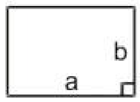
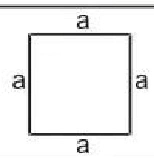
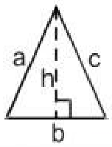
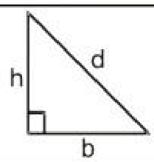
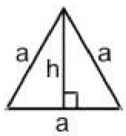
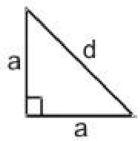
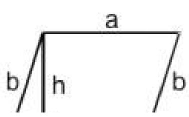
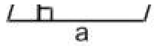
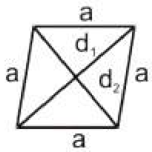
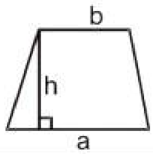
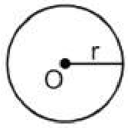
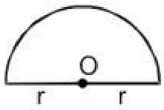
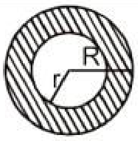
Mensuration
Exercise 20A

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 $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$

Q1

Answer :

(i) Length = 24.5 m
Breadth = 18 m

∴ Area of the rectangle = Length × Breadth
= 24.5 m × 18 m
= 441 m^2

(ii) Length = 12.5 m
Breadth = 8 dm = (8 × 10) = 80 cm = 0.8 m [since 1 dm = 10 cm and 1 m = 100 cm]

∴ Area of the rectangle = Length × Breadth
= 12.5 m × 0.8 m
= 10 m^2

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:
$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$
Perpendicular = $\sqrt{(\text{Hypotenuse})^2 - \left(\text{Base}\right)^2}$
Perpendicular = $\sqrt{(50)^2 - (48)^2} = \sqrt{2500 - 2304} = \sqrt{196} = 14$ m
∴ Other side of the rectangular plot = 14 m
Length = 48m
Breadth = 14m

∴ Area of the rectangular plot = 48 m × 14 m = 672 m^2
Hence, the area of a rectangular plot is 672 m^2.

Q3

Answer :

Let the length of the field be $4x$ m.
Breadth = $3x$ m
∴ Area of the field = $(4x \times 3x)$ m^2 = $12x^2$ m^2
But it is given that the area is 1728 m^2.
∴ $12x^2 = 1728$
⇒ $x^2 = \left(\frac{1728}{12}\right) = 144$
⇒ $x = \sqrt{144} = 12$
∴ Length = (4 × 12) m = 48 m
Breadth = (3 × 12) m =36 m
∴ Perimeter of the field = $2(l + b)$ units
= 2(48 + 36) m = (2 × 84) m = 168 m
∴ Cost of fencing = Rs (168 × 30) = Rs 5040

Q4

Answer :

Area of the rectangular field = 3584 m^2
Length of the rectangular field = 64 m
Breadth of the rectangular field = $\left(\frac{\text{Area}}{\text{Length}}\right) = \left(\frac{3584}{64}\right)$ m = 56 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 = $\left(\frac{6\times1000}{60}\right)$ m/min = 100 m/min.

∴ Required time to cover a distance of 1200 m = $\left(\frac{1200}{100}\right)$ min = 12 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) dm^2 = 60000 dm^2

Length of a stone = 6 dm
Breadth of a stone = 5 dm
∴ Area of a stone = (6 × 5) dm^2 = 30 dm^2

∴ 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 m × 9 m) = 117 m^2

Now, width of the carpet = 75 cm (given)
= 0.75 m [since 1 m = 100 cm]

Length of the carpet = $\left(\frac{\text{Area of the carpet}}{\text{Width of the carpet}}\right) = \left(\frac{117}{0.75}\right)$ m = 156 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
∴ Cost of x m carpet = Rs. $(80 \times x)$ = Rs. $(80x)$
Cost of carpeting the room = Rs. 19200
∴ $80x = 19200 \Rightarrow x = \left(\frac{19200}{80}\right) = 240$
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 × Width of the carpet
= (240×0.75) m^2 = 180 m^2
Let the width of the room be b m.
Area to be carpeted = 15 m × b m = $15b$ m^2
∴ $15b$ m^2 = 180 m^2
$\Rightarrow b = \left(\frac{180}{15}\right)$ m = 12 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
∴ Perimeter of the rectangular field = $\left(\frac{\text{Total cost of fencing}}{\text{Rate of fencing}}\right)$ m = $\left(\frac{9600}{24}\right)$ m = 400 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.
∴ $16x = 400$
$x = \left(\frac{400}{16}\right) = 25$
Length of the field = (5×25) m = 125 m
Breadth of the field = (3×25) m = 75 m

Q9

Answer :

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

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
∴ Area of the square = (Side)^2
= (8.5 m)^2
= 72.25 m^2

Q11

Answer :

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

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

Q12

Answer :

We know:

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

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

= $\left(\sqrt{2 \times 16200}\right)$ m = 180 m

∴ Length of the diagonal of the square = 180 m

Q13

Answer :

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

Given:

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

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

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

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

∴ Length of the diagonal of the square field = 100 m

Q14

Answer :

Area of the square plot = 6084 m^2

Side of the square plot = $\left(\sqrt{\textbf{Area}}\right)$

= $\left(\sqrt{6084}\right)$ m

= $\left(\sqrt{78 \times 78}\right)$m = 78 m

∴ Perimeter of the square plot = 4 × side = (4 × 78) m = 312 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 × 312) m = 1248 m

Q15

Answer :

Side of the square = 10 cm
Length of the wire = Perimeter of the square = 4 $\times$ Side = 4 $\times$ 10 cm = 40 cm
Length of the rectangle (l) = 12 cm
Let b be the breadth of the rectangle.

Perimeter of the rectangle = Perimeter of the square

$\Rightarrow 2(l + b) = 40$
$\Rightarrow 2(12 + b) = 40$
$\Rightarrow 24 + 2b = 40$
$\Rightarrow 2b = 40 - 24 = 16$
$\Rightarrow b = \left(\frac{16}{2}\right)$ cm = 8 cm
$\therefore$ Breadth of the rectangle = 8 cm
Now, Area of the square = $(\text{Side})^2$ = (10 cm $\times$ 10 cm) = 100 cm^2
Area of the rectangle = $l \times b$ = (12 cm $\times$ 8 cm) = 96 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
= $\{2 \times 10 \times (50 + 40)\} m^2$
= $\{20 \times 90\}$ m^2 = 1800 m^2
Area of the ceiling = $l \times b$ = (50 m $\times$ 40 m) = 2000 m^2
$\therefore$ Total area to be white washed = (1800 + 2000) m^2 = 3800 m^2
Rate of white washing = Rs 20/sq. metre
$\therefore$ Total cost of white washing = Rs (3800 $\times$ 20) = 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 m^2
$\therefore 168 = [2(l + 10) \times 4]$
$\Rightarrow 168 = [8l + 80]$
$\Rightarrow 168 - 80 = 8l$
$\Rightarrow 88 = 8l$
$\Rightarrow l = \left(\frac{88}{8}\right)$ m = 11 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 m^2
$\therefore 77 = [2(7.5 + 3.5)h]$
$\Rightarrow 77 = [(2 \times 11)h]$
$\Rightarrow 77 = 22h$
$\Rightarrow h = \left(\frac{77}{22}\right)$ m = $\left(\frac{7}{2}\right)$ m = 3.5 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 = $2x = (2 \times 5)$ m = 10 m

Breadth of the room = x = 5 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 = $(3 + 4) \text{ m}^2$

$= 7 \text{ m}^2$

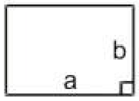
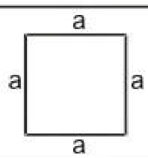
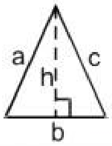
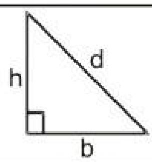
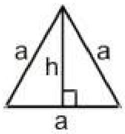
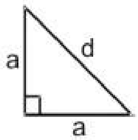
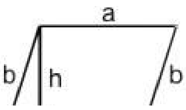
Area to be painted = $(102 - 7) \text{ m}^2 = 95 \text{ m}^2$

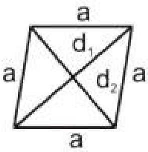
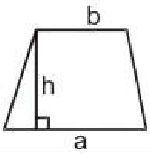
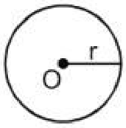
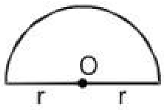
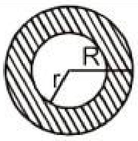
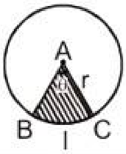
Rate of painting = Rs 160 per m^2

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

Mensuration

Exercise 20B

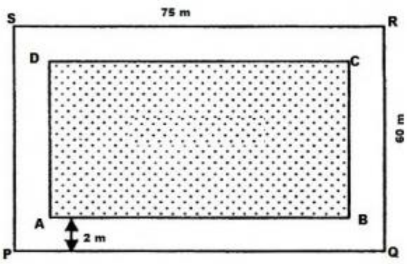
Name	Figure	Perimeter	Area
Rectangle		$2(a+b)$	ab
Square		$4a$	a^2
Triangle		$a+b+c=2s$	$1 = \frac{1}{2}\times b\times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
Right triangle		$b+h+d$	$\frac{1}{2}bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}ah$ 2. $\frac{\sqrt{3}}{4}a^2$
Isosceles right triangle		$2a+d$	$\frac{1}{2}a^2$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

			
Rhombus		4a	$\frac{1}{2}d_1d_2$
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 $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$

Q1

Answer :

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

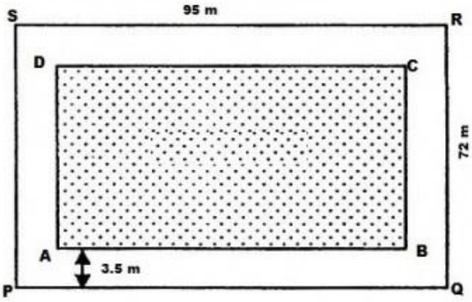


Length = 75 m
Breadth = 60 m
Area of the plot = $(75 \times 60)\ m^2 = 4500\ m^2$
Width of the path = 2 m
$\therefore$ AB = $(75 - 2 \times 2)$ m = $(75 - 4)$ m = 71 m
AD = $(60 - 2 \times 2)$ m = $(60 - 4)$ m = 56 m
Area of rectangle ABCD = $(71 \times 56)\ m^2 = 3976\ m^2$
Area of the path = (Area of PQRS - Area of ABCD)
= $(4500 - 3976)\ m^2 = 524\ m^2$
Rate of constructing the path = Rs 125 per m^2
$\therefore$ Total cost of constructing the path = Rs (524×125) = Rs 65,500

Q2

Answer :

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



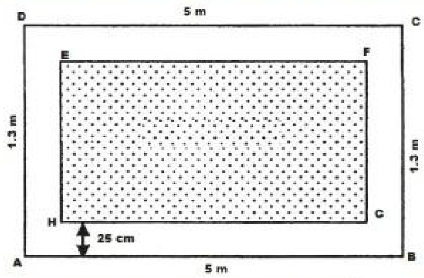
Length = 95 m
Breadth = 72 m
Area of the plot = $(95 \times 72)\ m^2 = 6{,}840\ m^2$
Width of the path = 3.5 m
∴ AB = $(95 - 2 \times 3.5)$ m = $(95 - 7)$ m = 88 m
AD = $(72 - 2 \times 3.5)$ m = $(72 - 7)$ m = 65 m

Area of the path = (Area PQRS - Area ABCD)
= $(6840 - 5720)\ m^2 = 1{,}120\ m^2$
Rate of constructing the path = Rs. 80 per m^2
∴ Total cost of constructing the path = Rs. $(1{,}120 \times 80)$ = Rs. 89,600
Rate of laying the grass on the plot ABCD = Rs. 40 per m^2
∴ Total cost of laying the grass on the plot = Rs. $(5{,}720 \times 40)$ = Rs. 2,28,800
∴ Total expenses involved = Rs. (89,600 + 2,28,800) = 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



∴ Area of ABCD = 5 m $\times$ 1.3 m = 6.5 m^2

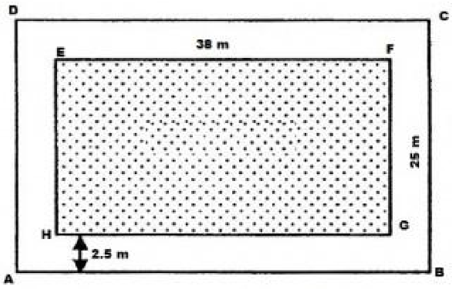
Length, GH = {5 -(0.25 + 0.25} m = 4.5 m
Breadth, FG = {1.3 - 0.25 + 0.25} m = 0.8 m
∴ Area of EFGH = 4.5 m $\times$ .8 m = 3.6 m^2

Area of the border = Area of ABCD − Area of EFGH
= 6.5 m^2 − 3.6 m^2
= 2.9 m^2 = 29000 cm^2 [since 1 m^2 = 10000 cm^2]
Rate of printing the border = Rs 1 per 10 cm^2
∴ Total cost of printing the border = Rs $\left(\frac{1\times29000}{10}\right)$
= Rs 2900

Q4

Answer :

Length, EF = 38 m
Breadth, FG = 25 m



∴ Area of EFGH = 38 m $\times$ 25 m = 950 m^2

Length, AB = (38 + 2.5 + 2.5) m = 43 m
Breadth, BC = (25 + 2.5 + 2.5) m = 30 m
∴ Area of ABCD = 43 m $\times$ 30 m = 1290 m^2

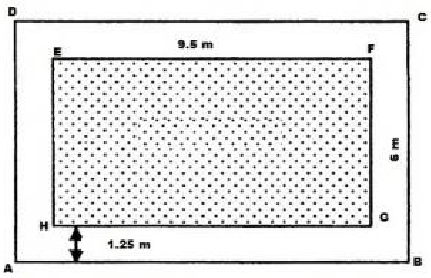
Area of the path = Area of ABCD − Area of PQRS
= 1290 m^2 – 950 m^2
= 340 m^2
Rate of gravelling the path = Rs 120 per m^2

∴ Total cost of gravelling the path = Rs (120 $\times$ 340)
= Rs 40800

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



∴ Area of EFGH = 9.5 m $\times$ 6 m = 57 m^2

Length, AB = (9.5 + 1.25 + 1.25) m = 12 m
Breadth, BC = (6 + 1.25 + 1.25) m = 8.5 m
∴ Area of ABCD = 12 m $\times$ 8.5 m = 102 m^2

Area of the verandah = Area of ABCD − Area of EFGH

$= 102\ m^2 - 57\ m^2$

$= 45\ m^2$

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

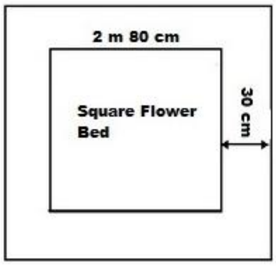
∴ Total cost of cementing the verandah = Rs (80 × 45)

= Rs 3600

Q6

Answer :

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



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

Side of the flower bed with the digging strip = 2.80 m + 30 cm + 30 cm

= (2.80 + 0.3 + 0.3) m = 3.4 m

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

∴ Increase in the area of the flower bed = $11.56\ m^2 - 7.84\ m^2$

$= 3.72\ m^2$

Q7

Answer :

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

Perimeter of the park = $2(2x + x)$ = 240 m

⇒ $2(2x + x) = 240$

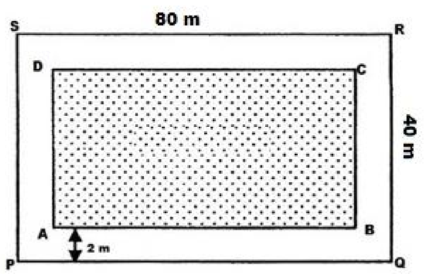
⇒ $6x = 240$

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

∴ Length of the park = $2x$ = (2 × 40) = 80 m

Breadth = x = 40 m

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



Length = 80 m

Breadth = 40 m

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

Width of the path = 2 m

∴ AB = (80 - 2 × 2) m = (80 - 4) m =76 m

AD = (40 - 2 × 2) m = (40 - 4) m = 36 m

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

Area of the path = (Area of PQRS - Area of ABCD)

$= (3200 - 2736)\ m^2 = 464\ m^2$

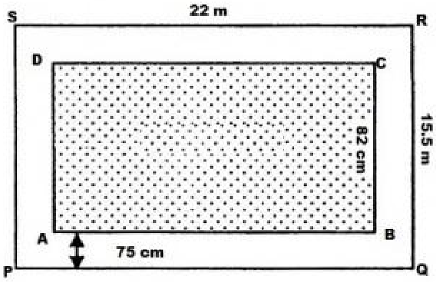
Rate of paving the path = Rs. 80 per m^2

∴ Total cost of paving the path = Rs. (464 × 80) = Rs. 37,120

Q8

Answer :

Length of the hall, PQ = 22 m
Breadth of the hall, QR = 15.5 m



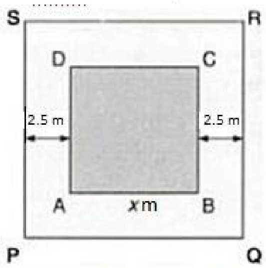
$\therefore$ Area of the school hall PQRS = 22 m $\times$ 15.5 m = 341 m^2
Length of the carpet, AB = 22 m – (0.75 m + 0.75 m) = 20.5 m [since 100 cm = 1 m]
Breadth of the carpet, BC = 15.5 m – (0.75 m + 0.75 m) = 14 m
$\therefore$ Area of the carpet ABCD = 20.5 m $\times$ 14 m = 287 m^2
Area of the strip = Area of the school hall (PQRS) – Area of the carpet (ABCD)
= 341 m^2 – 287 m^2
= 54 m^2

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

$\therefore$ Length of the carpet whose area is 287 m^2 = 287 m^2 ÷ 0.82 m^2 = 350 m
Cost of the 350 m long carpet = Rs 60 $\times$ 350 = Rs 21000

Q9
Answer :

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



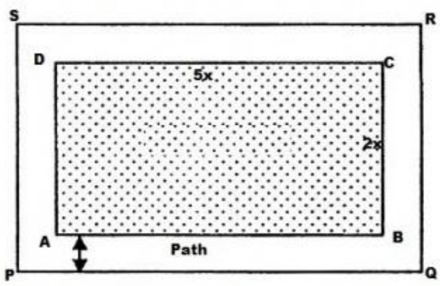
Let a side of the lawn (AB) be x m.
Area of the square lawn = x^2
Length, PQ = (x m + 2.5 m + 2.5 m) = (x + 5) m
$\therefore$ Area of PQRS = $(x + 5)^2 = (x^2 + 10x + 25)$ m^2

Area of the path = Area of PQRS – Area of the square lawn (ABCD)
$\Rightarrow 165 = x^2 + 10x + 25 - x^2$
$\Rightarrow 165 = 10x + 25$
$\Rightarrow 165 - 25 = 10x$
$\Rightarrow 140 = 10x$
$\therefore x = 140 \div 10 = 14$
$\therefore$ Side of the lawn = 14 m

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

Q10
Answer :

Area of the path = 305 m^2



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

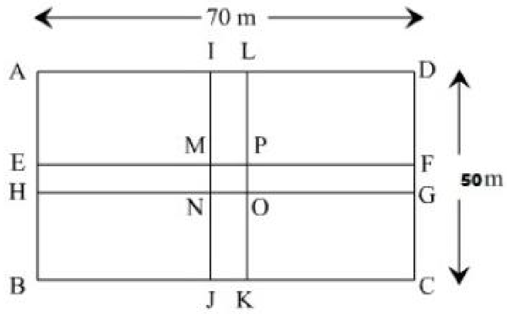
∴ Area of the rectangular park = $5x \times 2x = 10x^2$ m^2
Width of the path = 2.5 m
Outer length, PQ = $5x$ m + 2.5 m + 2.5 m = $(5x + 5)$ m
Outer breadth, QR = $2x$ + 2.5 m + 2.5 m = $(2x + 5)$ m
Area of $PQRS$ = $(5x + 5) \times (2x + 5)$ = $(10x^2 + 25x + 10x + 25)$ = $(10x^2 + 35x + 25)$ m^2
∴ Area of the path = $[(10x^2 + 35x + 25) - 10x^2]$ m^2
⇒ $305 = 35x + 25$
⇒ $305 - 25 = 35x$
⇒ $280 = 35x$
⇒ $x = 280 \div 35 = 8$

∴ Length of the park = $5x = 5 \times 8 = 40$ m
Breadth of the park = $2x = 2 \times 8 = 16$ 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 m
Breadth of the rectangular park, CD = 50 m
∴ Area of the rectangular park = Length × Breadth = 70 m × 50 m = 3500 m^2
Area of road $EFGH$ = 70 m × 5 m = 350 m^2
Area of road $IJKL$ = 50 m × 5 m = 250 m^2

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

∴ Area of $MNOP$ = 5 m × 5 m = 25 m^2

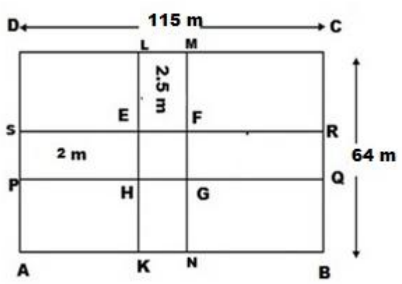
Area of the roads = Area ($EFGH$) + Area ($IJKL$) − Area ($MNOP$)
= (350 + 250) m^2– 25 m^2 = 575 m^2
It is given that the cost of constructing the roads is Rs. 120/m^2.

Cost of constructing 575 m^2 area of the roads = Rs. (120 × 575)
= Rs. 69000

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 cm
Breadth of the rectangular field, BC = 64 m
∴ Area of the rectangular lawn ABCD = 115 m × 64 m = 7360 m^2
Area of the road PQRS = 115 m × 2 m = 230 m^2
Area of the road KLMN = 64 m × 2.5 m = 160 m^2

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

∴ Area of EFGH = 2 m × 2.5 m = 5 m^2

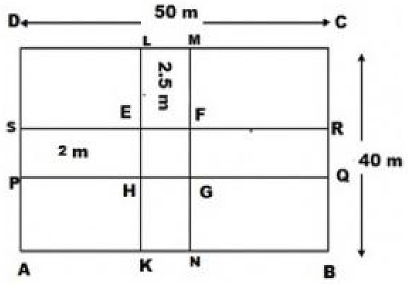
∴ Area of the roads = Area (KLMN) + Area (PQRS) − Area (EFGH)
= (230 m^2 + 160 m^2) − 5 m^2 = 385 m^2

Rate of gravelling the roads = Rs 60 per m^2
∴ Total cost of gravelling the roads = Rs (385 × 60)
= Rs 23,100

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 cm
Breadth of the rectangular field BC = 40 m
∴ Area of the rectangular field ABCD = 50 m × 40 m = 2000 m^2
Area of road KLMN = 40 m × 2.5 m = 100 m^2
Area of road PQRS = 50 m × 2 m = 100 m^2

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

∴ Area of EFGH = 2.5 m × 2 m = 5 m^2

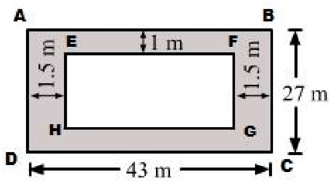
∴ Area of the roads = Area (KLMN) + Area (PQRS) − Area (EFGH)
= (100 m^2 + 100 m^2) − 5 m^2 = 195 m^2

Area of the remaining portion of the field = Area of the rectangular field (ABCD) − Area of the roads
= (2000 − 195) m^2
= 1805 m^2

Q14

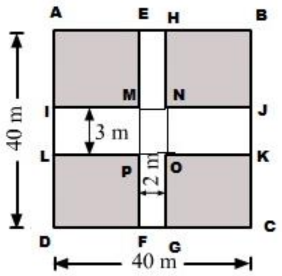
Answer :

(i) Complete the rectangle as shown below:



Area of the shaded region = [Area of rectangle ABCD - Area of rectangle EFGH] sq. units
= [(43 m × 27 m) - {(43 - 2 × 1.5) m x (27 - 1 × 2) m}]
= [(43 m × 27 m) - {40 m × 25 m}]
= 1161 m^2 - 1000 m^2
= 161 m^2

(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

$= [(40 \times 40) - \{(40 \times 2) + (40 \times 3) - (2 \times 3)\}]\ m^2$

$= [1600 - \{(80 + 120 - 6)]\ m^2$

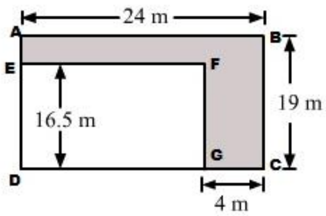
$= [1600 - 194]\ m^2$

$= 1406\ m^2$

Q15

Answer :

(i) Complete the rectangle as shown below:



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

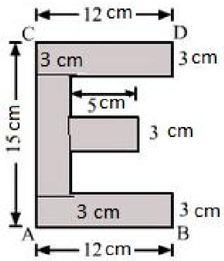
$= [(AB \times BC) - (DG \times GF)]\ m^2$

$= [(24\ m \times 19\ m) - \{(24 - 4)\ m \times 16.5\ m\}]$

$= [(24\ m \times 19\ m) - (20\ m \times 16.5)\ m]$

$= (456 - 330)\ m^2 = 126\ m^2$

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



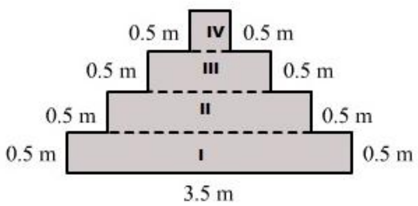
Area of the shaded region $=\{(12 \times 3) + (12 \times 3) + (5 \times 3) + \{(15 - 3 - 3) \times 3)\}\ cm^2$

$= \{36 + 36 + 15 + 27\}\ cm^2$

Q16

$= 114\ cm^2$

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

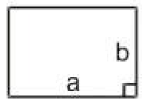
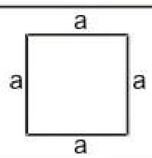
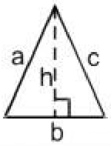
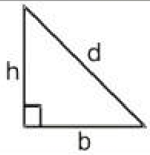
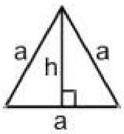
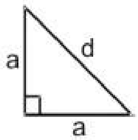
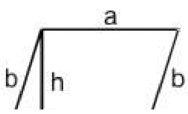
∴ Area of the shaded region = [Area of part (I) + Area of part (II) + Area of part (III) + Area of part (IV)] sq. units

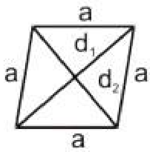
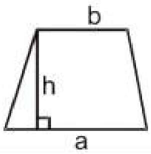
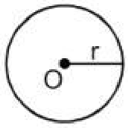
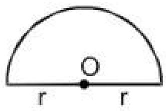
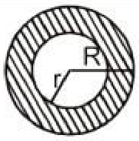
$= [(3.5 \times 0.5) + (2.5 \times 0.5) + (1.5 \times 0.5) + (0.5 \times 0.5)]\ m^2$

$= [1.75 + 1.25 + 0.75 + 0.25]\ m^2$

$= 4\ m^2$

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 $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$

Q1

Answer :

Base = 32 cm
Height = 16.5 cm

∴ Area of the parallelogram = Base × Height
= 32 cm × 16.5 cm
= 528 cm^2

Q2

Answer :

Base = 1 m 60 cm = 1.6 m [since 100 cm = 1 m]
Height = 75 cm = 0.75 m

∴ Area of the parallelogram = Base × Height
= 1.6 m × 0.75 m
= 1.2 m^2

Q3
Answer :

(i) Base = 14 dm = (14 × 10) cm = 140 cm [since 1 dm = 10 cm]
Height = 6.5 dm = (6.5 × 10) cm = 65 cm

Area of the parallelogram = Base × Height
= 140 cm × 65 cm
= 9100 cm^2

(ii) Base = 14 dm = (14 × 10) cm [since 1 dm = 10 cm and 100 cm = 1 m]
= 140 cm = 1.4 m
Height = 6.5 dm = (6.5 × 10) cm
= 65 cm = 0.65 m

∴ Area of the parallelogram = Base × Height
= 1.4 m × 0.65 m
= 0.91 m^2

Q4
Answer :

Area of the given parallelogram = 54 cm^2
Base of the given parallelogram = 15 cm
∴ Height of the given parallelogram = $\frac{\textbf{Area}}{\textbf{Base}} = \left(\frac{54}{15}\right)$ cm = 3.6 cm

Q5
Answer :

Base of the parallelogram = 18 cm
Area of the parallelogram = 153 cm^2
∴ Area of the parallelogram = Base × Height
⇒ Height = $\frac{\textbf{Area of the parallelogram}}{\textbf{Base}} = \left(\frac{153}{18}\right)$ cm = 8.5 cm
Hence, the distance of the given side from its opposite side is 8.5 cm.

Q6
Answer :

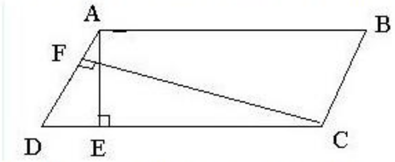
Base, AB = 18 cm
Height, AL = 6.4 cm
∴ Area of the parallelogram ABCD = Base × Height
= (18 cm × 6.4 cm) = 115.2 cm^2 ... (i)

Now, taking BC as the base:
Area of the parallelogram ABCD = Base × Height
= (12 cm × AM) ... (ii)
From equation (i) and (ii):
12 cm × AM = 115.2 cm^2
⇒ AM = $\left(\frac{115.2}{12}\right)$cm
= 9.6 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 × 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 × Height

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

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

$\Rightarrow x^2 = (108 \times 3) \text{ cm}^2 = 324 \text{ cm}^2$
$\Rightarrow x^2 = (18 \text{ cm})^2$
$\Rightarrow x = 18 \text{ cm}$

$\therefore$ Base = x = 18 cm
Height = $\frac{1}{3}x = \left(\frac{1}{3} \times 18\right)$ cm
= 6 cm

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 × Height

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

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

$\Rightarrow x^2 = \left(\frac{512}{2}\right) \text{ cm}^2 = 256 \text{ cm}^2$
$\Rightarrow x^2 = (16 \text{ cm})^2$
$\Rightarrow x = 16 \text{ cm}$

$\therefore$ Base = $2x = 2 \times 16$
= 32 cm
Height = x = 16 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 × Height
(i) Area of the rhombus = 12 cm × 7.5 cm = 90 cm^2

(ii) Base = 2 dm = (2 × 10) = 20 cm [since 1 dm = 10 cm]
Height = 12.6 cm
$\therefore$ Area of the rhombus = 20 cm × 12.6 cm = 252 cm^2

Q11

Answer :

(i)

Length of one diagonal = 16 cm

Length of the other diagonal = 28 cm

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

$= \left(\frac{1}{2} \times 16 \times 28\right)$ cm^2 = 224 cm^2

(ii)

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

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

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

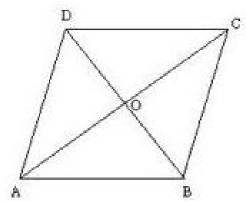
$= \left(\frac{1}{2} \times 85 \times 56\right)$ cm^2

= 2380 cm^2

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, ΔAOB is a right angled triangle, right angled at O.

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

$\therefore$ BD = 2 $\times$ OB = 2 $\times$ 16 cm = 32 cm

$\therefore$ Area of the rhombus ABCD = $\left(\frac{1}{2} \times \mathbf{AC} \times \mathbf{BD}\right)$ cm^2

$= \left(\frac{1}{2} \times 24 \times 32\right)$ cm^2

= 384 cm^2

Q13

Answer :

Area of a rhombus = $\frac{1}{2}$ × (Product of the diagonals)
Given:
Length of one diagonal = 19.2 cm
Area of the rhombus = 148.8 cm^2

∴ 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 cm^2
Side of the rhombus = $\frac{\text{Perimeter}}{4}$ = $\left(\frac{56}{4}\right)$ cm = 14 cm
Area of a rhombus = Base × Height

∴ 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 cm^2

We know:
Area of a rhombus = Base × Height

∴ 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.

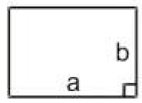
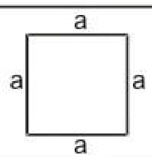
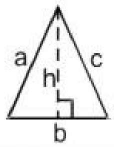
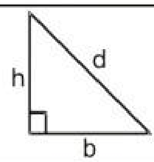
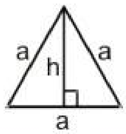
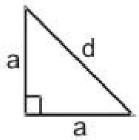
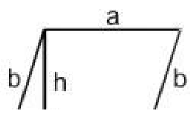
Q16

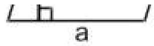
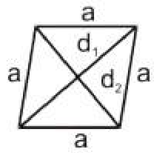
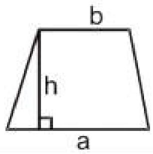
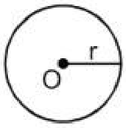
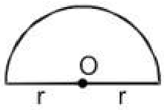
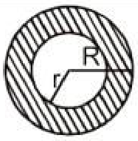
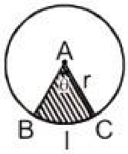
Answer :

Area of a triangle = $\frac{1}{2}$ × Base × Height
= $\left(\frac{1}{2} \times 24.8 \times 16.5\right)$ cm^2 = 204.6 cm^2
Given:
Area of the rhombus = Area of the triangle
Area of the rhombus = 204.6 cm^2

Area of the rhombus = $\frac{1}{2}$ × (Product of the diagonals)
Given:
Length of one diagonal = 22 cm
∴ 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	$\frac{1}{2}d_1d_2$
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 = $(\theta/360)\times 2\pi r$	$\theta/360° \times \pi r^2$

Q1

Answer :

We know:

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

(i) Base = 42 cm

Height = 25 cm

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

(ii) Base = 16.8 m

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

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

(iii) Base = 8 dm = (8 $\times$ 10) cm = 80 cm [since 1 dm = 10 cm]

Height = 35 cm

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

Q2

Answer :

Height of a triangle = 2×AreaBase
Here, base = 16 cm and area = 72 cm^2

∴ Height = 2×7216 cm = 9 cm

Q3

Answer :

Height of a triangle = $\frac{2\times\text{Area}}{\text{Base}}$
Here, base = 28 m and area = 224 m^2

∴ Height = $\left(\frac{2\times224}{28}\right)$ m = 16 m

Q4

Answer :

Base of a triangle = $\frac{2\times\text{Area}}{\text{Height}}$
Here, height = 12 cm and area = 90 cm^2

∴ Base = $\left(\frac{2\times90}{12}\right)$ cm = 15 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
= $\left(\frac{14580}{1080}\right)$ hectare
= 13.5 hectare
= (13.5 × 10000) m^2 = 135000 m^2 [since 1 hectare = 10000 m^2]
Let the height of the field be x m.
Then, its base will be $3x$ m.
Area of the field = $\left(\frac{1}{2}\times 3x\times x\right)$ m^2 = $\left(\frac{3x^2}{2}\right)$ m^2
∴ $\left(\frac{3x^2}{2}\right)$ = 135000
⇒ $x^2=\left(135000\times\frac{2}{3}\right)=90000$
⇒ x = $\sqrt{90000}$ = 300
∴ Base = (3 × 300) = 900 m
Height = 300 m

Q6

Answer :

Let the length of the other leg be h cm.
Then, area of the triangle = $\left(\frac{1}{2}\times 14.8\times h\right)$ cm^2 = (7.4 h) cm^2
But it is given that the area of the triangle is 129.5 cm^2.
∴ 7.4h = 129.5
⇒ h = $\left(\frac{129.5}{7.4}\right)$ = 17.5 cm
∴ Length of the other leg = 17.5 cm

Q7

Answer :

Here, base = 1.2 m and hypotenuse = 3.7 m

In the right angled triangle:

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

$$= \sqrt{(3.7)^2 - (1.2)^2}$$
$$= \sqrt{13.69 - 1.44}$$
$$= \sqrt{12.25}$$
$$= 3.5$$

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

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

∴ Area of the right angled triangle = 2.1 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.
Area of the triangle = $\left(\frac{1}{2} \times 3x \times 4x\right)$ cm^2

⇒ 1014 = $(6x^2)$

⇒ 1014 = $6x^2$

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

⇒ x = $\sqrt{169}$ = 13

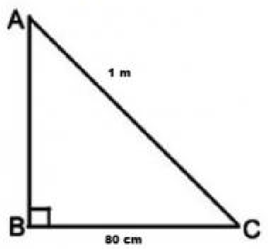
∴ Base = (3 × 13) = 39 cm

Height = (4 × 13) = 52 cm

Q9

Answer :

Consider a right-angled triangular scarf (ABC).
Here, ∠B= 90°
BC = 80 cm
AC = 1 m = 100 cm



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

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

= (10000 - 6400) = 3600

⇒ AB = $\sqrt{3600}$ = 60 cm

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

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

= 2400 cm^2 = 0.24 m^2 [since 1 m^2 = 10000 cm^2]

Rate of the cloth = Rs 250 per m^2

∴ Total cost of the scarf = Rs (250 × 0.24) = Rs 60

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

Q10

Answer :

(i) Side of the equilateral triangle = 18 cm

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

$= \frac{\sqrt{3}}{4}(18)^2$ cm^2 = $\left(\sqrt{3} \times 81\right)$ cm^2

= (1.73 × 81) cm^2 = 140.13 cm^2

(ii) Side of the equilateral triangle = 20 cm

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

$= \frac{\sqrt{3}}{4}(20)^2$ cm^2 = $\left(\sqrt{3} \times 100\right)$ cm^2

= (1.73 × 100) cm^2 = 173 cm^2

Q11

Answer :

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

We know:

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

∴ Side of the equilateral triangle = $\left[\sqrt{\left(\frac{4 \times \text{Area}}{\sqrt{3}}\right)}\right]$ cm

$= \left[\sqrt{\left(\frac{4 \times 16\sqrt{3}}{\sqrt{3}}\right)}\right]$ cm = $\left(\sqrt{4 \times 16}\right)$ cm = $\left(\sqrt{64}\right)$ cm = 8 cm

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

Q12

Answer :

Let the height of the triangle be *h* cm.

Area of the triangle = $\left(\frac{1}{2} \times \text{ Base } \times \text{ Height}\right)$ sq. units

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

Let the side of the equilateral triangle be *a* cm.

Area of the equilateral triangle = $\left(\frac{\sqrt{3}}{4}a^2\right)$ sq. units

$= \left(\frac{\sqrt{3}}{4} \times 24 \times 24\right)$ cm^2 = $\left(\sqrt{3} \times 144\right)$ cm^2

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

⇒ 12 *h* = $\left(\sqrt{3} \times 144\right)$

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

∴ Height of the equilateral triangle = 20.76 cm

Q13

Answer :

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

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

∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

= $\sqrt{21(21-13)(21-14)(21-15)}$ m^2

= $\sqrt{21 \times 8 \times 7 \times 6}$ m^2

= $\sqrt{3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 2 \times 3}$ m^2

= (2 × 2 × 3 × 7) m^2

= 84 m^2

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

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

∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

= $\sqrt{84(84-52)(84-56)(84-60)}$ cm^2

= $\sqrt{84 \times 32 \times 28 \times 24}$ cm^2

= $\sqrt{12 \times 7 \times 4 \times 8 \times 4 \times 7 \times 3 \times 8}$ cm^2

= $\sqrt{2 \times 2 \times 3 \times 7 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 3 \times 2 \times 2 \times 2}$ cm^2

= (2 × 2 × 2 × 2 × 2 × 2 × 3 × 3 × 7) m^2

= 1344 cm^2

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

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

∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

= $\sqrt{147(147-91)(147-98)(147-105)}$ m^2

= $\sqrt{147 \times 56 \times 49 \times 42}$ m^2

= $\sqrt{3 \times 49 \times 8 \times 7 \times 49 \times 6 \times 7}$ m^2

= $\sqrt{3 \times 7 \times 7 \times 2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 2 \times 3 \times 7}$ m^2

= (2 × 2 × 3 × 7 × 7 × 7) m^2

= 4116 m^2

Q14

Answer :

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

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

∴ Area of the triangle = $\sqrt{\mathbf{s(s-a)(s-b)(s-c)}}$ sq. units

= $\sqrt{66(66-33)(66-44)(66-55)}$ cm^2

= $\sqrt{66 \times 33 \times 22 \times 11}$ cm^2

= $\sqrt{6 \times 11 \times 3 \times 11 \times 2 \times 11 \times 11}$ cm^2

= (6 × 11 × 11) cm^2 = 726 cm^2

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

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

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

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

∴ Area of the triangle = 726 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)

⇒ 42x = 84

⇒ $x = \frac{84}{42} = 2$

∴ a = 26 cm , b = 28 cm and c = 30 cm

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

∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

= $\sqrt{42(42-26)(42-28)(42-30)}$ cm^2

= $\sqrt{42\times16\times14\times12}$ cm^2

= $\sqrt{6\times7\times4\times4\times2\times7\times6\times2}$ cm^2

= (2 ×4 × 6 × 7) cm^2 = 336 cm^2

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

Q16

Answer :

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

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

∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

= $\sqrt{48(48-42)(48-34)(48-20)}$ cm^2

= $\sqrt{48\times6\times14\times28}$ cm^2

= $\sqrt{6\times2\times2\times2\times6\times14\times2\times14}$ cm^2

= (2 × 2 × 6 × 14) cm^2 = 336 cm^2

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

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

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

⇒ $h = \left(\frac{2\times336}{42}\right)$ cm = 16 cm

∴ Area of the triangle = 336 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 cm

a = 30 cm

Area of the triangle = $\left\{\frac{1}{2}\times b\times\sqrt{a^2-\frac{b^2}{4}}\right\}$ sq. units

= $\left\{\frac{1}{2}\times48\times\sqrt{(30)^2-\frac{(48)^2}{4}}\right\}$ cm^2 = $\left(24\times\sqrt{900-\frac{2304}{4}}\right)$ cm^2

= $\left(24\times\sqrt{900-576}\right)$ cm^2 = $\left(24\times\sqrt{324}\right)$ cm^2 = (24 × 18) cm^2 = 432 cm^2

∴ Area of the triangle = 432 cm^2

Q18

Answer :

Let each of the equal sides be a cm.

a + a + 12 = 32 ⇒ 2a = 20 ⇒ a = 10

∴ b = 12 cm and a = 10 cm

Area of the triangle = $\left\{\frac{1}{2}\times b\times\sqrt{a^2-\frac{b^2}{4}}\right\}$ sq. units

= $\left\{\frac{1}{2}\times12\times\sqrt{100-\frac{144}{4}}\right\}$ cm^2 = $\left(6-\sqrt{100-36}\right)$ cm^2

= $\left(6\times\sqrt{64}\right)$ cm^2 = (6 × 8) cm^2

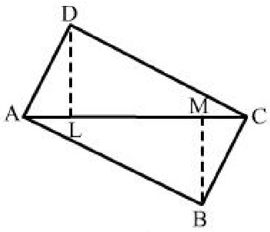
= 48 cm^2

Q19

Answer :

We have:

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



Area of $\Delta ADC = \frac{1}{2} \times AC \times DL$

$= \frac{1}{2} \times 26 \text{ cm} \times 12.8 \text{ cm} = 166.4 \text{ cm}^2$

Area of $\Delta ABC = \frac{1}{2} \times AC \times BM$

$= \frac{1}{2} \times 26 \text{ cm} \times 11.2 \text{ cm} = 145.6 \text{ cm}^2$

∴ Area of the quadrilateral $ABCD$ = Area of ΔADC + Area of ΔABC

$= (166.4 + 145.6) \text{ cm}^2$

$= 312 \text{ cm}^2$

Q20

Answer :

First, we have to find the area of ΔABC and ΔACD.

For ΔACD:

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

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

∴ Area of triangle ACD = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

$= \sqrt{60(60-30)(60-40)(60-50)}$ cm^2

$= \sqrt{60 \times 30 \times 20 \times 10}$ cm^2

$= \sqrt{360000}$ cm^2

= 600 cm^2

For ΔABC:

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

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

∴ Area of triangle ABC = $\sqrt{s(s-a)(s-b(s-c))}$ sq. units

$= \sqrt{42(42-26)(42-28)(42-30)}$ cm^2

$= \sqrt{42 \times 16 \times 14 \times 12}$ cm^2

$= \sqrt{2 \times 3 \times 7 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 3 \times 2 \times 2}$ cm^2

$= (2 \times 2 \times 2 \times 2 \times 3 \times 7)$ cm^2

= 336 cm^2

∴ Area of the given quadrilateral ABCD = Area of ΔACD + Area of ΔABC

= (600 + 336) cm^2 = 936 cm^2

Q21

Answer :

Area of the rectangle = AB × BC

= 36 m × 24 m

= 864 m^2

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

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

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

= 12 m × 15 m = 180 m^2

∴ Area of the shaded region = Area of the rectangle − Area of the triangle

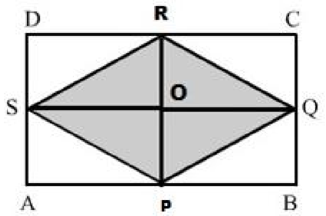
= (864 − 180) m^2

= 684 m^2

Q22

Answer :

Join points *PR* and *SQ*.
These two lines bisect each other at point *O*.



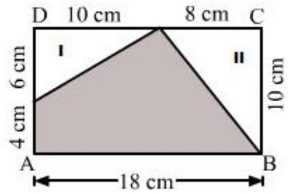
Here, $AB = DC = SQ = 40$ cm
$AD = BC = RP = 25$ cm

Also, $OP = OR = \frac{RP}{2} = \frac{25}{2} = 12.5$ cm
From the figure we observe:
Area of ΔSPQ = Area of ΔSRQ
∴ Area of the shaded region $= 2 \times$ (Area of ΔSPQ)
$= 2 \times (\frac{1}{2} \times SQ \times OP)$
$= 2 \times (\frac{1}{2} \times 40 \text{ cm} \times 12.5 \text{ cm})$
$= 500 \text{ cm}^2$

Q23

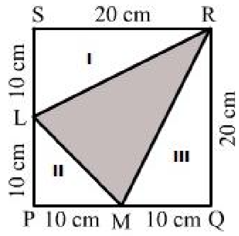
Answer :

(i) Area of rectangle ABCD = (10 cm x 18 cm) = 180 cm^2



Area of triangle I = $\left(\frac{1}{2} \times 6 \times 10\right)$ cm^2 = 30 cm^2
Area of triangle II = $\left(\frac{1}{2} \times 8 \times 10\right)$ cm^2 = 40 cm^2
∴ Area of the shaded region = {180 - (30 + 40)} cm^2 = { 180 - 70}cm^2 = 110 cm^2

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



Area of triangle I = $\left(\frac{1}{2} \times 10 \times 20\right)$ cm^2 = 100 cm^2
Area of triangle II = $\left(\frac{1}{2} \times 10 \times 10\right)$ cm^2 = 50 cm^2
Area of triangle III = $\left(\frac{1}{2} \times 10 \times 20\right)$ cm^2 = 100 cm^2
∴ Area of the shaded region = {400 - (100 + 50 + 100)} cm^2 = { 400 - 250}cm^2 = 150 cm^2

Q24

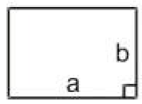
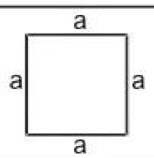
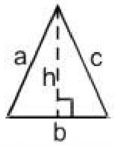
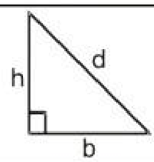
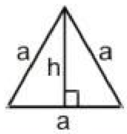
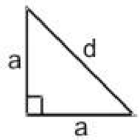
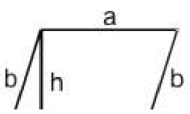
Answer :

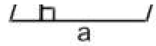
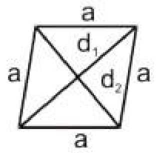
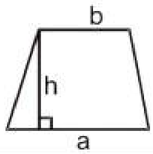
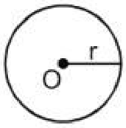
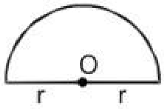
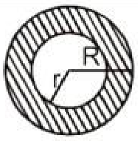
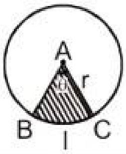
Let ABCD be the given quadrilateral and let BD be the diagonal such that BD is of the length 24 cm.
Let AL ⊥ BD and CM ⊥ BD
Then, AL = 5 cm and CM = 8 cm
Area of the quadrilateral ABCD = (Area of ΔABD + Area of ΔCBD)
$= \left[\left(\frac{1}{2} \times BD \times AL\right) + \left(\frac{1}{2} \times BD \times CM\right)\right]$ sq. units
$= \left[\left(\frac{1}{2} \times 24 \times 5\right) + \left(\frac{1}{2} \times 24 \times 8\right)\right]$ cm^2
= (60 + 96) cm^2 = 156 cm^2

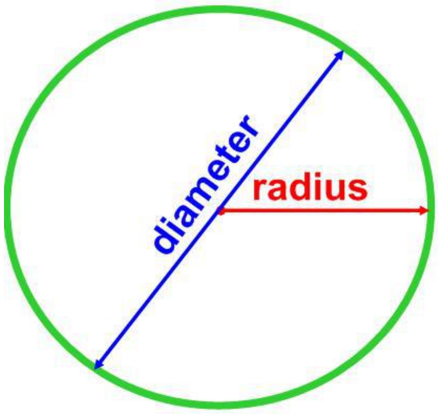
∴ Area of the given quadrilateral = 156 cm

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 $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$



Area of a circle
= π x **radius²**

Circumference of a circle = π x **diameter**

remember that the **diameter = 2 x radius**

Q1

Answer :

Here, r = 15 cm

∴ Circumference = $2\pi r$

= (2 × 3.14 × 15) cm

= 94.2 cm

Hence, the circumference of the given circle is 94.2 cm

Q2

Answer :

(i) Here, r = 28 cm

∴ Circumference = 2π r

= $\left(2 \times \frac{22}{7} \times 28\right)$cm

= 176 cm

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

(ii) Here, r = 1.4 m

∴ Circumference = 2π r

= $\left(2 \times \frac{22}{7} \times 1.4\right)$ m

= $(2 \times 22 \times 0.2)$ m = 8.8 m

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

Q3

Answer :

(i) Here, d = 35 cm

Circumference = 2π r

= (πd) [since 2r = d]

= $\left(\frac{22}{7} \times 35\right)$ cm = (22 × 5) = 110 cm

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

(ii) Here, d = 4.9 m

Circumference =2π r

= (πd) [since 2r = d]

= $\left(\frac{22}{7} \times 4.9\right)$ m = (22 × 0.7) = 15.4 m

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

Q4

Answer :

Circumference of the given circle = 57.2 cm

∴ C = 57.2 cm

Let the radius of the given circle be r cm.

C = $2\pi r$

⇒ r = $\frac{C}{2\pi}$ cm

⇒ r = $\left(\frac{57.2}{2} \times \frac{7}{22}\right)$ cm = 9.1 cm

Thus, radius of the given circle is 9.1 cm.

Q5

Answer :

Circumference of the given circle = 63.8 m

∴ C = 63.8 m

Let the radius of the given circle be r cm.

C = $2\pi r$

⇒ r = $\frac{C}{2\pi}$

⇒ r = $\left(\frac{63.8}{2} \times \frac{7}{22}\right)$m =10.15 m

∴ Diameter of the given circle = 2r = (2 × 10.15) m = 20.3 m

Q6

Answer :

Let the radius of the given circle be *r* cm.
Then, its circumference = $2\pi r$

Given:
(Circumference) - (Diameter) = 30 cm
$\therefore$ ($2\pi r$ - 2*r*) = 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 5*x* and 3*x*, 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 :

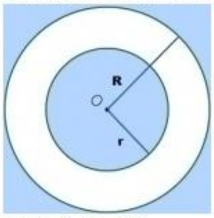
Radius of the circular field, *r* = 21 m.
Distance covered by the cyclist = Circumference of the circular field
= $2\pi r$
= $\left(2 \times \frac{22}{7} \times 21\right)$ m = 132 m
Speed of the cyclist = 8 km per hour = $\frac{8000 \text{ m}}{(60 \times 60) \text{ s}} = \left(\frac{8000}{3600}\right)\text{m/s} = \left(\frac{20}{9}\right)\text{m/s}$

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 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

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

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

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

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

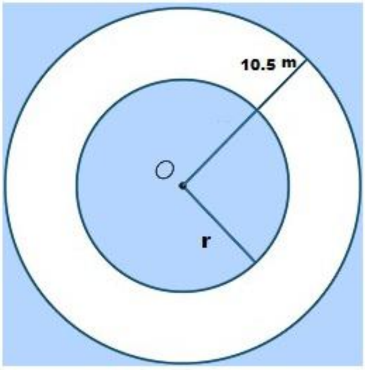
⇒ (*R* - *r*) = (98 - 84) m = 14 m

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

∴ Outer radii of the track = (52.5 + 10.5) m = 63 m

∴ 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

∴ 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 cm

∴ Circumference of the inner circle = $2\pi r$

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

Radius of the outer circle, *R* = 1 m 26 cm = 126 cm [since 1 m = 100 cm]

∴ Circumference of the outer circle = $2\pi R$

= $\left(2 \times \frac{22}{7} \times 126\right)$ cm = 792 cm

∴ Difference in the lengths of the circumference of the circles = (792 - 616) cm = 176 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 × Side of the equilateral triangle = (3 × 8.8) cm = 26.4 cm

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

Circumference of the circle = 26.4 cm

⇒ $2\pi r = 26.4$

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

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

∴ Diameter = 2*r* = (2 × 4.2) cm = 8.4 cm

Hence, the diameter of the ring is 8.4 cm.

Q13

Answer :

Circumference of the circle = Perimeter of the rhombus

= 4 × Side of the rhombus = (4 × 33) cm = 132 cm

∴ Circumference of the circle = 132 cm

⇒ $2\pi r = 132$

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

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

Hence, the radius of the circle is 21 cm.

Q14

Answer :

Length of the wire = Perimeter of the rectangle

= 2(*l* + *b*) = 2 × (18.7 + 14.3) cm = 66 cm

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

Circumference of the circle = 66 cm

⇒ $2\pi r = 66$

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

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

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

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

Perimeter of the square = 220 cm

⇒ 4*a* = 220

⇒ *a* = $\left(\frac{220}{4}\right)$cm = 55 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

∴ 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

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

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

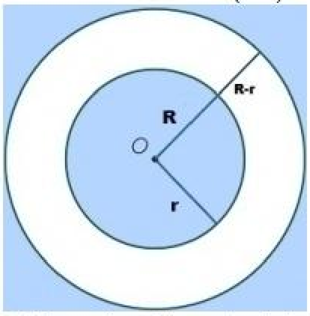
Q17

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

$\Rightarrow 2\pi R = 616$

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

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

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

= {98 -70} cm = 28 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

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

Thus, the bus travels 308 cm in one rotation.

∴ 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

∴ Circumference of the wheel = πd = $\left(\frac{22}{7} \times 70\right)$ cm = 220 cm

Thus, the cycle covers 220 cm in one revolution.

∴ Distance covered by the cycle in 250 revolutions = (220 × 250) cm

= 55000 cm

= 550 m [since 1 m = 100 cm]

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

Q20

Answer :

Diameter of the wheel = 77 cm

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

Circumference of the wheel = $2\pi r$

= $\left(2 \times \frac{22}{7} \times \frac{77}{2}\right)$cm = (22 × 11) cm = 242 cm

= $\left(\frac{242}{100}\right)$m = $\left(\frac{121}{50}\right)$m

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

∴ 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

⇒ 5000 × Circumference of the wheel = 11000 m [since 1 km = 1000 m]

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

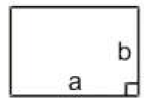
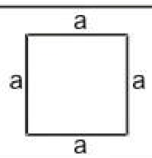
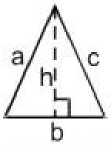
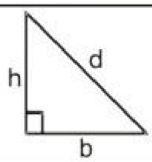
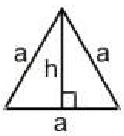
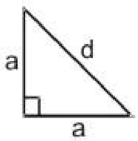
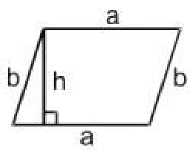
Circumference of the wheel = $\pi \times \text{Diameter of the wheel}$

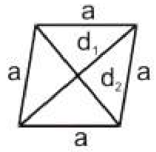
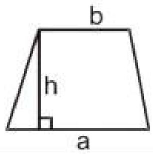
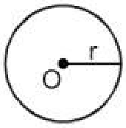
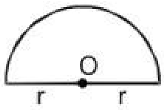
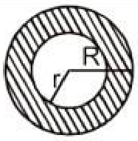
⇒ 220 cm = $\frac{22}{7} \times \text{Diameter of the wheel}$

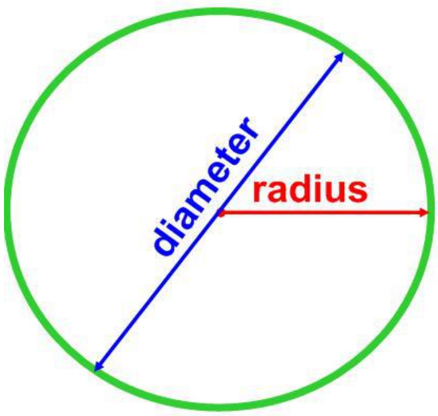
⇒ Diameter of the wheel = $\left(\frac{220 \times 7}{22}\right)$ cm = 70 cm

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 $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$



Area of a circle = π x **radius^2**

Circumference of a circle = π x **diameter**

remember that the **diameter = 2 x radius**

Q1

Answer :

(i) Given:
r = 21 cm

∴ Area of the circle = (πr^2) sq. units
= $\left(\frac{22}{7} \times 21 \times 21\right)$ cm^2 = $(22 \times 3 \times 21)$ cm^2 = 1386 cm^2

(ii) Given:
r = 3.5 m

Area of the circle = (πr^2) sq. units
= $\left(\frac{22}{7} \times 3.5 \times 3.5\right)$ m^2 = $(22 \times 0.5 \times 3.5)$ m^2 = 38.5 m^2

Q2

Answer :

(i) Given:
d = 28 cm ⇒ r = $\left(\frac{d}{2}\right)$ = $\left(\frac{28}{2}\right)$ cm = 14 cm
Area of the circle = (πr^2) sq. units
= $\left(\frac{22}{7} \times 14 \times 14\right)$ cm^2 = $(22 \times 2 \times 14)$ cm^2 = 616 cm^2

(ii) Given:
r = 1.4 m ⇒ r = $\left(\frac{d}{2}\right)$ = $\left(\frac{1.4}{2}\right)$m = 0.7 m
Area of the circle = (πr^2) sq. units
= $\left(\frac{22}{7} \times 0.7 \times 0.7\right)$ m^2 = $(22 \times 0.1 \times 0.7)$ m^2 = 1.54 m^2

Q3

Answer :

Let the radius of the circle be r cm.
Circumference = $(2\pi r)$cm
∴ $(2\pi r)$ = 264
⇒ $\left(2 \times \frac{22}{7} \times r\right) = 264$
⇒ r = $\left(\frac{264 \times 7}{2 \times 22}\right)$ = 42
∴ Area of the circle = πr^2
= $\left(\frac{22}{7} \times 42 \times 42\right)$ cm^2
= 5544 cm^2

Q4

Answer :

Let the radius of the circle be r m.
Then, its circumference will be $(2\pi r)$m.
∴ $(2\pi r)$ = 35.2
⇒ $\left(2 \times \frac{22}{7} \times r\right) = 35.2$
⇒ r = $\left(\frac{35.2 \times 7}{2 \times 22}\right)$ = 5.6
∴ Area of the circle = πr^2
= $\left(\frac{22}{7} \times 5.6 \times 5.6\right)$ m^2 = 98.56 m^2

Q5

Answer :

Let the radius of the circle be r cm.
Then, its area will be πr^2 cm^2.
$\therefore \pi r^2 = 616$
$\Rightarrow \left(\frac{22}{7} \times r \times r\right) = 616$
$\Rightarrow r^2 = \left(\frac{616 \times 7}{22}\right) = 196$
$\Rightarrow r = \sqrt{196} = 14$
$\Rightarrow$ Circumference of the circle = $(2\pi r)$ cm
$= \left(2 \times \frac{22}{7} \times 14\right)$ cm = 88 cm

Q6

Answer :

Let the radius of the circle be r m.
Then, area = πr^2 m^2
$\therefore \pi r^2 = 1386$
$\Rightarrow \left(\frac{22}{7} \times r \times r\right) = 1386$
$\Rightarrow r^2 = \left(\frac{1386 \times 7}{22}\right) = 441$
$\Rightarrow r = \sqrt{441} = 21$
$\Rightarrow$ Circumference of the circle = $(2\pi r)$ m
$= \left(2 \times \frac{22}{7} \times 21\right)$ m = 132 m

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

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

Q9

Answer :

Let a be one side of the square.
Area of the square = 121 cm^2 (given)
$\Rightarrow a^2 = 121$
$\Rightarrow a = 11$ cm (since $11 \times 11 = 121$)
Perimeter of the square = $4 \times$ side = $4a = (4 \times 11)$ cm = 44 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
$\Rightarrow 2\pi r = 44$
$\Rightarrow \left(2 \times \frac{22}{7} \times r\right) = 44$
$\Rightarrow r = \left(\frac{44 \times 7}{2 \times 22}\right) = 7$ cm
$\therefore$ Area of the circle = πr^2
$= \left(\frac{22}{7} \times 7 \times 7\right)$ cm^2
= 154 cm^2

Q10

Answer :

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

Length of the wire = Circumference of the circle
⇒ Circumference of the circle $= 2\pi r = \left(2 \times \frac{22}{7} \times 28\right)$ cm = 176 cm
Let the wire be bent into the form of a square of side *a* cm.

Perimeter of the square = 176 cm

⇒ 4*a* = 176
⇒ *a* = $\left(\frac{176}{4}\right)$cm = 44 cm
Thus, each side of the square is 44 cm.

Area of the square = (Side)^2 = (a)^2 = (44 cm)^2
= 1936 cm^2
∴ Required area of the square formed = 1936 cm^2

Q11

Answer :

Area of the acrylic sheet = 34 cm × 24 cm = 816 cm^2
Given that the diameter of a circular button is 3.5 cm.
∴ Radius of the circular button (*r*)= $\left(\frac{3.5}{2}\right)$ cm = 1.75 cm
∴ Area of 1 circular button = πr^2
= $\left(\frac{22}{7} \times 1.75 \times 1.75\right)$ cm^2
= 9.625 cm^2
∴ Area of 64 such buttons = (64 × 9.625) cm^2 = 616 cm^2
Area of the remaining acrylic sheet = (Area of the acrylic sheet - Area of 64 circular buttons)
= (816 - 616) cm^2 = 200 cm^2

Q12

Answer :

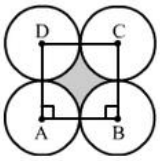
Area of the rectangular ground = 90 m × 32 m = (90 × 32) m^2 = 2880 m^2
Given:
Radius of the circular tank (*r*) = 14 m
∴ Area covered by the circular tank = πr^2 = $\left(\frac{22}{7} \times 14 \times 14\right)$ m^2
= 616 m^2

∴ Remaining portion of the rectangular ground for turfing = (Area of the rectangular ground - Area covered by the circular tank)
= (2880 - 616) m^2 = 2264 m^2
Rate of turfing = Rs 50 per sq. metre
∴ Total cost of turfing the remaining ground = Rs (50 × 2264) = Rs 1,13,200

Q13

Answer :

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



Area of the square ABCD = (Side)^2 = (14 cm)^2 = 196 cm^2
Sum of the areas of the four quadrants = $\left(4 \times \frac{1}{4} \times \frac{22}{7} \times 7 \times 7\right)$ cm^2
= 154 cm^2
∴ Area of the shaded portion = Area of square ABCD - Areas of the four quadrants
= (196 - 154) cm^2
= 42 cm^2

Q14

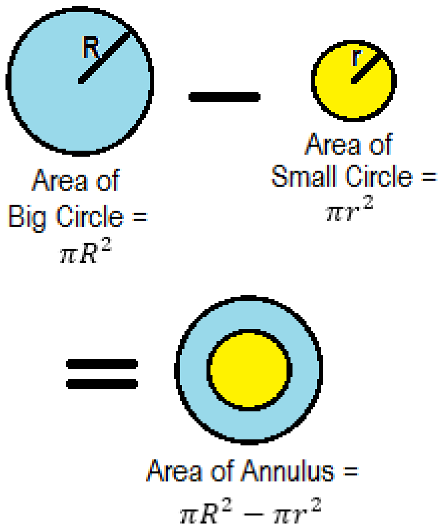
Answer :

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.
∴ Required area of the field = $\left(\frac{1}{4} \times \frac{22}{7} \times 14 \times 14\right)$ m^2 = 154 m^2
Hence, horse can graze 154 m^2 area of the rectangular field.



Q15

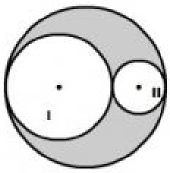
Answer :

Diameter of the big circle = 21 cm

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

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

= 346.5 cm^2



Diameter of circle I = $\frac{2}{3}$ of the diameter of the bigger circle

= $\frac{2}{3}$ of 21 cm = $\left(\frac{2}{3} \times 21\right)$ cm = 14 cm

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

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

= 154 cm^2

Diameter of circle II = $\frac{1}{3}$ of the diameter of the bigger circle

= $\frac{1}{3}$ of 21 cm = $\left(\frac{1}{3} \times 21\right)$ cm = 7 cm

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

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

= 38.5 cm^2

$\therefore$ Area of the shaded portion = {Area of the bigger circle - (Sum of the areas of circle I and II)}

= {346.5 - (154 + 38.5)} cm^2

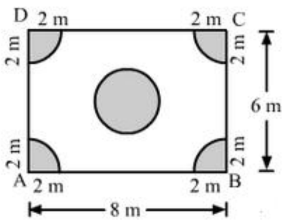
= {346.5 - 192.5} cm^2

= 154 cm^2

Hence, the area of the shaded portion is 154 cm^2

Q16

Answer :



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

$\therefore$ Area of the plot = (8 m × 6 m) = 48 m^2

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

Area of the circular flower bed in the middle of the plot = πr^2

= $\left(\frac{22}{7} \times 2 \times 2\right)$ m^2 = $\left(\frac{88}{7}\right)$ m^2

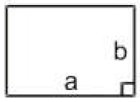
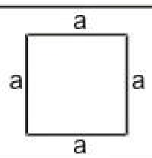
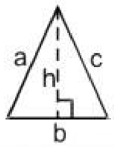
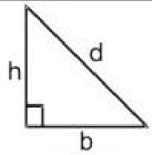
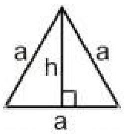
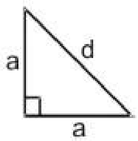
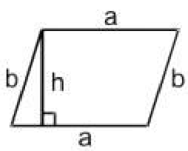
Area of the remaining part = $\left\{48 - \left(\frac{88}{7} + \frac{88}{7}\right)\right\}$ m^2

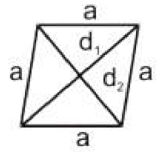
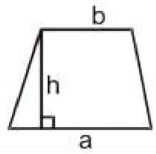
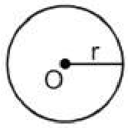
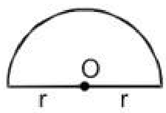
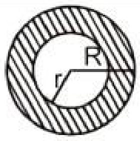
= $\left\{48 - \frac{176}{7}\right\}$ m^2

= $\left\{\frac{336-176}{7}\right\}$ m^2 = $\left(\frac{160}{7}\right)$ m^2 = 22.86 m^2

$\therefore$ Required area of the remaining plot = 22.86 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 $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$

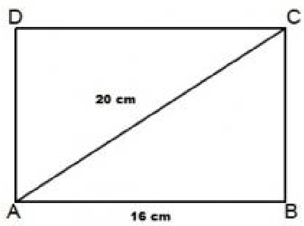
Mensuration RS Aggarwal Class 7 Maths Solutions Exercise 20G

Q1

Answer :

(c) 192 cm^2

Let ABCD be the rectangular plot.
Then, AB = 16 cm
AC = 20 cm



Let BC = x 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 cm
$\therefore$ Area of the plot = $(16 \times 12)\ cm^2 = 192\ cm^2$

Q2

Answer :

(b) 72 cm^2

Given:

Diagonal of the square = 12 cm

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

= $\left\{\frac{1}{2} \times (12)^2\right\}$ cm^2

= 72 cm^2

Q3

Answer :

(b) 20 cm

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

Area of the square field = 200 cm^2

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

= $\left(\sqrt{2 \times 200}\right)$ cm = $\left(\sqrt{400}\right)$ cm = 20 cm

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

Q4

Answer :

(a) 100 m

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

Given:

Area of square field = 0.5 hectare

= (0.5×10000)m^2 [since 1 hectare = 10000 m^2]

= 5000 m^2

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

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

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 = $2(l + b)$
$\Rightarrow 240 = 2(x + 3x)$
$\Rightarrow 240 = 2(4x)$
$\Rightarrow 240 = 8x \quad \Rightarrow x = \left(\frac{240}{8}\right) = 30$
$\therefore$ Length of the field = $3x$ = (3 × 30) m = 90 m

Q6

Answer :

(d) 56.25%

Let the side of the square be a cm.
Area of the square = $(a)^2$ cm^2
Increased side = (a + 25% of a) cm

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

Area of the square = $\left(\frac{5}{4}a\right)^2 \text{cm}^2 = \left(\frac{25}{16}a^2\right)$ cm^2
Increase in the area = $\left[\left(\frac{25}{16}a^2\right) - a^2\right]$ cm^2= $\left(\frac{25a^2 - 16a^2}{16}\right)$ cm^2 = $\left(\frac{9a^2}{16}\right)$ cm^2
% 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 = $\sqrt{2}a$
$\therefore$ 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.

$\therefore$ Area of a square > Area of a rectangle

Q9

Answer :

(b) 13500 m^2

Let the length of the rectangular field be $5x$.
Breadth = $3x$
Perimeter of the field = $2(l + b)$ = 480 m (given)
$\Rightarrow 480 = 2(5x + 3x) \Rightarrow 480 = 16x$
$\Rightarrow x = \frac{480}{16} = 30$
$\therefore$ Length = $5x$ = (5 × 30) = 150 m
Breadth = $3x$ = (3 × 30) = 90 m
$\therefore$ Area of the rectangular park = 150 m × 90 m = 13500 m^2

Q10

Answer :

(a) 6 m

Total cost of carpeting = Rs 6000
Rate of carpeting = Rs 50 per m
∴ Length of the carpet = $\left(\frac{6000}{50}\right)$ m = 120 m
∴ Area of the carpet = $\left(120 \times \frac{75}{100}\right)$ m^2 = 90 m^2 [since 75 cm = $\frac{75}{100}$ $\mathbf{m}$]
Area of the floor = Area of the carpet = 90 m^2
∴ Width of the room = $\left(\frac{\text{Area}}{\text{Length}}\right) = \left(\frac{90}{15}\right)\ \mathbf{m} = 6\ \mathbf{m}$

Q11

Answer :

(a) 84 cm^2

Let a = 13 cm, b = 14 cm and c = 15 cm
Then, $s = \frac{a+b+c}{2} = \left(\frac{13+14+15}{2}\right)$ cm = 21 cm
∴ Area of the triangle = $\sqrt{\mathbf{s(s-a)(s-b)(s-c)}}$ sq. units
= $\sqrt{21(21-13)(21-14)(21-15)}$ cm^2
= $\sqrt{21 \times 8 \times 7 \times 6}$ cm^2
= $\sqrt{3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 2 \times 3}$ cm^2
= (2 × 2 × 3 × 7) cm^2
= 84 cm^2

Q12

Answer :

(b) 48 m^2

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

Q13

Answer :

(b) 4 cm

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

We know:
Area of an equilateral triangle = $\frac{\sqrt{3}}{4}(\mathbf{side})^2$ sq. units
∴ Side of the equilateral triangle = $\left[\sqrt{\left(\frac{4\times\text{Area}}{\sqrt{3}}\right)}\right]$ cm
= $\left[\sqrt{\left(\frac{4\times4\sqrt{3}}{\sqrt{3}}\right)}\right]$ cm = $\left(\sqrt{4 \times 4}\right)$ cm = $\left(\sqrt{16}\right)$cm = 4 cm

Q14

Answer :

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

It is given that one side of an equilateral triangle is 8 cm.
∴ Area of the equilateral triangle = $\frac{\sqrt{3}}{4}(\text{Side})^2$ sq. units
= $\frac{\sqrt{3}}{4}(8)^2$ cm^2
= $\left(\frac{\sqrt{3}}{4} \times 64\right)$ cm^2 = $16\sqrt{3}$ cm^2

Q15

Answer :

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

Let ΔABC be an equilateral triangle with one side of the length *a* cm.

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

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

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

Area of the equilateral triangle = $\frac{\sqrt{3}}{4}\boldsymbol{a}^2$

$= \frac{\sqrt{3}}{4}\left(2\sqrt{2}\right)^2 \text{cm}^2 = \left(\frac{\sqrt{3}}{4}\times 8\right)\text{cm}^2 = 2\sqrt{3}\,\text{cm}^2$

Q16

Answer :

(b) 72 cm^2

Base of the parallelogram = 16 cm

Height of the parallelogram = 4.5 cm

∴ Area of the parallelogram = Base × Height

= (16 × 4.5) cm^2 = 72 cm^2

Q17

Answer :

(b) 216 cm^2

Length of one diagonal = 24 cm

Length of the other diagonal = 18 cm

∴ Area of the rhombus = $\frac{1}{2}$ × (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 = $2\pi\mathbf{r}$

(Circumference) - (Radius) = 37

∴ $(2\pi\mathbf{r} - \mathbf{r}) = 37$

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

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

∴ Radius of the given circle is 7 cm.

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

Q19

Answer :

(c) 54 m^2

Given:
Perimeter of the floor = $2(l + b)$ = 18 m
Height of the room = 3 m

∴ Area of the four walls = $\{2(l + b) \times h\}$
= Perimeter × Height
= 18 m × 3 m = 54 m^2

Q20

Answer :

(a) 200 m

Area of the floor of a room = 14 m × 9 m = 126 m^2

Width of the carpet = 63 cm = 0.63 m (since 100 cm = 1 m)

∴ Required length of the carpet = $\frac{\text{Area of the floor of a room}}{\text{Width of the carpet}}$
= $\left(\frac{126}{0.63}\right)\mathrm{m} = 200\ \mathrm{m}$

Q21

Answer :

(c) 120 cm^2

Let the length of the rectangle be x cm and the breadth be y cm.
Area of the rectangle = xy cm^2
Perimeter of the rectangle = $2(x + y)$ = 46 cm (given)
⇒ $2(x + y) = 46$
⇒ $(x + y) = \left(\frac{46}{2}\right)$ cm = 23 cm

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

Squaring both the sides, we get:
⇒ $x^2 + y^2 = (17)^2$
⇒ $x^2 + y^2 = 289$

Now, $(x^2 + y^2) = (x + y)^2 - 2xy$
⇒ $2xy = (x + y)^2 - (x^2 + y^2)$
$= (23)^2 - 289$
$= 529 - 289 = 240$
∴ $xy = \left(\frac{240}{2}\right)$ cm^2 = 120 cm^2

Q22

Answer :

(b) 3:1

Let a side of the first square be a cm and that of the second square be b cm.
Then, their areas will be a^2 and b^2, respectively.
Their perimeters will be $4a$ and $4b$, respectively.

According to the question:
$\frac{a^2}{b^2} = \frac{9}{1} \Rightarrow \left(\frac{a}{b}\right)^2 = \frac{9}{1} = \left(\frac{3}{1}\right)^2 \Rightarrow \frac{a}{b} = \frac{3}{1}$

∴ Required ratio of the perimeters = $\frac{4a}{4b} = \frac{4\times3}{4\times1} = \frac{3}{1}$ = 3:1

Q23

Answer :

(d) 4:1

Let the diagonals be 2*d* 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
⇒ Length × Width = Side × Side
⇒ (144 × *x*) = 84 × 84
∴ Width (*x*) = $\left(\frac{84\times84}{144}\right)$m = 49 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 = $\frac{\sqrt{3}}{4}(\text{Side})^2 = \frac{\sqrt{3}}{4}(\text{a})^2$
∴ Required ratio = $\frac{a^2}{\frac{\sqrt{3}}{4}a^2} = \frac{4}{\sqrt{3}} = 4:\sqrt{3}$

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
⇒ $(x)^2 = \pi r^2$
∴ 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) $\frac{49\sqrt{3}}{4}$ cm^2

Let the radius of the circle be *r* cm.
Then, its area = πr^2 cm^2
∴ $\pi r^2 = 154$
⇒ $\frac{22}{7}\times r\times r = 154$
⇒ $r^2 = \left(\frac{154\times7}{22}\right) = 49$
⇒ $r = \sqrt{49}$ cm = 7 cm

Side of the equilateral triangle = Radius of the circle
= 7 cm
∴ Area of the equilateral triangle = $\frac{\sqrt{3}}{4}(\text{side})^2$ sq. units

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

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

Q28

Answer :

(c) 12 cm

Area of the rhombus = $\frac{1}{2}$ × (Product of the diagonals)
Given:
Length of one diagonal = 6 cm
Area of the rhombus = 36 cm^2

∴ Length of the other diagonal = $\left(\frac{36\times2}{6}\right)$ cm = 12 cm

Q30

Answer :

(c) 17.60 m

Let the radius of the circle be *r* m.
Area = πr^2 m^2
∴ πr^2 = 24.64
⇒ $\left(\frac{22}{7}\times r\times r\right)$ = 24.64
⇒ r^2 = $\left(\frac{24.64\times7}{22}\right)$ = 7.84
⇒ r = $\sqrt{7.84}$ = 2.8 m
⇒ Circumference of the circle = $(2\pi r)$ m
= $\left(2\times\frac{22}{7}\times2.8\right)$ m = 17.60 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) cm
According to the question:
$\pi(r+1)^2 = \pi r^2+22$
⇒ $\pi\left(r^2+1+2r\right)=\pi r^2+22$
⇒ $\pi r^2+\pi+2\pi r=\pi r^2+22$
⇒ $\pi+2\pi r=22$ [cancel πr^2 from both the sides of the equation]
⇒ $\pi(1+2r)=22$
⇒ $(1+2r)=\frac{22}{\pi}=\left(\frac{22\times7}{22}\right)=7$
⇒ $2r$ = 7 -1 = 6
∴ r = $\left(\frac{6}{2}\right)$ cm = 3 cm
∴ Original radius of the circle = 3 cm

Q32

Answer :

(c) 1000

Radius of the wheel = 1.75 m
Circumference of the wheel = $2\pi r$
= $\left(2\times\frac{22}{7}\times1.75\right)$cm = (2 × 22 × 0.25) m = 11 m

Distance covered by the wheel in 1 revolution is 11 m.
Now, 11 m is covered by the car in 1 revolution.
(11 × 1000) m will be covered by the car in $\left(1\times\frac{1}{11}\times11\times1000\right)$ revolutions, i.e. 1000 revolutions.
∴ Required number of revolutions = 1000