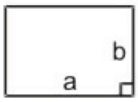
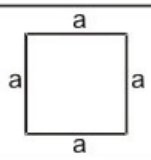
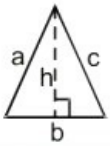
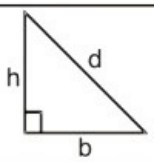
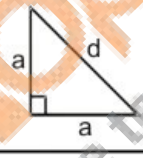
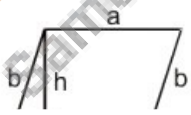
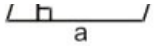
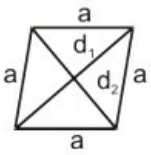
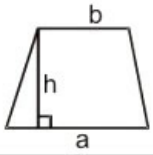
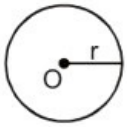
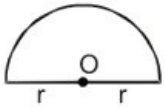
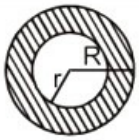
Mensuration
Exercise 20A

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

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

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

∴ 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 4*x* m.
Breadth = 3*x* 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.
∴ $12x^2 = 1728$

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

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

∴ 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
$= (240 \times 0.75)\ m^2 = 180\ m^2$
Let the width of the room be b m.
Area to be carpeted = $15\ m \times b\ m = 15b\ m^2$
∴ $15b\ m^2 = 180\ m^2$
$\Rightarrow b = \left(\frac{180}{15}\right)$ 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 = $(\text{Side})^2$
$= (8.5\ m)^2$
$= 72.25\ m^2$

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 = $\left\{\frac{1}{2} \times (\mathrm{Diagonal})^2\right\}$ sq. units

Diagonal of the square = $\sqrt{2 \times \text{Area of square}}$ 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 = $\left\{\frac{1}{2} \times (\mathrm{Diagonal})^2\right\}$ 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 = $\sqrt{2 \times \text{Area of } \mathit{the} \text{ square}}$

= $\left(\sqrt{2 \times 5000}\right)$ 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 = $\left(\sqrt{\text{Area}}\right)$

= $\left(\sqrt{6084}\right)$ 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 × Side = 4 × 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 = $(\text{Side})^2 = (10 \text{ cm} \times 10 \text{ cm}) = 100 \text{ cm}^2$
Area of the rectangle = $l \times b = (12 \text{ cm} \times 8 \text{ cm}) = 96 \text{ cm}^2$

Hence, the square encloses more area.
It encloses 4 cm^2 more area.

Q16

Answer :

Given:
Length = 50 m
Breadth = 40 m
Height = 10 m

Area of the four walls $= \{2h(l + b)\}$ sq. unit
$= \{2 \times 10 \times (50 + 40)\}\text{m}^2$
$= \{20 \times 90\}\ \text{m}^2 = 1800\ \text{m}^2$
Area of the ceiling = $l \times b = (50 \text{ m} \times 40 \text{ m}) = 2000\ \text{m}^2$
$\therefore$ Total area to be white washed = $(1800 + 2000)\ \text{m}^2 = 3800\ \text{m}^2$
Rate of white washing = Rs 20/sq. metre
$\therefore$ Total cost of white washing = Rs (3800×20) = 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
$= 168\ \text{m}^2$
$\therefore 168 = [2(l + 10) \times 4]$
$\Rightarrow 168 = [8l + 80]$
$\Rightarrow 168 - 80 = 8l$
$\Rightarrow 88 = 8l$
$\Rightarrow l = \left(\frac{88}{8}\right)$ 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.
$= 77\ \text{m}^2$
$\therefore 77 = [2(7.5 + 3.5)h]$
$\Rightarrow 77 = [(2 \times 11)h]$
$\Rightarrow 77 = 22h$
$\Rightarrow h = \left(\frac{77}{22}\right)$ 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
$120\ m^2 = \{2(2x + x) \times 4\}\ m^2$
$\Rightarrow 120 = \{8 \times 3x\}$
$\Rightarrow 120 = 24x$
$\Rightarrow x = \left(\frac{120}{24}\right) = 5$
$\therefore$ 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 m $\times$ 5 m) = 50 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
$= \{2(8.5 + 6.5) \times 3.4\}m^2 = \{30 \times 3.4\}\ m^2 = 102\ m^2$
Area of one door = $(1.5 \times 1)\ m^2 = 1.5\ m^2$
$\therefore$ Area of two doors = $(2 \times 1.5)\ m^2 = 3\ m^2$
Area of one window = $(2 \times 1)\ m^2 = 2\ m^2$
$\therefore$ Area of two windows = $(2 \times 2)\ m^2 = 4\ m^2$
Total area of two doors and two windows = $(3 + 4)\ m^2$
$= 7\ m^2$
Area to be painted = $(102 - 7)\ m^2 = 95\ m^2$
Rate of painting = Rs 160 per m^2
Total cost of painting = Rs (95×160) = Rs 15200