= \{36 + 36 + 15 + 27\} \text{ cm}^2 \\
 &= 114 \text{ cm}^2
 \end{aligned}$$

Q16

Divide the given figure in four parts shown below:



Given:

Width of each part = 0.5 m

Now, we have to find the length of each part.

Length of part I = 3.5 m

Length of part II = (3.5 - 0.5 - 0.5) m = 2.5 m

Length of part III = (2.5 - 0.5 - 0.5) = 1.5 m

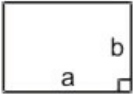
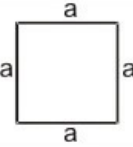
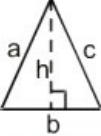
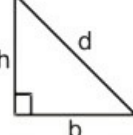
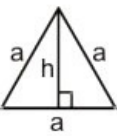
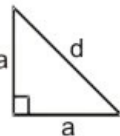
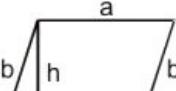
Length of part IV = (1.5 - 0.5 - 0.5) = 0.5 m

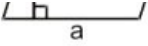
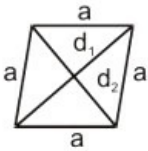
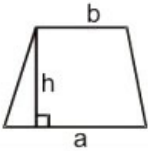
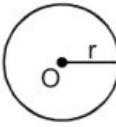
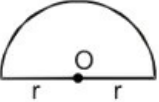
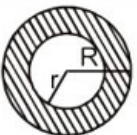

∴ Area of the shaded region = [Area of part (I) + Area of part (II) + Area of part (III) + Area of part (IV)] sq. units

$$\begin{aligned}
 &= [(3.5 \times 0.5) + (2.5 \times 0.5) + (1.5 \times 0.5) + (0.5 \times 0.5)] \text{ m}^2 \\
 &= [1.75 + 1.25 + 0.75 + 0.25] \text{ m}^2 \\
 &= 4 \text{ m}^2
 \end{aligned}$$

Mensuration

Exercise 20C

Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

			
Rhombus		$4a$	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \left(\frac{\theta}{360}\right) \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$

Q1

Answer :

Base = 32 cm

Height = 16.5 cm

$$\begin{aligned}
 \therefore \text{Area of the parallelogram} &= \text{Base} \times \text{Height} \\
 &= 32 \text{ cm} \times 16.5 \text{ cm} \\
 &= 528 \text{ cm}^2
 \end{aligned}$$

Q2

Answer :

$$\text{Base} = 1 \text{ m } 60 \text{ cm} = 1.6 \text{ m} \quad [\text{since } 100 \text{ cm} = 1 \text{ m}]$$

$$\text{Height} = 75 \text{ cm} = 0.75 \text{ m}$$

$$\begin{aligned}\therefore \text{Area of the parallelogram} &= \text{Base} \times \text{Height} \\ &= 1.6 \text{ m} \times 0.75 \text{ m} \\ &= 1.2 \text{ m}^2\end{aligned}$$

Q3

Answer :

$$(i) \text{ Base} = 14 \text{ dm} = (14 \times 10) \text{ cm} = 140 \text{ cm} \quad [\text{since } 1 \text{ dm} = 10 \text{ cm}]$$

$$\text{Height} = 6.5 \text{ dm} = (6.5 \times 10) \text{ cm} = 65 \text{ cm}$$

$$\begin{aligned}\text{Area of the parallelogram} &= \text{Base} \times \text{Height} \\ &= 140 \text{ cm} \times 65 \text{ cm} \\ &= 9100 \text{ cm}^2\end{aligned}$$

$$(ii) \text{ Base} = 14 \text{ dm} = (14 \times 10) \text{ cm} \quad [\text{since } 1 \text{ dm} = 10 \text{ cm and } 100 \text{ cm} = 1 \text{ m}]$$

$$= 140 \text{ cm} = 1.4 \text{ m}$$

$$\text{Height} = 6.5 \text{ dm} = (6.5 \times 10) \text{ cm}$$

$$= 65 \text{ cm} = 0.65 \text{ m}$$

$$\begin{aligned}\therefore \text{Area of the parallelogram} &= \text{Base} \times \text{Height} \\ &= 1.4 \text{ m} \times 0.65 \text{ m} \\ &= 0.91 \text{ m}^2\end{aligned}$$

Q4

Answer :

$$\text{Area of the given parallelogram} = 54 \text{ cm}^2$$

$$\text{Base of the given parallelogram} = 15 \text{ cm}$$

$$\therefore \text{Height of the given parallelogram} = \frac{\text{Area}}{\text{Base}} = \left(\frac{54}{15} \right) \text{ cm} = 3.6 \text{ cm}$$

Q5

Answer :

$$\text{Base of the parallelogram} = 18 \text{ cm}$$

$$\text{Area of the parallelogram} = 153 \text{ cm}^2$$

$$\therefore \text{Area of the parallelogram} = \text{Base} \times \text{Height}$$

$$\Rightarrow \text{Height} = \frac{\text{Area of the parallelogram}}{\text{Base}} = \left(\frac{153}{18} \right) \text{ cm} = 8.5 \text{ cm}$$

Hence, the distance of the given side from its opposite side is 8.5 cm.

Q6

Answer :

$$\text{Base, AB} = 18 \text{ cm}$$

$$\text{Height, AL} = 6.4 \text{ cm}$$

$$\begin{aligned}\therefore \text{Area of the parallelogram ABCD} &= \text{Base} \times \text{Height} \\ &= (18 \text{ cm} \times 6.4 \text{ cm}) = 115.2 \text{ cm}^2 \quad \dots (i)\end{aligned}$$

Now, taking BC as the base:

$$\begin{aligned}\text{Area of the parallelogram ABCD} &= \text{Base} \times \text{Height} \\ &= (12 \text{ cm} \times \text{AM}) \quad \dots (ii)\end{aligned}$$

From equation (i) and (ii):

$$12 \text{ cm} \times \text{AM} = 115.2 \text{ cm}^2$$

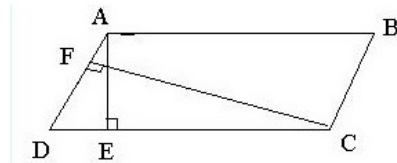
$$\Rightarrow \text{AM} = \left(\frac{115.2}{12} \right) \text{ cm}$$

$$= 9.6 \text{ cm}$$

Q7

Answer :

$ABCD$ is a parallelogram with side AB of length 15 cm and the corresponding altitude AE of length 4 cm. The adjacent side AD is of length 8 cm and the corresponding altitude is CF .



Area of a parallelogram = Base \times Height

We have two altitudes and two corresponding bases.

$$\therefore AD \times CF = AB \times AE$$

$$\Rightarrow 8 \text{ cm} \times CF = 15 \text{ cm} \times 4 \text{ cm}$$

$$\Rightarrow CF = \left(\frac{15 \times 4}{8} \right) \text{ cm} = \left(\frac{15}{2} \right) \text{ cm} = 7.5 \text{ cm}$$

Hence, the distance between the shorter sides is 7.5 cm.

Q8

Answer :

Let the base of the parallelogram be x cm.

Then, the height of the parallelogram will be $\frac{1}{3}x$ cm.

It is given that the area of the parallelogram is 108 cm^2 .

Area of a parallelogram = Base \times Height

$$\therefore 108 \text{ cm}^2 = x \times \frac{1}{3}x$$

$$108 \text{ cm}^2 = \frac{1}{3}x^2$$

$$\Rightarrow x^2 = (108 \times 3) \text{ cm}^2 = 324 \text{ cm}^2$$

$$\Rightarrow x^2 = (18 \text{ cm})^2$$

$$\Rightarrow x = 18 \text{ cm}$$

$$\therefore \text{Base} = x = 18 \text{ cm}$$

$$\begin{aligned} \text{Height} &= \frac{1}{3}x = \left(\frac{1}{3} \times 18 \right) \text{ cm} \\ &= 6 \text{ cm} \end{aligned}$$

Q9

Answer :

Let the height of the parallelogram be x cm.

Then, the base of the parallelogram will be $2x$ cm.

It is given that the area of the parallelogram is 512 cm^2 .

Area of a parallelogram = Base \times Height

$$\therefore 512 \text{ cm}^2 = 2x \times x$$

$$512 \text{ cm}^2 = 2x^2$$

$$\Rightarrow x^2 = \left(\frac{512}{2} \right) \text{ cm}^2 = 256 \text{ cm}^2$$

$$\Rightarrow x^2 = (16 \text{ cm})^2$$

$$\Rightarrow x = 16 \text{ cm}$$

$$\therefore \text{Base} = 2x = 2 \times 16$$

$$= 32 \text{ cm}$$

$$\text{Height} = x = 16 \text{ cm}$$

Q10

Answer :

A rhombus is a special type of a parallelogram.

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

\therefore Area of the given rhombus = Base \times Height

$$(i) \text{ Area of the rhombus} = 12 \text{ cm} \times 7.5 \text{ cm} = 90 \text{ cm}^2$$

$$(ii) \text{ Base} = 2 \text{ dm} = (2 \times 10) = 20 \text{ cm} \quad [\text{since } 1 \text{ dm} = 10 \text{ cm}]$$

$$\text{Height} = 12.6 \text{ cm}$$

$$\therefore \text{Area of the rhombus} = 20 \text{ cm} \times 12.6 \text{ cm} = 252 \text{ cm}^2$$

Q11

Answer :

(i)

Length of one diagonal = 16 cm

Length of the other diagonal = 28 cm

$$\begin{aligned}\therefore \text{Area of the rhombus} &= \frac{1}{2} \times (\text{Product of the diagonals}) \\ &= \left(\frac{1}{2} \times 16 \times 28 \right) \text{ cm}^2 = 224 \text{ cm}^2\end{aligned}$$

(ii)

Length of one diagonal = 8 dm 5 cm = $(8 \times 10 + 5) \text{ cm} = 85 \text{ cm}$ [since 1 dm = 10 cm]

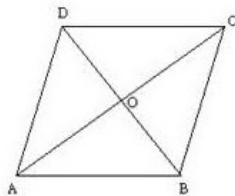
Length of the other diagonal = 5 dm 6 cm = $(5 \times 10 + 6) \text{ cm} = 56 \text{ cm}$

$$\begin{aligned}\therefore \text{Area of the rhombus} &= \frac{1}{2} \times (\text{Product of the diagonals}) \\ &= \left(\frac{1}{2} \times 85 \times 56 \right) \text{ cm}^2 \\ &= 2380 \text{ cm}^2\end{aligned}$$

Q12

Answer :

Let ABCD be the rhombus, whose diagonals intersect at O.



AB = 20 cm and AC = 24 cm

The diagonals of a rhombus bisect each other at right angles.

Therefore, $\triangle AOB$ is a right angled triangle, right angled at O.

Here, $OA = \frac{1}{2} AC = 12 \text{ cm}$

AB = 20 cm

By Pythagoras theorem:

$$(AB)^2 = (OA)^2 + (OB)^2$$

$$\Rightarrow (20)^2 = (12)^2 + (OB)^2$$

$$\Rightarrow (OB)^2 = (20)^2 - (12)^2$$

$$\Rightarrow (OB)^2 = 400 - 144 = 256$$

$$\Rightarrow (OB)^2 = (16)^2$$

$$\Rightarrow OB = 16 \text{ cm}$$

$$\therefore BD = 2 \times OB = 2 \times 16 \text{ cm} = 32 \text{ cm}$$

$$\begin{aligned}\therefore \text{Area of the rhombus ABCD} &= \left(\frac{1}{2} \times AC \times BD \right) \text{ cm}^2 \\ &= \left(\frac{1}{2} \times 24 \times 32 \right) \text{ cm}^2 \\ &= 384 \text{ cm}^2\end{aligned}$$

Q13

Answer :

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

Given:

Length of one diagonal = 19.2 cm

Area of the rhombus = 148.8 cm²

\therefore Length of the other diagonal = $\left(\frac{148.8 \times 2}{19.2} \right)$ cm = 15.5 cm

Q14

Answer :

Perimeter of the rhombus = 56 cm

Area of the rhombus = 119 cm²

Side of the rhombus = $\frac{\text{Perimeter}}{4} = \left(\frac{56}{4} \right)$ cm = 14 cm

Area of a rhombus = Base \times Height

\therefore Height of the rhombus = $\frac{\text{Area}}{\text{Base}} = \left(\frac{119}{14} \right)$ cm
= 8.5 cm

Q15

Answer :

Given:

Height of the rhombus = 17.5 cm

Area of the rhombus = 441 cm²

We know:

Area of a rhombus = Base \times Height

\therefore Base of the rhombus = $\frac{\text{Area}}{\text{Height}} = \left(\frac{441}{17.5} \right)$ cm = 25.2 cm

Hence, each side of a rhombus is 25.2 cm.

Q16

Answer :

Area of a triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$
= $\left(\frac{1}{2} \times 24.8 \times 16.5 \right)$ cm² = 204.6 cm²

Given:

Area of the rhombus = Area of the triangle

Area of the rhombus = 204.6 cm²

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

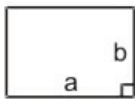
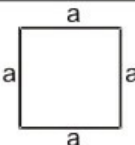

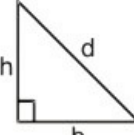
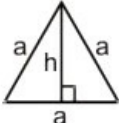
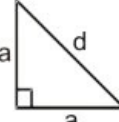
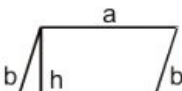
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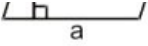
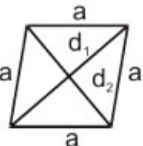
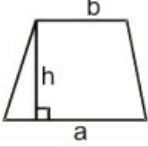
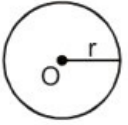
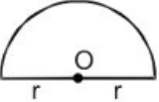
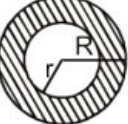

Length of one diagonal = 22 cm

\therefore Length of the other diagonal = $\left(\frac{204.6 \times 2}{22} \right)$ cm
= 18.6 cm

Mensuration

Exercise 20D

Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

			
Rhombus		4a	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \left(\frac{\theta}{360}\right) \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$

Q1

Answer :

We know:

Area of a triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

(i) Base = 42 cm

Height = 25 cm

$$\therefore \text{Area of the triangle} = \left(\frac{1}{2} \times 42 \times 25\right) \text{ cm}^2 = 525 \text{ cm}^2$$

(ii) Base = 16.8 m

Height = 75 cm = 0.75 m [since 100 cm = 1 m]

$$\therefore \text{Area of the triangle} = \left(\frac{1}{2} \times 16.8 \times 0.75\right) \text{ m}^2 = 6.3 \text{ m}^2$$

(iii) Base = 8 dm = (8 × 10) cm = 80 cm [since 1 dm = 10 cm]

Height = 35 cm

$$\therefore \text{Area of the triangle} = \left(\frac{1}{2} \times 80 \times 35\right) \text{ cm}^2 = 1400 \text{ cm}^2$$

Q2

Answer :

Height of a triangle = $\frac{2 \times \text{Area}}{\text{Base}}$

Here, base = 16 cm and area = 72 cm²

$$\therefore \text{Height} = \frac{2 \times 72}{16} \text{ cm} = 9 \text{ cm}$$

Q3

Answer :

Height of a triangle = $\frac{2 \times \text{Area}}{\text{Base}}$

Here, base = 28 m and area = 224 m²

$$\therefore \text{Height} = \left(\frac{2 \times 224}{28} \right) \text{ m} = 16 \text{ m}$$

Q4

Answer :

Base of a triangle = $\frac{2 \times \text{Area}}{\text{Height}}$

Here, height = 12 cm and area = 90 cm²

$$\therefore \text{Base} = \left(\frac{2 \times 90}{12} \right) \text{ cm} = 15 \text{ cm}$$

Q5

Answer :

Total cost of cultivating the field = Rs. 14580

Rate of cultivating the field = Rs. 1080 per hectare

Area of the field = $\left(\frac{\text{Total cost}}{\text{Rate per hectare}} \right)$ hectare

$$= \left(\frac{14580}{1080} \right) \text{ hectare}$$

$$= 13.5 \text{ hectare}$$

$$= (13.5 \times 10000) \text{ m}^2 = 135000 \text{ m}^2 \quad [\text{since } 1 \text{ hectare} = 10000 \text{ m}^2]$$

Let the height of the field be x m.

Then, its base will be $3x$ m.

Area of the field = $\left(\frac{1}{2} \times 3x \times x \right) \text{ m}^2 = \left(\frac{3x^2}{2} \right) \text{ m}^2$

$$\therefore \left(\frac{3x^2}{2} \right) = 135000$$

$$\Rightarrow x^2 = \left(135000 \times \frac{2}{3} \right) = 90000$$

$$\Rightarrow x = \sqrt{90000} = 300$$

$$\therefore \text{Base} = (3 \times 300) = 900 \text{ m}$$

$$\text{Height} = 300 \text{ m}$$

Q6

Answer :

Let the length of the other leg be h cm.

Then, area of the triangle = $\left(\frac{1}{2} \times 14.8 \times h \right) \text{ cm}^2 = (7.4 h) \text{ cm}^2$

But it is given that the area of the triangle is 129.5 cm².

$$\therefore 7.4h = 129.5$$

$$\Rightarrow h = \left(\frac{129.5}{7.4} \right) = 17.5 \text{ cm}$$

$$\therefore \text{Length of the other leg} = 17.5 \text{ cm}$$

Q7

Answer :

Here, base = 1.2 m and hypotenuse = 3.7 m

In the right angled triangle:

$$\text{Perpendicular} = \sqrt{(\text{Hypotenuse})^2 - (\text{Base})^2}$$

$$= \sqrt{(3.7)^2 - (1.2)^2}$$

$$= \sqrt{13.69 - 1.44}$$

$$= \sqrt{12.25}$$

$$= 3.5$$

$$\text{Area} = \left(\frac{1}{2} \times \text{base} \times \text{perpendicular} \right) \text{ sq. units}$$

$$= \left(\frac{1}{2} \times 1.2 \times 3.5 \right) \text{ m}^2$$

$$\therefore \text{Area of the right angled triangle} = 2.1 \text{ m}^2$$

Q8

Answer :

In a right angled triangle, if one leg is the base, then the other leg is the height.

Let the given legs be $3x$ and $4x$, respectively.

$$\text{Area of the triangle} = \left(\frac{1}{2} \times 3x \times 4x \right) \text{ cm}^2$$

$$\Rightarrow 1014 = (6x^2)$$

$$\Rightarrow 1014 = 6x^2$$

$$\Rightarrow x^2 = \left(\frac{1014}{6} \right) = 169$$

$$\Rightarrow x = \sqrt{169} = 13$$

$$\therefore \text{Base} = (3 \times 13) = 39 \text{ cm}$$

$$\text{Height} = (4 \times 13) = 52 \text{ cm}$$

Q9

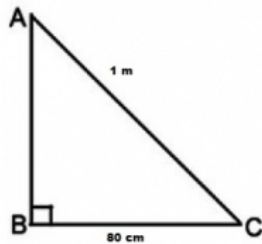
Answer :

Consider a right-angled triangular scarf (ABC).

Here, $\angle B = 90^\circ$

BC = 80 cm

AC = 1 m = 100 cm



$$\text{Now, } AB^2 + BC^2 = AC^2$$

$$\Rightarrow AB^2 = AC^2 - BC^2 = (100)^2 - (80)^2$$

$$= (10000 - 6400) = 3600$$

$$\Rightarrow AB = \sqrt{3600} = 60 \text{ cm}$$

$$\text{Area of the scarf ABC} = \left(\frac{1}{2} \times BC \times AB \right) \text{ sq. units}$$

$$= \left(\frac{1}{2} \times 80 \times 60 \right) \text{ cm}^2$$

$$= 2400 \text{ cm}^2 = 0.24 \text{ m}^2 \quad [\text{since } 1 \text{ m}^2 = 10000 \text{ cm}^2]$$

Rate of the cloth = Rs 250 per m^2

$$\therefore \text{Total cost of the scarf} = \text{Rs } (250 \times 0.24) = \text{Rs } 60$$

Hence, cost of the right angled scarf is Rs 60.

Q10

Answer :

(i) Side of the equilateral triangle = 18 cm

$$\begin{aligned}\text{Area of the equilateral triangle} &= \frac{\sqrt{3}}{4} (\text{Side})^2 \text{ sq. units} \\ &= \frac{\sqrt{3}}{4} (18)^2 \text{ cm}^2 = (\sqrt{3} \times 81) \text{ cm}^2 \\ &= (1.73 \times 81) \text{ cm}^2 = 140.13 \text{ cm}^2\end{aligned}$$

(ii) Side of the equilateral triangle = 20 cm

$$\begin{aligned}\text{Area of the equilateral triangle} &= \frac{\sqrt{3}}{4} (\text{Side})^2 \text{ sq. units} \\ &= \frac{\sqrt{3}}{4} (20)^2 \text{ cm}^2 = (\sqrt{3} \times 100) \text{ cm}^2 \\ &= (1.73 \times 100) \text{ cm}^2 = 173 \text{ cm}^2\end{aligned}$$

Q11

Answer :

It is given that the area of an equilateral triangle is $16\sqrt{3} \text{ cm}^2$.

We know:

$$\text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} (\text{side})^2 \text{ sq. units}$$

$$\begin{aligned}\therefore \text{Side of the equilateral triangle} &= \left[\sqrt{\left(\frac{4 \times \text{Area}}{\sqrt{3}} \right)} \right] \text{ cm} \\ &= \left[\sqrt{\left(\frac{4 \times 16\sqrt{3}}{\sqrt{3}} \right)} \right] \text{ cm} = (\sqrt{4 \times 16}) \text{ cm} = (\sqrt{64}) \text{ cm} = 8 \text{ cm}\end{aligned}$$

Hence, the length of the equilateral triangle is 8 cm.

Q12

Answer :

Let the height of the triangle be h cm.

$$\begin{aligned}\text{Area of the triangle} &= \left(\frac{1}{2} \times \text{Base} \times \text{Height} \right) \text{ sq. units} \\ &= \left(\frac{1}{2} \times 24 \times h \right) \text{ cm}^2\end{aligned}$$

Let the side of the equilateral triangle be a cm.

$$\begin{aligned}\text{Area of the equilateral triangle} &= \left(\frac{\sqrt{3}}{4} a^2 \right) \text{ sq. units} \\ &= \left(\frac{\sqrt{3}}{4} \times 24 \times 24 \right) \text{ cm}^2 = (\sqrt{3} \times 144) \text{ cm}^2\end{aligned}$$

$$\therefore \left(\frac{1}{2} \times 24 \times h \right) = (\sqrt{3} \times 144)$$

$$\Rightarrow 12 h = (\sqrt{3} \times 144)$$

$$\Rightarrow h = \left(\frac{\sqrt{3} \times 144}{12} \right) = (\sqrt{3} \times 12) = (1.73 \times 12) = 20.76 \text{ cm}$$

\therefore Height of the equilateral triangle = 20.76 cm

Q13

Answer :

(i) Let $a = 13$ m, $b = 14$ m and $c = 15$ m

$$s = \left(\frac{a+b+c}{2} \right) = \left(\frac{13+14+15}{2} \right) = \left(\frac{42}{2} \right) \text{ m} = 21 \text{ m}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{21(21-13)(21-14)(21-15)} \text{ m}^2 \\ &= \sqrt{21 \times 8 \times 7 \times 6} \text{ m}^2 \\ &= \sqrt{3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 2 \times 3} \text{ m}^2 \\ &= (2 \times 2 \times 3 \times 7) \text{ m}^2 \\ &= 84 \text{ m}^2 \end{aligned}$$

(ii) Let $a = 52$ cm, $b = 56$ cm and $c = 60$ cm

$$s = \left(\frac{a+b+c}{2} \right) = \left(\frac{52+56+60}{2} \right) = \left(\frac{168}{2} \right) \text{ cm} = 84 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{84(84-52)(84-56)(84-60)} \text{ cm}^2 \\ &= \sqrt{84 \times 32 \times 28 \times 24} \text{ cm}^2 \\ &= \sqrt{12 \times 7 \times 4 \times 8 \times 4 \times 7 \times 3 \times 8} \text{ cm}^2 \\ &= \sqrt{2 \times 2 \times 3 \times 7 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 3 \times 2 \times 2 \times 2} \text{ cm}^2 \\ &= (2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7) \text{ m}^2 \\ &= 1344 \text{ cm}^2 \end{aligned}$$

(iii) Let $a = 91$ m, $b = 98$ m and $c = 105$ m

$$s = \left(\frac{a+b+c}{2} \right) = \left(\frac{91+98+105}{2} \right) = \left(\frac{294}{2} \right) \text{ m} = 147 \text{ m}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{147(147-91)(147-98)(147-105)} \text{ m}^2 \\ &= \sqrt{147 \times 56 \times 49 \times 42} \text{ m}^2 \\ &= \sqrt{3 \times 49 \times 8 \times 7 \times 49 \times 6 \times 7} \text{ m}^2 \\ &= \sqrt{3 \times 7 \times 7 \times 2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 2 \times 3 \times 7} \text{ m}^2 \\ &= (2 \times 2 \times 3 \times 7 \times 7 \times 7) \text{ m}^2 \\ &= 4116 \text{ m}^2 \end{aligned}$$

Q14

Answer :

Let $a = 33$ cm, $b = 44$ cm and $c = 55$ cm

$$\text{Then, } s = \frac{a+b+c}{2} = \left(\frac{33+44+55}{2} \right) \text{ cm} = \left(\frac{132}{2} \right) \text{ cm} = 66 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{66(66-33)(66-44)(66-55)} \text{ cm}^2 \\ &= \sqrt{66 \times 33 \times 22 \times 11} \text{ cm}^2 \\ &= \sqrt{6 \times 11 \times 3 \times 11 \times 2 \times 11 \times 11} \text{ cm}^2 \\ &= (6 \times 11 \times 11) \text{ cm}^2 = 726 \text{ cm}^2 \end{aligned}$$

Let the height on the side measuring 44 cm be h cm.

$$\text{Then, Area} = \frac{1}{2} \times b \times h$$

$$\Rightarrow 726 \text{ cm}^2 = \frac{1}{2} \times 44 \times h$$

$$\Rightarrow h = \left(\frac{2 \times 726}{44} \right) \text{ cm} = 33 \text{ cm.}$$

$$\therefore \text{Area of the triangle} = 726 \text{ cm}^2$$

Height corresponding to the side measuring 44 cm = 33 cm

Q15

Answer :

Let $a = 13x$ cm, $b = 14x$ cm and $c = 15x$ cm

Perimeter of the triangle $= 13x + 14x + 15x = 84$ (given)

$$\Rightarrow 42x = 84$$

$$\Rightarrow x = \frac{84}{42} = 2$$

$\therefore a = 26$ cm, $b = 28$ cm and $c = 30$ cm

$$s = \frac{a+b+c}{2} = \left(\frac{26+28+30}{2} \right) \text{cm} = \left(\frac{84}{2} \right) \text{cm} = 42 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{42(42-26)(42-28)(42-30)} \text{ cm}^2 \\ &= \sqrt{42 \times 16 \times 14 \times 12} \text{ cm}^2 \\ &= \sqrt{6 \times 7 \times 4 \times 4 \times 2 \times 7 \times 6 \times 2} \text{ cm}^2 \\ &= (2 \times 4 \times 6 \times 7) \text{ cm}^2 = 336 \text{ cm}^2 \end{aligned}$$

Hence, area of the given triangle is 336 cm^2 .

Q16

Answer :

Let $a = 42$ cm, $b = 34$ cm and $c = 20$ cm

$$\text{Then, } s = \frac{a+b+c}{2} = \left(\frac{42+34+20}{2} \right) \text{cm} = \left(\frac{96}{2} \right) \text{cm} = 48 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{48(48-42)(48-34)(48-20)} \text{ cm}^2 \\ &= \sqrt{48 \times 6 \times 14 \times 28} \text{ cm}^2 \\ &= \sqrt{6 \times 2 \times 2 \times 2 \times 6 \times 14 \times 2 \times 14} \text{ cm}^2 \\ &= (2 \times 2 \times 6 \times 14) \text{ cm}^2 = 336 \text{ cm}^2 \end{aligned}$$

Let the height on the side measuring 42 cm be h cm.

$$\text{Then, Area} = \frac{1}{2} \times b \times h$$

$$\Rightarrow 336 \text{ cm}^2 = \frac{1}{2} \times 42 \times h$$

$$\Rightarrow h = \left(\frac{2 \times 336}{42} \right) \text{cm} = 16 \text{ cm}$$

\therefore Area of the triangle $= 336 \text{ cm}^2$

Height corresponding to the side measuring 42 cm $= 16$ cm

Q17

Answer :

Let each of the equal sides be a cm.

$$b = 48 \text{ cm}$$

$$a = 30 \text{ cm}$$

$$\begin{aligned} \text{Area of the triangle} &= \left\{ \frac{1}{2} \times b \times \sqrt{a^2 - \frac{b^2}{4}} \right\} \text{ sq. units} \\ &= \left\{ \frac{1}{2} \times 48 \times \sqrt{(30)^2 - \frac{(48)^2}{4}} \right\} \text{ cm}^2 = \left(24 \times \sqrt{900 - \frac{2304}{4}} \right) \text{ cm}^2 \\ &= (24 \times \sqrt{900 - 576}) \text{ cm}^2 = (24 \times \sqrt{324}) \text{ cm}^2 = (24 \times 18) \text{ cm}^2 = 432 \text{ cm}^2 \\ \therefore \text{Area of the triangle} &= 432 \text{ cm}^2 \end{aligned}$$

Q18

Answer :

Let each of the equal sides be a cm.

$$a + a + 12 = 32 \Rightarrow 2a = 20 \Rightarrow a = 10$$

$\therefore b = 12$ cm and $a = 10$ cm

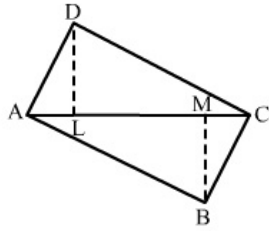
$$\begin{aligned} \text{Area of the triangle} &= \left\{ \frac{1}{2} \times b \times \sqrt{a^2 - \frac{b^2}{4}} \right\} \text{ sq. units} \\ &= \left\{ \frac{1}{2} \times 12 \times \sqrt{100 - \frac{144}{4}} \right\} \text{ cm}^2 = (6 \times \sqrt{100 - 36}) \text{ cm}^2 \\ &= (6 \times \sqrt{64}) \text{ cm}^2 = (6 \times 8) \text{ cm}^2 \\ &= 48 \text{ cm}^2 \end{aligned}$$

Q19

Answer :

We have:

$AC = 26$ cm, $DL = 12.8$ cm and $BM = 11.2$ cm



$$\begin{aligned}\text{Area of } \triangle ADC &= \frac{1}{2} \times AC \times DL \\ &= \frac{1}{2} \times 26 \text{ cm} \times 12.8 \text{ cm} = 166.4 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Area of } \triangle ABC &= \frac{1}{2} \times AC \times BM \\ &= \frac{1}{2} \times 26 \text{ cm} \times 11.2 \text{ cm} = 145.6 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\therefore \text{Area of the quadrilateral } ABCD &= \text{Area of } \triangle ADC + \text{Area of } \triangle ABC \\ &= (166.4 + 145.6) \text{ cm}^2 \\ &= 312 \text{ cm}^2\end{aligned}$$

Q20

Answer :

First, we have to find the area of $\triangle ABC$ and $\triangle ACD$.

For $\triangle ACD$:

Let $a = 30$ cm, $b = 40$ cm and $c = 50$ cm

$$s = \left(\frac{a+b+c}{2} \right) = \left(\frac{30+40+50}{2} \right) = \left(\frac{120}{2} \right) = 60 \text{ cm}$$

$$\begin{aligned}\therefore \text{Area of triangle } ACD &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{60(60-30)(60-40)(60-50)} \text{ cm}^2 \\ &= \sqrt{60 \times 30 \times 20 \times 10} \text{ cm}^2 \\ &= \sqrt{360000} \text{ cm}^2 \\ &= 600 \text{ cm}^2\end{aligned}$$

For $\triangle ABC$:

Let $a = 26$ cm, $b = 28$ cm and $c = 30$ cm

$$s = \left(\frac{a+b+c}{2} \right) = \left(\frac{26+28+30}{2} \right) = \left(\frac{84}{2} \right) = 42 \text{ cm}$$

$$\begin{aligned}\therefore \text{Area of triangle } ABC &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{42(42-26)(42-28)(42-30)} \text{ cm}^2 \\ &= \sqrt{42 \times 16 \times 14 \times 12} \text{ cm}^2 \\ &= \sqrt{2 \times 3 \times 7 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 3 \times 2 \times 2} \text{ cm}^2 \\ &= (2 \times 2 \times 2 \times 2 \times 3 \times 7) \text{ cm}^2 \\ &= 336 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\therefore \text{Area of the given quadrilateral } ABCD &= \text{Area of } \triangle ACD + \text{Area of } \triangle ABC \\ &= (600 + 336) \text{ cm}^2 = 936 \text{ cm}^2\end{aligned}$$

Q21

Answer :

Area of the rectangle = $AB \times BC$

$$= 36 \text{ m} \times 24 \text{ m}$$

$$= 864 \text{ m}^2$$

Area of the triangle = $\frac{1}{2} \times AD \times FE$

$$= \frac{1}{2} \times BC \times FE \quad [\text{since } AD = BC]$$

$$= \frac{1}{2} \times 24 \text{ m} \times 15 \text{ m}$$

$$= 12 \text{ m} \times 15 \text{ m} = 180 \text{ m}^2$$

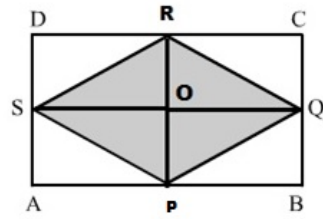
$$\begin{aligned}\therefore \text{Area of the shaded region} &= \text{Area of the rectangle} - \text{Area of the triangle} \\ &= (864 - 180) \text{ m}^2 \\ &= 684 \text{ m}^2\end{aligned}$$

Q22

Answer :

Join points PR and SQ .

These two lines bisect each other at point O .



Here, $AB = DC = SQ = 40$ cm

$AD = BC = RP = 25$ cm

Also, $OP = OR = \frac{RP}{2} = \frac{25}{2} = 12.5$ cm

From the figure we observe:

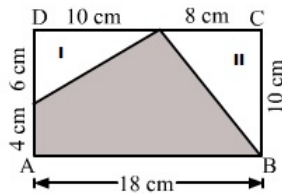
Area of $\triangle SPQ$ = Area of $\triangle SRQ$

$$\begin{aligned} \therefore \text{Area of the shaded region} &= 2 \times (\text{Area of } \triangle SPQ) \\ &= 2 \times \left(\frac{1}{2} \times SQ \times OP \right) \\ &= 2 \times \left(\frac{1}{2} \times 40 \text{ cm} \times 12.5 \text{ cm} \right) \\ &= 500 \text{ cm}^2 \end{aligned}$$

Q23

Answer :

(i) Area of rectangle ABCD = $(10 \text{ cm} \times 18 \text{ cm}) = 180 \text{ cm}^2$

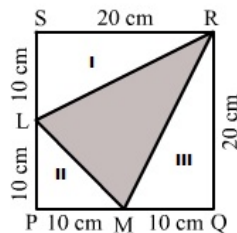


$$\text{Area of triangle I} = \left(\frac{1}{2} \times 6 \times 10 \right) \text{ cm}^2 = 30 \text{ cm}^2$$

$$\text{Area of triangle II} = \left(\frac{1}{2} \times 8 \times 10 \right) \text{ cm}^2 = 40 \text{ cm}^2$$

$$\therefore \text{Area of the shaded region} = \{180 - (30 + 40)\} \text{ cm}^2 = \{180 - 70\} \text{ cm}^2 = 110 \text{ cm}^2$$

(ii) Area of square ABCD = $(\text{Side})^2 = (20 \text{ cm})^2 = 400 \text{ cm}^2$



$$\text{Area of triangle I} = \left(\frac{1}{2} \times 10 \times 20 \right) \text{ cm}^2 = 100 \text{ cm}^2$$

$$\text{Area of triangle II} = \left(\frac{1}{2} \times 10 \times 10 \right) \text{ cm}^2 = 50 \text{ cm}^2$$

$$\text{Area of triangle III} = \left(\frac{1}{2} \times 10 \times 20 \right) \text{ cm}^2 = 100 \text{ cm}^2$$

$$\therefore \text{Area of the shaded region} = \{400 - (100 + 50 + 100)\} \text{ cm}^2 = \{400 - 250\} \text{ cm}^2 = 150 \text{ cm}^2$$

Q24

Answer :

Let ABCD be the given quadrilateral and let BD be the diagonal such that BD is of the length 24 cm.

Let $AL \perp BD$ and $CM \perp BD$

Then, $AL = 5$ cm and $CM = 8$ cm

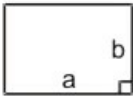
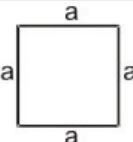

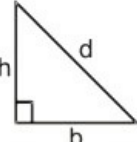
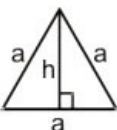
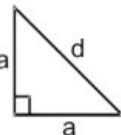
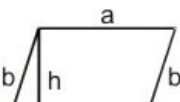
Area of the quadrilateral ABCD = (Area of $\triangle ABD$ + Area of $\triangle CBD$)

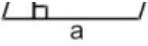
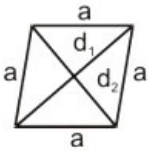
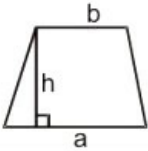
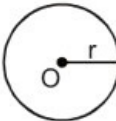
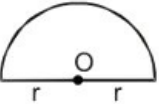
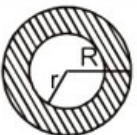

$$\begin{aligned} &= \left[\left(\frac{1}{2} \times BD \times AL \right) + \left(\frac{1}{2} \times BD \times CM \right) \right] \text{ sq. units} \\ &= \left[\left(\frac{1}{2} \times 24 \times 5 \right) + \left(\frac{1}{2} \times 24 \times 8 \right) \right] \text{ cm}^2 \\ &= (60 + 96) \text{ cm}^2 = 156 \text{ cm}^2 \end{aligned}$$

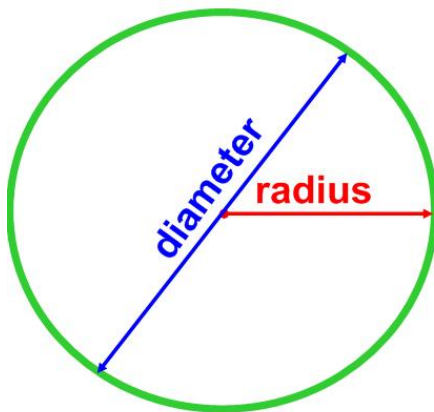
\therefore Area of the given quadrilateral = 156 cm

Mensuration

Exercise 20E

Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

			
Rhombus		$4a$	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \left(\frac{\theta}{360}\right) \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$



Area of a circle
 $= \pi \times \text{radius}^2$

Circumference of a
circle $= \pi \times \text{diameter}$

remember that the
diameter $= 2 \times \text{radius}$

Q1

Answer :

Here, $r = 15$ cm

$$\begin{aligned}\therefore \text{Circumference} &= 2\pi r \\ &= (2 \times 3.14 \times 15) \text{ cm} \\ &= 94.2 \text{ cm}\end{aligned}$$

Hence, the circumference of the given circle is 94.2 cm

Q2

Answer :

(i) Here, $r = 28$ cm

$$\begin{aligned}\therefore \text{Circumference} &= 2\pi r \\ &= \left(2 \times \frac{22}{7} \times 28\right) \text{ cm} \\ &= 176 \text{ cm}\end{aligned}$$

Hence, the circumference of the given circle is 176 cm.

(ii) Here, $r = 1.4$ m

$$\begin{aligned}\therefore \text{Circumference} &= 2\pi r \\ &= \left(2 \times \frac{22}{7} \times 1.4\right) \text{ m} \\ &= (2 \times 22 \times 0.2) \text{ m} = 8.8 \text{ m}\end{aligned}$$

Hence, the circumference of the given circle is 8.8 m.

Q3

Answer :

(i) Here, $d = 35$ cm

$$\begin{aligned}\text{Circumference} &= 2\pi r \\ &= (\pi d) \quad [\text{since } 2r = d] \\ &= \left(\frac{22}{7} \times 35\right) \text{ cm} = (22 \times 5) = 110 \text{ cm}\end{aligned}$$

Hence, the circumference of the given circle is 110 cm.

(ii) Here, $d = 4.9$ m

$$\begin{aligned}\text{Circumference} &= 2\pi r \\ &= (\pi d) \quad [\text{since } 2r = d] \\ &= \left(\frac{22}{7} \times 4.9\right) \text{ m} = (22 \times 0.7) = 15.4 \text{ m}\end{aligned}$$

Hence, the circumference of the given circle is 15.4 m.

Q4

Answer :

Circumference of the given circle = 57.2 cm

$$\therefore C = 57.2 \text{ cm}$$

Let the radius of the given circle be r cm.

$$\begin{aligned}C &= 2\pi r \\ \Rightarrow r &= \frac{C}{2\pi} \text{ cm} \\ \Rightarrow r &= \left(\frac{57.2}{2} \times \frac{7}{22}\right) \text{ cm} = 9.1 \text{ cm}\end{aligned}$$

Thus, radius of the given circle is 9.1 cm.

Q5

Answer :

Circumference of the given circle = 63.8 m

$$\therefore C = 63.8 \text{ m}$$

Let the radius of the given circle be r cm.

$$\begin{aligned}C &= 2\pi r \\ \Rightarrow r &= \frac{C}{2\pi} \\ \Rightarrow r &= \left(\frac{63.8}{2} \times \frac{7}{22}\right) \text{ m} = 10.15 \text{ m}\end{aligned}$$

$$\therefore \text{Diameter of the given circle} = 2r = (2 \times 10.15) \text{ m} = 20.3 \text{ m}$$

Q6

Answer :

Let the radius of the given circle be r cm.

Then, its circumference = $2\pi r$

Given:

(Circumference) - (Diameter) = 30 cm

$$\therefore (2\pi r - 2r) = 30$$

$$\Rightarrow 2r(\pi - 1) = 30$$

$$\Rightarrow 2r\left(\frac{22}{7} - 1\right) = 30$$

$$\Rightarrow 2r \times \frac{15}{7} = 30$$

$$\Rightarrow r = \left(30 \times \frac{7}{30}\right) = 7$$

\therefore Radius of the given circle = 7 cm

Q7

Answer :

Let the radii of the given circles be $5x$ and $3x$, respectively.

Let their circumferences be C_1 and C_2 , respectively.

$$C_1 = 2 \times \pi \times 5x = 10\pi x$$

$$C_2 = 2 \times \pi \times 3x = 6\pi x$$

$$\therefore \frac{C_1}{C_2} = \frac{10\pi x}{6\pi x} = \frac{5}{3}$$

$$\Rightarrow C_1:C_2 = 5:3$$

Hence, the ratio of the circumference of the given circle is 5:3.

Q8

Answer :

Radius of the circular field, $r = 21$ m.

Distance covered by the cyclist = Circumference of the circular field

$$= 2\pi r$$

$$= \left(2 \times \frac{22}{7} \times 21\right) \text{ m} = 132 \text{ m}$$

$$\text{Speed of the cyclist} = 8 \text{ km per hour} = \frac{8000 \text{ m}}{(60 \times 60) \text{ s}} = \left(\frac{8000}{3600}\right) \text{ m/s} = \left(\frac{20}{9}\right) \text{ m/s}$$

$$\text{Time taken by the cyclist to cover the field} = \frac{\text{Distance covered by the cyclist}}{\text{Speed of the cyclist}}$$

$$= \left[\frac{132}{\left(\frac{20}{9}\right)} \right] \text{ s}$$

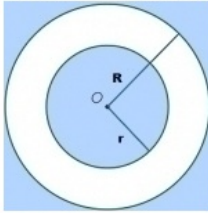
$$= \left(\frac{132 \times 9}{20}\right) \text{ s}$$

$$= 59.4 \text{ s}$$

Q9

Answer :

Let the inner and outer radii of the track be r metres and R metres, respectively.



Then, $2\pi r = 528$

$2\pi R = 616$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 528$$

$$2 \times \frac{22}{7} \times R = 616$$

$$\Rightarrow r = \left(528 \times \frac{7}{44} \right) = 84$$

$$R = \left(616 \times \frac{7}{44} \right) = 98$$

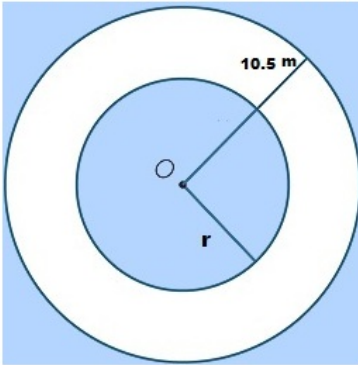
$$\Rightarrow (R - r) = (98 - 84) \text{ m} = 14 \text{ m}$$

Hence, the width of the track is 14 m.

Q10

Answer :

Let the inner and outer radii of the track be r metres and $(r + 10.5)$ metres, respectively.



Inner circumference = 330 m

$$\therefore 2\pi r = 330 \Rightarrow 2 \times \frac{22}{7} \times r = 330$$

$$\Rightarrow r = \left(330 \times \frac{7}{44} \right) = 52.5 \text{ m}$$

Inner radius of the track = 52.5 m

\therefore Outer radii of the track = $(52.5 + 10.5) \text{ m} = 63 \text{ m}$

$$\therefore \text{Circumference of the outer circle} = \left(2 \times \frac{22}{7} \times 63 \right) \text{ m} = 396 \text{ m}$$

Rate of fencing = Rs. 20 per metre

\therefore Total cost of fencing the outer circle = Rs. (396×20) = Rs. 7920

Q11

Answer :

We know that the concentric circles are circles that form within each other, around a common centre point.

Radius of the inner circle, $r = 98 \text{ cm}$

$$\therefore \text{Circumference of the inner circle} = 2\pi r \\ = \left(2 \times \frac{22}{7} \times 98 \right) \text{ cm} = 616 \text{ cm}$$

Radius of the outer circle, $R = 1 \text{ m } 26 \text{ cm} = 126 \text{ cm}$ [since 1 m = 100 cm]

$$\therefore \text{Circumference of the outer circle} = 2\pi R \\ = \left(2 \times \frac{22}{7} \times 126 \right) \text{ cm} = 792 \text{ cm}$$

\therefore Difference in the lengths of the circumference of the circles = $(792 - 616) \text{ cm} = 176 \text{ cm}$

Hence, the circumference of the second circle is 176 cm larger than that of the first circle.

Q12

Answer :

Length of the wire = Perimeter of the equilateral triangle

$$= 3 \times \text{Side of the equilateral triangle} = (3 \times 8.8) \text{ cm} = 26.4 \text{ cm}$$

Let the wire be bent into the form of a circle of radius r cm.

Circumference of the circle = 26.4 cm

$$\Rightarrow 2\pi r = 26.4$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 26.4$$

$$\Rightarrow r = \left(\frac{26.4 \times 7}{2 \times 22} \right) \text{ cm} = 4.2 \text{ cm}$$

$$\therefore \text{Diameter} = 2r = (2 \times 4.2) \text{ cm} = 8.4 \text{ cm}$$

Hence, the diameter of the ring is 8.4 cm.

Q13

Answer :

Circumference of the circle = Perimeter of the rhombus

$$= 4 \times \text{Side of the rhombus} = (4 \times 33) \text{ cm} = 132 \text{ cm}$$

\therefore Circumference of the circle = 132 cm

$$\Rightarrow 2\pi r = 132$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 132$$

$$\Rightarrow r = \left(\frac{132 \times 7}{2 \times 22} \right) \text{ cm} = 21 \text{ cm}$$

Hence, the radius of the circle is 21 cm.

Q14

Answer :

Length of the wire = Perimeter of the rectangle

$$= 2(l + b) = 2 \times (18.7 + 14.3) \text{ cm} = 66 \text{ cm}$$

Let the wire be bent into the form of a circle of radius r cm.

Circumference of the circle = 66 cm

$$\Rightarrow 2\pi r = 66$$

$$\Rightarrow \left(2 \times \frac{22}{7} \times r \right) = 66$$

$$\Rightarrow r = \left(\frac{66 \times 7}{2 \times 22} \right) \text{ cm} = 10.5 \text{ cm}$$

Hence, the radius of the circle formed is 10.5 cm.

Q15

Answer :

It is given that the radius of the circle is 35 cm.

Length of the wire = Circumference of the circle

$$\Rightarrow \text{Circumference of the circle} = 2\pi r = \left(2 \times \frac{22}{7} \times 35 \right) \text{ cm} = 220 \text{ cm}$$

Let the wire be bent into the form of a square of side a cm.

Perimeter of the square = 220 cm

$$\Rightarrow 4a = 220$$

$$\Rightarrow a = \left(\frac{220}{4} \right) \text{ cm} = 55 \text{ cm}$$

Hence, each side of the square will be 55 cm.

Q16

Answer :

Length of the hour hand (r) = 4.2 cm.

Distance covered by the hour hand in 12 hours = $2\pi r = \left(2 \times \frac{22}{7} \times 4.2\right)$ cm = 26.4 cm

\therefore Distance covered by the hour hand in 24 hours = (2×26.4) = 52.8 cm

Length of the minute hand (R) = 7 cm

Distance covered by the minute hand in 1 hour = $2\pi R = \left(2 \times \frac{22}{7} \times 7\right)$ cm = 44 cm

\therefore Distance covered by the minute hand in 24 hours = (44×24) cm = 1056 cm

\therefore Sum of the distances covered by the tips of both the hands in 1 day = $(52.8 + 1056)$ cm
= 1108.8 cm

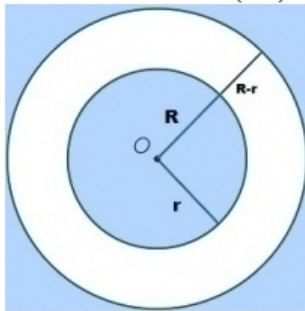
Q17

Answer :

Given:

Diameter of the well (d) = 140 cm.

Radius of the well (r) = $\left(\frac{140}{2}\right)$ cm = 70 cm



Let the radius of the outer circle (including the stone parapet) be R cm.

Length of the outer edge of the parapet = 616 cm

$$\Rightarrow 2\pi R = 616$$

$$\Rightarrow \left(2 \times \frac{22}{7} \times R\right) = 616$$

$$\Rightarrow R = \left(\frac{616 \times 7}{2 \times 22}\right) \text{ cm} = 98 \text{ cm}$$

Now, width of the parapet = {Radius of the outer circle (including the stone parapet) - Radius of the well}

$$= \{98 - 70\} \text{ cm} = 28 \text{ cm}$$

Hence, the width of the parapet is 28 cm.

Q18

Answer :

It may be noted that in one rotation, the bus covers a distance equal to the circumference of the wheel.

Now, diameter of the wheel = 98 cm

\therefore Circumference of the wheel = $\pi d = \left(\frac{22}{7} \times 98\right)$ cm = 308 cm

Thus, the bus travels 308 cm in one rotation.

\therefore Distance covered by the bus in 2000 rotations = (308×2000) cm
= 616000 cm
= 6160 m [since 1 m = 100 cm]

Q19

Answer :

It may be noted that in one revolution, the cycle covers a distance equal to the circumference of the wheel.

Diameter of the wheel = 70 cm

$$\therefore \text{Circumference of the wheel} = \pi d = \left(\frac{22}{7} \times 70\right) \text{ cm} = 220 \text{ cm}$$

Thus, the cycle covers 220 cm in one revolution.

$$\begin{aligned}\therefore \text{Distance covered by the cycle in 250 revolutions} &= (220 \times 250) \text{ cm} \\ &= 55000 \text{ cm} \\ &= 550 \text{ m} \quad [\text{since } 1 \text{ m} = 100 \text{ cm}]\end{aligned}$$

Hence, the cycle will cover 550 m in 250 revolutions.

Q20

Answer :

Diameter of the wheel = 77 cm

$$\Rightarrow \text{Radius of the wheel} = \left(\frac{77}{2}\right) \text{ cm}$$

Circumference of the wheel = $2\pi r$

$$\begin{aligned}&= \left(2 \times \frac{22}{7} \times \frac{77}{2}\right) \text{ cm} = (22 \times 11) \text{ cm} = 242 \text{ cm} \\ &= \left(\frac{242}{100}\right) \text{ m} = \left(\frac{121}{50}\right) \text{ m}\end{aligned}$$

$$\text{Distance covered by the wheel in 1 revolution} = \left(\frac{121}{50}\right) \text{ m}$$

Now, $\left(\frac{121}{50}\right)$ m is covered by the car in 1 revolution.

(121×1000) m will be covered by the car in $\left(1 \times \frac{50}{121} \times 121 \times 1000\right)$ revolutions, i.e. 50000 revolutions.

\therefore Required number of revolutions = 50000

Q21

Answer :

It may be noted that in one revolution, the bicycle covers a distance equal to the circumference of the wheel.

Total distance covered by the bicycle in 5000 revolutions = 11 km

$$\Rightarrow 5000 \times \text{Circumference of the wheel} = 11000 \text{ m} \quad [\text{since } 1 \text{ km} = 1000 \text{ m}]$$

$$\text{Circumference of the wheel} = \left(\frac{11000}{5000}\right) \text{ m} = 2.2 \text{ m} = 220 \text{ cm} \quad [\text{since } 1 \text{ m} = 100 \text{ cm}]$$

Circumference of the wheel = $\pi \times \text{Diameter of the wheel}$

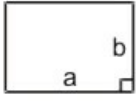
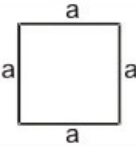
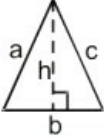
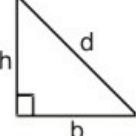
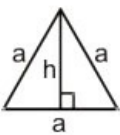
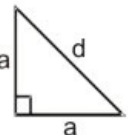
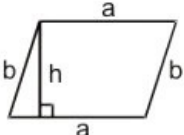
$$\Rightarrow 220 \text{ cm} = \frac{22}{7} \times \text{Diameter of the wheel}$$

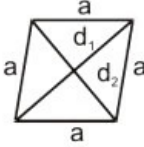
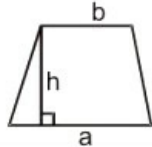
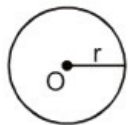
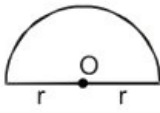
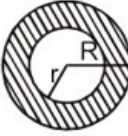

$$\Rightarrow \text{Diameter of the wheel} = \left(\frac{220 \times 7}{22}\right) \text{ cm} = 70 \text{ cm}$$

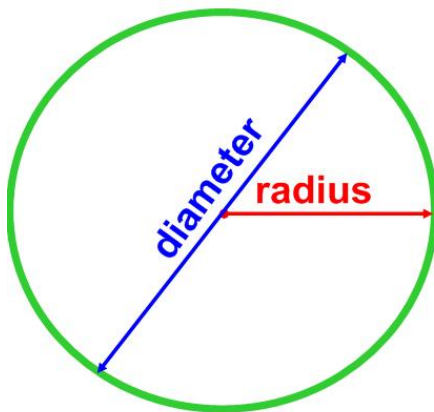
Hence, the circumference of the wheel is 220 cm and its diameter is 70 cm.

Mensuration

Exercise 20F

Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

Rhombus		$4a$	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \left(\frac{\theta}{360}\right) \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$



Area of a circle
 $= \pi \times \text{radius}^2$

Circumference of a
circle $= \pi \times \text{diameter}$

remember that the
diameter $= 2 \times \text{radius}$

Q1

Answer :

(i) Given:

$$r = 21 \text{ cm}$$

$$\begin{aligned}\therefore \text{Area of the circle} &= (\pi r^2) \text{ sq. units} \\ &= \left(\frac{22}{7} \times 21 \times 21\right) \text{ cm}^2 = (22 \times 3 \times 21) \text{ cm}^2 = 1386 \text{ cm}^2\end{aligned}$$

(ii) Given:

$$r = 3.5 \text{ m}$$

$$\begin{aligned}\text{Area of the circle} &= (\pi r^2) \text{ sq. units} \\ &= \left(\frac{22}{7} \times 3.5 \times 3.5\right) \text{ m}^2 = (22 \times 0.5 \times 3.5) \text{ m}^2 = 38.5 \text{ m}^2\end{aligned}$$

Q2

Answer :

(i) Given:

$$d = 28 \text{ cm} \Rightarrow r = \left(\frac{d}{2}\right) = \left(\frac{28}{2}\right) \text{ cm} = 14 \text{ cm}$$

$$\begin{aligned}\text{Area of the circle} &= (\pi r^2) \text{ sq. units} \\ &= \left(\frac{22}{7} \times 14 \times 14\right) \text{ cm}^2 = (22 \times 2 \times 14) \text{ cm}^2 = 616 \text{ cm}^2\end{aligned}$$

(ii) Given:

$$r = 1.4 \text{ m} \Rightarrow r = \left(\frac{d}{2}\right) = \left(\frac{1.4}{2}\right) \text{ m} = 0.7 \text{ m}$$

$$\begin{aligned}\text{Area of the circle} &= (\pi r^2) \text{ sq. units} \\ &= \left(\frac{22}{7} \times 0.7 \times 0.7\right) \text{ m}^2 = (22 \times 0.1 \times 0.7) \text{ m}^2 = 1.54 \text{ m}^2\end{aligned}$$

Q3

Answer :

Let the radius of the circle be r cm.

$$\text{Circumference} = (2\pi r) \text{ cm}$$

$$\therefore (2\pi r) = 264$$

$$\Rightarrow \left(2 \times \frac{22}{7} \times r\right) = 264$$

$$\Rightarrow r = \left(\frac{264 \times 7}{2 \times 22}\right) = 42$$

$$\begin{aligned}\therefore \text{Area of the circle} &= \pi r^2 \\ &= \left(\frac{22}{7} \times 42 \times 42\right) \text{ cm}^2 \\ &= 5544 \text{ cm}^2\end{aligned}$$

Q4

Answer :

Let the radius of the circle be r m.

Then, its circumference will be $(2\pi r)$ m.

$$\therefore (2\pi r) = 35.2$$

$$\Rightarrow \left(2 \times \frac{22}{7} \times r\right) = 35.2$$

$$\Rightarrow r = \left(\frac{35.2 \times 7}{2 \times 22}\right) = 5.6$$

$$\begin{aligned}\therefore \text{Area of the circle} &= \pi r^2 \\ &= \left(\frac{22}{7} \times 5.6 \times 5.6\right) \text{ m}^2 = 98.56 \text{ m}^2\end{aligned}$$

Q5

Answer :

Let the radius of the circle be r cm.

Then, its area will be πr^2 cm².

$$\therefore \pi r^2 = 616$$

$$\Rightarrow \left(\frac{22}{7} \times r \times r \right) = 616$$

$$\Rightarrow r^2 = \left(\frac{616 \times 7}{22} \right) = 196$$

$$\Rightarrow r = \sqrt{196} = 14$$

$$\begin{aligned} \Rightarrow \text{Circumference of the circle} &= (2\pi r) \text{ cm} \\ &= \left(2 \times \frac{22}{7} \times 14 \right) \text{ cm} = 88 \text{ cm} \end{aligned}$$

Q6

Answer :

Let the radius of the circle be r m.

Then, area = πr^2 m²

$$\therefore \pi r^2 = 1386$$

$$\Rightarrow \left(\frac{22}{7} \times r \times r \right) = 1386$$

$$\Rightarrow r^2 = \left(\frac{1386 \times 7}{22} \right) = 441$$

$$\Rightarrow r = \sqrt{441} = 21$$

$$\begin{aligned} \Rightarrow \text{Circumference of the circle} &= (2\pi r) \text{ m} \\ &= \left(2 \times \frac{22}{7} \times 21 \right) \text{ m} = 132 \text{ m} \end{aligned}$$

Q7

Answer :

Let r_1 and r_2 be the radii of the two given circles and A_1 and A_2 be their respective areas.

$$\frac{r_1}{r_2} = \frac{4}{5}$$

$$\therefore \frac{A_1}{A_2} = \frac{\pi r_1^2}{\pi r_2^2} = \frac{r_1^2}{r_2^2} = \left(\frac{r_1}{r_2} \right)^2 = \left(\frac{4}{5} \right)^2 = \frac{16}{25}$$

Hence, the ratio of the areas of the given circles is 16:25.

Q8

Answer :

If the horse is tied to a pole, then the pole will be the central point and the area over which the horse will graze will be a circle. The string by which the horse is tied will be the radius of the circle.

Thus,

Radius of the circle (r) = Length of the string = 21 m

$$\text{Now, area of the circle} = \pi r^2 = \left(\frac{22}{7} \times 21 \times 21 \right) \text{ m}^2 = 1386 \text{ m}^2$$

$$\therefore \text{Required area} = 1386 \text{ m}^2$$

Q9

Answer :

Let a be one side of the square.

Area of the square = 121 cm² (given)

$$\Rightarrow a^2 = 121$$

$$\Rightarrow a = 11 \text{ cm (since } 11 \times 11 = 121)$$

Perimeter of the square = 4 \times side = $4a = (4 \times 11) \text{ cm} = 44 \text{ cm}$

Length of the wire = Perimeter of the square
= 44 cm

The wire is bent in the form of a circle.

Circumference of a circle = Length of the wire

\therefore Circumference of a circle = 44 cm

$$\Rightarrow 2\pi r = 44$$

$$\Rightarrow \left(2 \times \frac{22}{7} \times r \right) = 44$$

$$\Rightarrow r = \left(\frac{44 \times 7}{2 \times 22} \right) = 7 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of the circle} &= \pi r^2 \\ &= \left(\frac{22}{7} \times 7 \times 7 \right) \text{ cm}^2 \\ &= 154 \text{ cm}^2 \end{aligned}$$

Q10

Answer :

It is given that the radius of the circle is 28 cm.

Length of the wire = Circumference of the circle

$$\Rightarrow \text{Circumference of the circle} = 2\pi r = \left(2 \times \frac{22}{7} \times 28\right) \text{ cm} = 176 \text{ cm}$$

Let the wire be bent into the form of a square of side a cm.

Perimeter of the square = 176 cm

$$\Rightarrow 4a = 176$$

$$\Rightarrow a = \left(\frac{176}{4}\right) \text{ cm} = 44 \text{ cm}$$

Thus, each side of the square is 44 cm.

$$\begin{aligned} \text{Area of the square} &= (\text{Side})^2 = (a)^2 = (44 \text{ cm})^2 \\ &= 1936 \text{ cm}^2 \end{aligned}$$

$$\therefore \text{Required area of the square formed} = 1936 \text{ cm}^2$$

Q11

Answer :

$$\text{Area of the acrylic sheet} = 34 \text{ cm} \times 24 \text{ cm} = 816 \text{ cm}^2$$

Given that the diameter of a circular button is 3.5 cm.

$$\therefore \text{Radius of the circular button } (r) = \left(\frac{3.5}{2}\right) \text{ cm} = 1.75 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of 1 circular button} &= \pi r^2 \\ &= \left(\frac{22}{7} \times 1.75 \times 1.75\right) \text{ cm}^2 \\ &= 9.625 \text{ cm}^2 \end{aligned}$$

$$\therefore \text{Area of 64 such buttons} = (64 \times 9.625) \text{ cm}^2 = 616 \text{ cm}^2$$

$$\begin{aligned} \text{Area of the remaining acrylic sheet} &= (\text{Area of the acrylic sheet} - \text{Area of 64 circular buttons}) \\ &= (816 - 616) \text{ cm}^2 = 200 \text{ cm}^2 \end{aligned}$$

Q12

Answer :

$$\text{Area of the rectangular ground} = 90 \text{ m} \times 32 \text{ m} = (90 \times 32) \text{ m}^2 = 2880 \text{ m}^2$$

Given:

Radius of the circular tank $(r) = 14 \text{ m}$

$$\begin{aligned} \therefore \text{Area covered by the circular tank} &= \pi r^2 = \left(\frac{22}{7} \times 14 \times 14\right) \text{ m}^2 \\ &= 616 \text{ m}^2 \end{aligned}$$

$$\therefore \text{Remaining portion of the rectangular ground for turfing} = (\text{Area of the rectangular ground} - \text{Area covered by the circular tank})$$

$$= (2880 - 616) \text{ m}^2 = 2264 \text{ m}^2$$

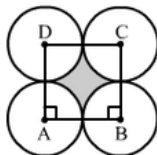
Rate of turfing = Rs 50 per sq. metre

$$\therefore \text{Total cost of turfing the remaining ground} = \text{Rs } (50 \times 2264) = \text{Rs } 1,13,200$$

Q13

Answer :

Area of each of the four quadrants is equal to each other with radius 7 cm.



$$\text{Area of the square ABCD} = (\text{Side})^2 = (14 \text{ cm})^2 = 196 \text{ cm}^2$$

$$\begin{aligned} \text{Sum of the areas of the four quadrants} &= \left(4 \times \frac{1}{4} \times \frac{22}{7} \times 7 \times 7\right) \text{ cm}^2 \\ &= 154 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \therefore \text{Area of the shaded portion} &= \text{Area of square ABCD} - \text{Areas of the four quadrants} \\ &= (196 - 154) \text{ cm}^2 \\ &= 42 \text{ cm}^2 \end{aligned}$$

Q14

Answer :

Let ABCD be the rectangular field.

Here, AB = 60 m

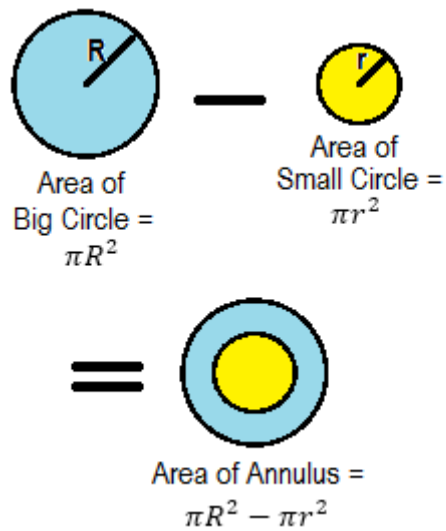
BC = 40 m

Let the horse be tethered to corner A by a 14 m long rope.

Then, it can graze through a quadrant of a circle of radius 14 m.

\therefore Required area of the field = $\left(\frac{1}{4} \times \frac{22}{7} \times 14 \times 14\right) \text{ m}^2 = 154 \text{ m}^2$

Hence, horse can graze 154 m^2 area of the rectangular field.



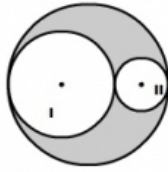
Q15

Answer :

Diameter of the big circle = 21 cm

Radius = $\left(\frac{21}{2}\right)$ cm = 10.5 cm

$$\therefore \text{Area of the bigger circle} = \pi r^2 = \left(\frac{22}{7} \times 10.5 \times 10.5\right) \text{ cm}^2 \\ = 346.5 \text{ cm}^2$$



$$\text{Diameter of circle I} = \frac{2}{3} \text{ of the diameter of the bigger circle} \\ = \frac{2}{3} \text{ of } 21 \text{ cm} = \left(\frac{2}{3} \times 21\right) \text{ cm} = 14 \text{ cm}$$

Radius of circle I (r_1) = $\left(\frac{14}{2}\right)$ cm = 7 cm

$$\therefore \text{Area of circle I} = \pi r_1^2 = \left(\frac{22}{7} \times 7 \times 7\right) \text{ cm}^2 \\ = 154 \text{ cm}^2$$

$$\text{Diameter of circle II} = \frac{1}{3} \text{ of the diameter of the bigger circle} \\ = \frac{1}{3} \text{ of } 21 \text{ cm} = \left(\frac{1}{3} \times 21\right) \text{ cm} = 7 \text{ cm}$$

Radius of circle II (r_2) = $\left(\frac{7}{2}\right)$ cm = 3.5 cm

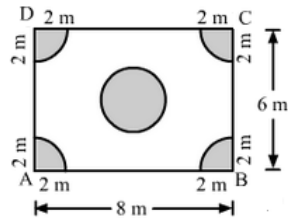
$$\therefore \text{Area of circle II} = \pi r_2^2 = \left(\frac{22}{7} \times 3.5 \times 3.5\right) \text{ cm}^2 \\ = 38.5 \text{ cm}^2$$

$$\therefore \text{Area of the shaded portion} = \{\text{Area of the bigger circle} - (\text{Sum of the areas of circle I and II})\} \\ = \{346.5 - (154 + 38.5)\} \text{ cm}^2 \\ = \{346.5 - 192.5\} \text{ cm}^2 \\ = 154 \text{ cm}^2$$

Hence, the area of the shaded portion is 154 cm²

Q16

Answer :



Let ABCD be the rectangular plot of land that measures 8 m by 6 m.

$$\therefore \text{Area of the plot} = (8 \text{ m} \times 6 \text{ m}) = 48 \text{ m}^2$$

$$\text{Area of the four flower beds} = \left(4 \times \frac{1}{4} \times \frac{22}{7} \times 2 \times 2\right) \text{ m}^2 = \left(\frac{88}{7}\right) \text{ m}^2$$

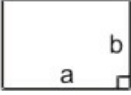
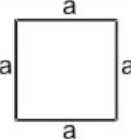
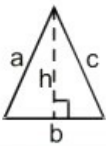
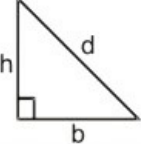
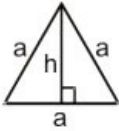
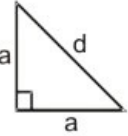
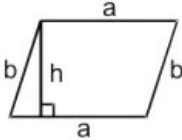
$$\text{Area of the circular flower bed in the middle of the plot} = \pi r^2 \\ = \left(\frac{22}{7} \times 2 \times 2\right) \text{ m}^2 = \left(\frac{88}{7}\right) \text{ m}^2$$

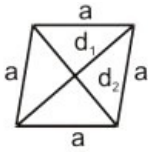
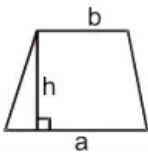
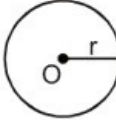
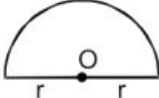


$$\text{Area of the remaining part} = \left\{48 - \left(\frac{88}{7} + \frac{88}{7}\right)\right\} \text{ m}^2 \\ = \left\{48 - \frac{176}{7}\right\} \text{ m}^2 \\ = \left\{\frac{336-176}{7}\right\} \text{ m}^2 = \left(\frac{160}{7}\right) \text{ m}^2 = 22.86 \text{ m}^2$$

$$\therefore \text{Required area of the remaining plot} = 22.86 \text{ m}^2$$

Mensuration

Exercise 20G

Name	Figure	Perimeter	Area
Rectangle		$2(a + b)$	ab
Square		$4a$	a^2
Triangle		$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b + h + d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}a^2$
Parallelogram		$2(a + b)$	ah

Rhombus		$4a$	$\frac{1}{2} d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2} h (a + b)$
Circle		$2\pi r$	πr^2
Semicircle		$\pi r + 2r$	$\frac{1}{2} \pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = \left(\frac{\theta}{360}\right) \times 2\pi r$	$\frac{\theta}{360} \times \pi r^2$

Mensuration RS Aggarwal Class 7 Maths Solutions Exercise 20G

Q1

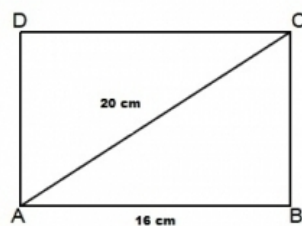
Answer :

(c) 192 cm^2

Let ABCD be the rectangular plot.

Then, $AB = 16 \text{ cm}$

$AC = 20 \text{ cm}$



Let $BC = x \text{ cm}$

From right triangle ABC:

$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow (20)^2 = (16)^2 + x^2$$

$$\Rightarrow x^2 = (20)^2 - (16)^2 \Rightarrow \{400 - 256\} = 144$$

$$\Rightarrow x = \sqrt{144} = 12$$

$$\therefore BC = 12 \text{ cm}$$

$$\therefore \text{Area of the plot} = (16 \times 12) \text{ cm}^2 = 192 \text{ cm}^2$$

Q2

Answer :

(b) 72 cm^2

Given:

Diagonal of the square = 12 cm

$$\begin{aligned}\therefore \text{Area of the square} &= \left\{ \frac{1}{2} \times (\text{Diagonal})^2 \right\} \text{ sq. units.} \\ &= \left\{ \frac{1}{2} \times (12)^2 \right\} \text{ cm}^2 \\ &= 72 \text{ cm}^2\end{aligned}$$

Q3

Answer :

(b) 20 cm

$$\text{Area of the square} = \left\{ \frac{1}{2} \times (\text{Diagonal})^2 \right\} \text{ sq. units.}$$

Area of the square field = 200 cm^2

$$\begin{aligned}\text{Diagonal of a square} &= \sqrt{2 \times \text{Area of the square}} \\ &= (\sqrt{2 \times 200}) \text{ cm} = (\sqrt{400}) \text{ cm} = 20 \text{ cm}\end{aligned}$$

\therefore Length of the diagonal of the square = 20 cm

Q4

Answer :

(a) 100 m

$$\text{Area of the square} = \left\{ \frac{1}{2} \times (\text{Diagonal})^2 \right\} \text{ sq. units.}$$

Given:

Area of square field = 0.5 hectare

$$\begin{aligned}&= (0.5 \times 10000) \text{ m}^2 && [\text{since } 1 \text{ hectare} = 10000 \text{ m}^2] \\ &= 5000 \text{ m}^2\end{aligned}$$

$$\begin{aligned}\text{Diagonal of a square} &= \sqrt{2 \times \text{Area of the square}} \\ &= (\sqrt{2 \times 5000}) \text{ m} = 100 \text{ m}\end{aligned}$$

Hence, the length of the diagonal of a square field is 100 m.

Q5

Answer :

(c) 90 m

Let the breadth of the rectangular field be x m.

Length = $3x$ m

Perimeter of the rectangular field = $2(l + b)$

$$\Rightarrow 240 = 2(x + 3x)$$

$$\Rightarrow 240 = 2(4x)$$

$$\Rightarrow 240 = 8x \Rightarrow x = \left(\frac{240}{8}\right) = 30$$

$$\therefore \text{Length of the field} = 3x = (3 \times 30) \text{ m} = 90 \text{ m}$$

Q6

Answer :

(d) 56.25%

Let the side of the square be a cm.

Area of the square = $(a)^2 \text{ cm}^2$

Increased side = $(a + 25\% \text{ of } a) \text{ cm}$

$$= \left(a + \frac{25}{100}a\right) \text{ cm} = \left(a + \frac{1}{4}a\right) \text{ cm} = \left(\frac{5}{4}a\right) \text{ cm}$$

$$\text{Area of the square} = \left(\frac{5}{4}a\right)^2 \text{ cm}^2 = \left(\frac{25}{16}a^2\right) \text{ cm}^2$$

$$\text{Increase in the area} = \left[\left(\frac{25}{16}a^2\right) - a^2\right] \text{ cm}^2 = \left(\frac{25a^2 - 16a^2}{16}\right) \text{ cm}^2 = \left(\frac{9a^2}{16}\right) \text{ cm}^2$$

$$\% \text{ increase in the area} = \frac{\text{Increased area}}{\text{Old area}} \times 100$$

$$= \left[\frac{\left(\frac{9}{16}a^2\right)}{a^2} \times 100\right] = \left(\frac{9 \times 100}{16}\right) = 56.25$$

Q7

Answer :

(b) 1:2

Let the side of the square be a .

Length of its diagonal = $\sqrt{2}a$

$$\therefore \text{Required ratio} = \frac{a^2}{(\sqrt{2}a)^2} = \frac{a^2}{2a^2} = \frac{1}{2} = 1 : 2$$

Q8

Answer :

(c) $A > B$

We know that a square encloses more area even though its perimeter is the same as that of the rectangle.

$$\therefore \text{Area of a square} > \text{Area of a rectangle}$$

Q9

Answer :

(b) 13500 m²

Let the length of the rectangular field be $5x$.

Breadth = $3x$

Perimeter of the field = $2(l + b) = 480 \text{ m}$ (given)

$$\Rightarrow 480 = 2(5x + 3x) \Rightarrow 480 = 16x$$

$$\Rightarrow x = \frac{480}{16} = 30$$

$$\therefore \text{Length} = 5x = (5 \times 30) = 150 \text{ m}$$

$$\text{Breadth} = 3x = (3 \times 30) = 90 \text{ m}$$

$$\therefore \text{Area of the rectangular park} = 150 \text{ m} \times 90 \text{ m} = 13500 \text{ m}^2$$

Q10

Answer :

(a) 6 m

Total cost of carpeting = Rs 6000

Rate of carpeting = Rs 50 per m

$$\therefore \text{Length of the carpet} = \left(\frac{6000}{50} \right) \text{ m} = 120 \text{ m}$$

$$\therefore \text{Area of the carpet} = \left(120 \times \frac{75}{100} \right) \text{ m}^2 = 90 \text{ m}^2 \quad [\text{since } 75 \text{ cm} = \frac{75}{100} \text{ m}]$$

Area of the floor = Area of the carpet = 90 m²

$$\therefore \text{Width of the room} = \left(\frac{\text{Area}}{\text{Length}} \right) = \left(\frac{90}{15} \right) \text{ m} = 6 \text{ m}$$

Q11

Answer :

(a) 84 cm²

Let $a = 13$ cm, $b = 14$ cm and $c = 15$ cm

$$\text{Then, } s = \frac{a+b+c}{2} = \left(\frac{13+14+15}{2} \right) \text{ cm} = 21 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \text{ sq. units} \\ &= \sqrt{21(21-13)(21-14)(21-15)} \text{ cm}^2 \\ &= \sqrt{21 \times 8 \times 7 \times 6} \text{ cm}^2 \\ &= \sqrt{3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 2 \times 3} \text{ cm}^2 \\ &= (2 \times 2 \times 3 \times 7) \text{ cm}^2 \\ &= 84 \text{ cm}^2 \end{aligned}$$

Q12

Answer :

(b) 48 m²

Base = 12 m

Height = 8 m

$$\begin{aligned} \text{Area of the triangle} &= \left(\frac{1}{2} \times \text{Base} \times \text{Height} \right) \text{ sq. units} \\ &= \left(\frac{1}{2} \times 12 \times 8 \right) \text{ m}^2 \\ &= 48 \text{ m}^2 \end{aligned}$$

Q13

Answer :

(b) 4 cm

$$\text{Area of the equilateral triangle} = 4\sqrt{3} \text{ cm}^2$$

We know:

$$\text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} (\text{side})^2 \text{ sq. units}$$

$$\begin{aligned} \therefore \text{Side of the equilateral triangle} &= \left[\sqrt{\left(\frac{4 \times \text{Area}}{\sqrt{3}} \right)} \right] \text{ cm} \\ &= \left[\sqrt{\left(\frac{4 \times 4\sqrt{3}}{\sqrt{3}} \right)} \right] \text{ cm} = (\sqrt{4 \times 4}) \text{ cm} = (\sqrt{16}) \text{ cm} = 4 \text{ cm} \end{aligned}$$

Q14

Answer :

(c) $16\sqrt{3} \text{ cm}^2$

It is given that one side of an equilateral triangle is 8 cm.

$$\begin{aligned} \therefore \text{Area of the equilateral triangle} &= \frac{\sqrt{3}}{4} (\text{Side})^2 \text{ sq. units} \\ &= \frac{\sqrt{3}}{4} (8)^2 \text{ cm}^2 \\ &= \left(\frac{\sqrt{3}}{4} \times 64 \right) \text{ cm}^2 = 16\sqrt{3} \text{ cm}^2 \end{aligned}$$

Q15

Answer :

(b) $2\sqrt{3} \text{ cm}^2$

Let $\triangle ABC$ be an equilateral triangle with one side of the length a cm.

Diagonal of an equilateral triangle = $\frac{\sqrt{3}}{2} a$ cm

$$\Rightarrow \frac{\sqrt{3}}{2} a = \sqrt{6}$$

$$\Rightarrow a = \frac{\sqrt{6} \times 2}{\sqrt{3}} = \frac{\sqrt{3} \times \sqrt{2} \times 2}{\sqrt{3}} = 2\sqrt{2} \text{ cm}$$

$$\begin{aligned} \text{Area of the equilateral triangle} &= \frac{\sqrt{3}}{4} a^2 \\ &= \frac{\sqrt{3}}{4} (2\sqrt{2})^2 \text{ cm}^2 = \left(\frac{\sqrt{3}}{4} \times 8 \right) \text{ cm}^2 = 2\sqrt{3} \text{ cm}^2 \end{aligned}$$

Q16

Answer :

(b) 72 cm^2

Base of the parallelogram = 16 cm

Height of the parallelogram = 4.5 cm

\therefore Area of the parallelogram = Base \times Height

$$= (16 \times 4.5) \text{ cm}^2 = 72 \text{ cm}^2$$

Q17

Answer :

(b) 216 cm^2

Length of one diagonal = 24 cm

Length of the other diagonal = 18 cm

\therefore Area of the rhombus = $\frac{1}{2} \times$ (Product of the diagonals)

$$= \left(\frac{1}{2} \times 24 \times 18 \right) \text{ cm}^2 = 216 \text{ cm}^2$$

Q18

Answer :

(c) 154 cm^2

Let the radius of the circle be r cm.

Circumference = $2\pi r$

(Circumference) - (Radius) = 37

$$\therefore (2\pi r - r) = 37$$

$$\Rightarrow r(2\pi - 1) = 37$$

$$\Rightarrow r = \frac{37}{(2\pi - 1)} = \frac{37}{\left(2 \times \frac{22}{7} - 1\right)} = \frac{37}{\left(\frac{44}{7} - 1\right)} = \frac{37}{\left(\frac{44-7}{7}\right)} = \left(\frac{37 \times 7}{37}\right) = 7$$

\therefore Radius of the given circle is 7 cm.

$$\therefore \text{Area} = \pi r^2 = \left(\frac{22}{7} \times 7 \times 7 \right) \text{ cm}^2 = 154 \text{ cm}^2$$

Q19

Answer :

(c) 54 m^2

Given:

Perimeter of the floor = $2(l + b) = 18 \text{ m}$

Height of the room = 3 m

$$\begin{aligned}\therefore \text{Area of the four walls} &= \{2(l + b) \times h\} \\ &= \text{Perimeter} \times \text{Height} \\ &= 18 \text{ m} \times 3 \text{ m} = 54 \text{ m}^2\end{aligned}$$

Q20

Answer :

(a) 200 m

Area of the floor of a room = $14 \text{ m} \times 9 \text{ m} = 126 \text{ m}^2$

Width of the carpet = $63 \text{ cm} = 0.63 \text{ m}$ (since $100 \text{ cm} = 1 \text{ m}$)

$$\begin{aligned}\therefore \text{Required length of the carpet} &= \frac{\text{Area of the floor of a room}}{\text{Width of the carpet}} \\ &= \left(\frac{126}{0.63} \right) \text{ m} = 200 \text{ m}\end{aligned}$$

Q21

Answer :

(c) 120 cm^2

Let the length of the rectangle be $x \text{ cm}$ and the breadth be $y \text{ cm}$.

Area of the rectangle = $xy \text{ cm}^2$

Perimeter of the rectangle = $2(x + y) = 46 \text{ cm}$ (given)

$$\Rightarrow 2(x + y) = 46$$

$$\Rightarrow (x + y) = \left(\frac{46}{2} \right) \text{ cm} = 23 \text{ cm}$$

Diagonal of the rectangle = $\sqrt{x^2 + y^2} = 17 \text{ cm}$

$$\Rightarrow \sqrt{x^2 + y^2} = 17$$

Squaring both the sides, we get:

$$\Rightarrow x^2 + y^2 = (17)^2$$

$$\Rightarrow x^2 + y^2 = 289$$

$$\text{Now, } (x^2 + y^2) = (x + y)^2 - 2xy$$

$$\Rightarrow 2xy = (x + y)^2 - (x^2 + y^2)$$

$$= (23)^2 - 289$$

$$= 529 - 289 = 240$$

$$\therefore xy = \left(\frac{240}{2} \right) \text{ cm}^2 = 120 \text{ cm}^2$$

Q22

Answer :

(b) $3:1$

Let a side of the first square be $a \text{ cm}$ and that of the second square be $b \text{ cm}$.

Then, their areas will be a^2 and b^2 , respectively.

Their perimeters will be $4a$ and $4b$, respectively.

According to the question:

$$\frac{a^2}{b^2} = \frac{9}{1} \Rightarrow \left(\frac{a}{b} \right)^2 = \frac{9}{1} = \left(\frac{3}{1} \right)^2 \Rightarrow \frac{a}{b} = \frac{3}{1}$$

$$\therefore \text{Required ratio of the perimeters} = \frac{4a}{4b} = \frac{4 \times 3}{4 \times 1} = \frac{3}{1} = 3:1$$

Q23

Answer :

(d) 4:1

Let the diagonals be $2d$ and d .

Area of the square = sq. units

Required ratio =

Q24

Answer :

(c) 49 m

Let the width of the rectangle be x m.

Given:

Area of the rectangle = Area of the square

$\Rightarrow \text{Length} \times \text{Width} = \text{Side} \times \text{Side}$

$\Rightarrow (144 \times x) = 84 \times 84$

$\therefore \text{Width } (x) = \left(\frac{84 \times 84}{144} \right) \text{m} = 49 \text{ m}$

Hence, width of the rectangle is 49 m.

Q25

Answer :

(d) $4 : \sqrt{3}$

Let one side of the square and that of an equilateral triangle be the same, i.e. a units.

Then, Area of the square = $(\text{Side})^2 = (a)^2$

Area of the equilateral triangle = $\frac{\sqrt{3}}{4} (\text{Side})^2 = \frac{\sqrt{3}}{4} (a)^2$

$\therefore \text{Required ratio} = \frac{\frac{a^2}{4}}{\frac{\sqrt{3}}{4} a^2} = \frac{4}{\sqrt{3}} = 4 : \sqrt{3}$

Q26

Answer :

(a) $\sqrt{\pi} : 1$

Let the side of the square be x cm and the radius of the circle be r cm.

Area of the square = Area of the circle

$\Rightarrow (x)^2 = \pi r^2$

$\therefore \text{Side of the square } (x) = \sqrt{\pi} r$

Required ratio = $\frac{\text{Side of the square}}{\text{Radius of the circle}}$
 $= \frac{x}{r} = \frac{\sqrt{\pi} r}{r} = \frac{\sqrt{\pi}}{1} = \sqrt{\pi} : 1$

Q27

Answer :

(b) $\frac{49\sqrt{3}}{4} \text{ cm}^2$

Let the radius of the circle be r cm.

Then, its area = $\pi r^2 \text{ cm}^2$

$\therefore \pi r^2 = 154$

$\Rightarrow \frac{22}{7} \times r \times r = 154$

$\Rightarrow r^2 = \left(\frac{154 \times 7}{22} \right) = 49$

$\Rightarrow r = \sqrt{49} \text{ cm} = 7 \text{ cm}$

Side of the equilateral triangle = Radius of the circle

$= 7 \text{ cm}$

$\therefore \text{Area of the equilateral triangle} = \frac{\sqrt{3}}{4} (\text{side})^2 \text{ sq. units}$

$$= \frac{\sqrt{3}}{4} (7)^2 \text{ cm}^2$$

$$= \frac{49\sqrt{3}}{4} \text{ cm}^2$$

Q28

Answer :

(c) 12 cm

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

Given:

Length of one diagonal = 6 cm

Area of the rhombus = 36 cm^2

\therefore Length of the other diagonal = $\left(\frac{36 \times 2}{6}\right) \text{ cm} = 12 \text{ cm}$

Q30

Answer :

(c) 17.60 m

Let the radius of the circle be r m.

Area = $\pi r^2 \text{ m}^2$

$\therefore \pi r^2 = 24.64$

$\Rightarrow \left(\frac{22}{7} \times r \times r\right) = 24.64$

$\Rightarrow r^2 = \left(\frac{24.64 \times 7}{22}\right) = 7.84$

$\Rightarrow r = \sqrt{7.84} = 2.8 \text{ m}$

\Rightarrow Circumference of the circle = $(2\pi r) \text{ m}$
 $= \left(2 \times \frac{22}{7} \times 2.8\right) \text{ m} = 17.60 \text{ m}$

Q31

Answer :

(c) 3 cm

Suppose the radius of the original circle is r cm.

Area of the original circle = πr^2

Radius of the circle = $(r + 1) \text{ cm}$

According to the question:

$\pi(r + 1)^2 = \pi r^2 + 22$

$\Rightarrow \pi(r^2 + 1 + 2r) = \pi r^2 + 22$

$\Rightarrow \pi r^2 + \pi + 2\pi r = \pi r^2 + 22$

$\Rightarrow \pi + 2\pi r = 22$ [cancel πr^2 from both the sides of the equation]

$\Rightarrow \pi(1 + 2r) = 22$

$\Rightarrow (1 + 2r) = \frac{22}{\pi} = \left(\frac{22 \times 7}{22}\right) = 7$

$\Rightarrow 2r = 7 - 1 = 6$

$\therefore r = \left(\frac{6}{2}\right) \text{ cm} = 3 \text{ cm}$

\therefore Original radius of the circle = 3 cm

Q32

Answer :

(c) 1000

Radius of the wheel = 1.75 m

Circumference of the wheel = $2\pi r$

$= \left(2 \times \frac{22}{7} \times 1.75\right) \text{ cm} = (2 \times 22 \times 0.25) \text{ m} = 11 \text{ m}$

Distance covered by the wheel in 1 revolution is 11 m.

Now, 11 m is covered by the car in 1 revolution.

$(11 \times 1000) \text{ m}$ will be covered by the car in $\left(1 \times \frac{1}{11} \times 11 \times 1000\right)$ revolutions, i.e. 1000 revolutions.

\therefore Required number of revolutions = 1000