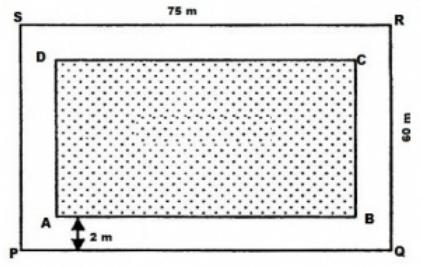
Mensuration
Exercise 20B

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 × 60) m^2 = 4500 m^2

Width of the path = 2 m

∴ AB = (75 - 2 × 2) m = (75 - 4) m =71 m

AD = (60 - 2 × 2) m = (60 - 4) m = 56 m

Area of rectangle ABCD = (71 x 56) m^2 = 3976 m^2

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

= (4500 - 3976) m^2 = 524 m^2

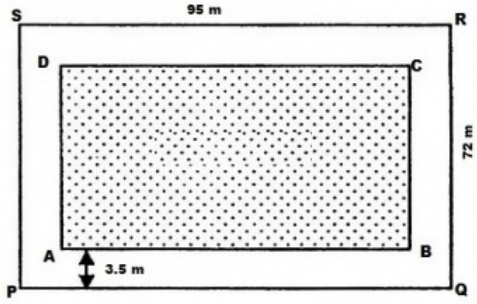
Rate of constructing the path = Rs 125 per m^2

∴ 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.



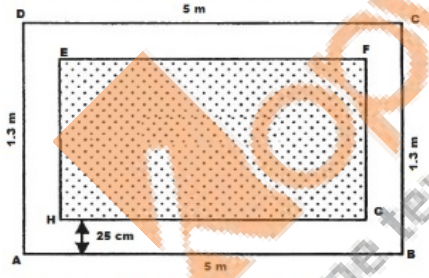
Length = 95 m
Breadth = 72 m
Area of the plot = (95 × 72) m^2 = 6,840 m^2
Width of the path = 3.5 m
∴ AB = (95 - 2 × 3.5) m = (95 - 7) m = 88 m
AD = (72 - 2 × 3.5) m = (72 - 7) m = 65 m
Area of the path = (Area PQRS - Area ABCD)
= (6840 - 5720) m^2 = 1,120 m^2
Rate of constructing the path = Rs. 80 per m^2
∴ Total cost of constructing the path = Rs. (1,120 × 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 × 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 × 1.3 m = 6.5 m^2

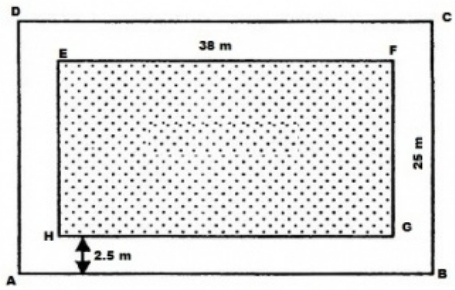
Length, GH = {5 -(0.25 + 0.25)} m = 4.5 m
Breadth, FG = {1.3 - 0.25 + 0.25} m = 0.8 m
∴ Area of EFGH = 4.5 m × .8 m = 3.6 m^2

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 × 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 × 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

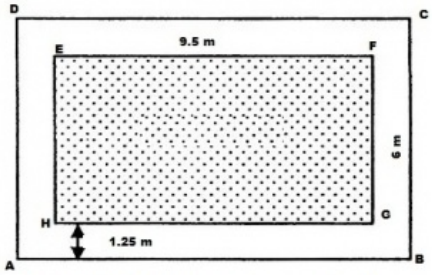
∴ Total cost of gravelling the path = Rs (120 × 340)
= Rs 40800

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 × 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 × 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

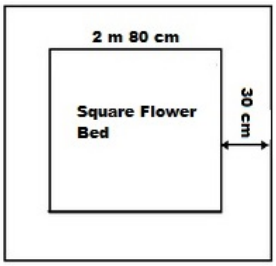
∴ Total cost of cementing the verandah = Rs (80 × 45)

= 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 = $(Side)^2$ = $(2.80\ m)^2$ = 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 = $(Side)^2$ = $(3.4)^2$ = 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

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

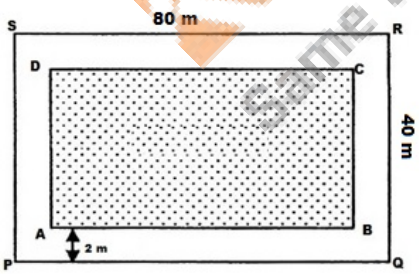
$\Rightarrow 6x = 240$

$\Rightarrow x = \left(\frac{240}{6}\right)$ 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 × 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 × 36) m^2 = 2736 m^2

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

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

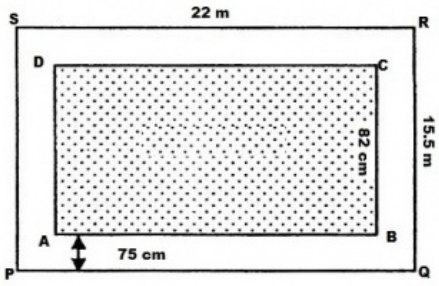
Rate of paving the path = Rs. 80 per m^2

∴ 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



∴ Area of the school hall PQRS = 22 m × 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
∴ Area of the carpet ABCD = 20.5 m × 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

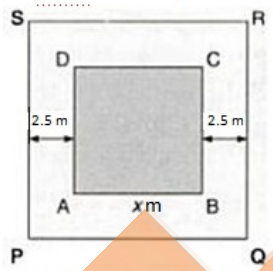
Area of 1 m length of the carpet = 1 m × 0.82 m = 0.82 m^2

∴ 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 × 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
∴ Area of PQRS = $(x + 5)^2 = (x^2 + 10x + 25)$ m^2

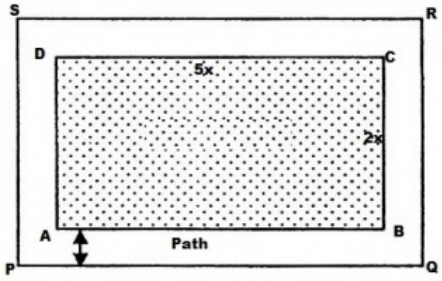
Area of the path = Area of PQRS − Area of the square lawn (ABCD)
⇒ $165 = x^2 + 10x + 25 - x^2$
⇒ $165 = 10x + 25$
⇒ $165 - 25 = 10x$
⇒ $140 = 10x$
∴ $x = 140 \div 10 = 14$
∴ Side of the lawn = 14 m

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

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.

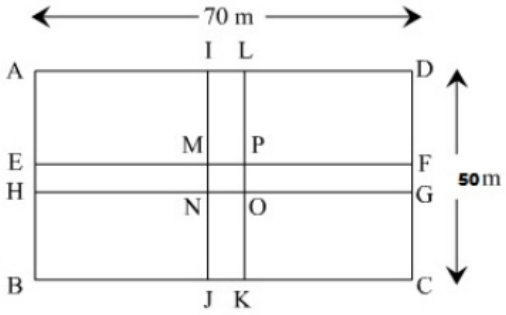
∴ Area of the rectangular park = $5x \times 2x = 10x^2$ m^2
Width of the path = 2.5 m
Outer length, $PQ = 5x$ m + 2.5 m + 2.5 m = $(5x + 5)$ m
Outer breadth, $QR = 2x$ + 2.5 m + 2.5 m = $(2x + 5)$ m
Area of $PQRS = (5x + 5) \times (2x + 5) = (10x^2 + 25x + 10x + 25) = (10x^2 + 35x + 25)$ m^2
∴ Area of 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

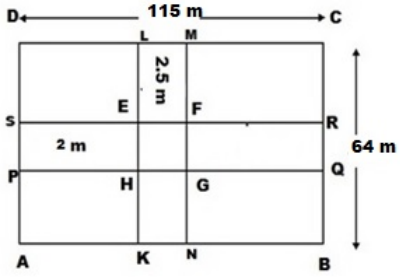
Area of the roads = Area (*EFGH*) + Area (*IJKL*) − Area (*MNOP*)
= (350 + 250) m^2 − 25 m^2 = 575 m^2
It is given that the cost of constructing the roads is Rs. 120/m^2.

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

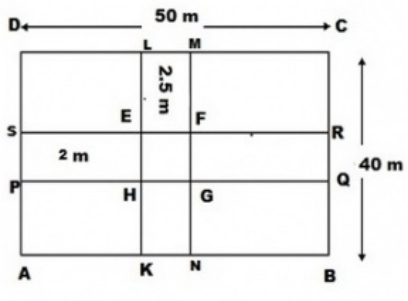
∴ Area of the roads = Area (KLMN) + Area (PQRS) − Area (EFGH)
= (230 m^2 + 160 m^2) − 5 m^2 = 385 m^2

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

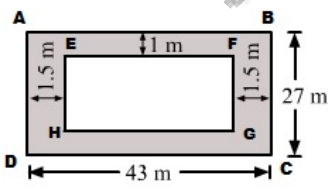
∴ Area of the roads = Area (KLMN) + Area (PQRS) − Area (EFGH)
= (100 m^2 + 100 m^2) − 5 m^2 = 195 m^2

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

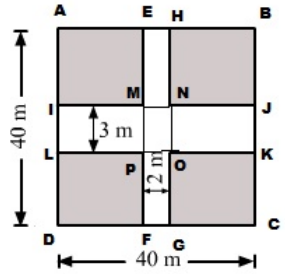
Answer :

(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

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

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

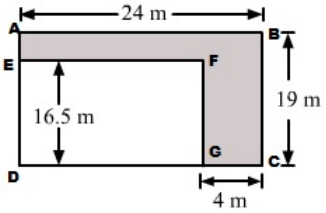
$= [1600 - 194]\ m^2$

$= 1406\ m^2$

Q15

Answer :

(i) Complete the rectangle as shown below:



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

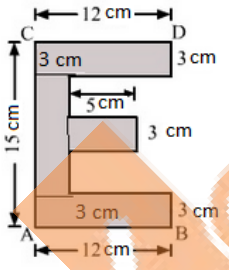
$= [(AB \times BC) - (DG \times GF)]\ m^2$

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

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

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

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



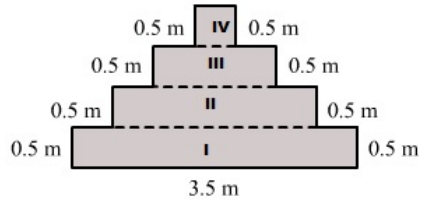
Area of the shaded region $= \{(12 \times 3) + (12 \times 3) + (5 \times 3) + \{(15 - 3 - 3) \times 3\}\}\ cm^2$

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

$= 114\ cm^2$

Q16

Divide the given figure in four parts shown below:



Given:

Width of each part = 0.5 m

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

Length of part I = 3.5 m

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

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

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

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

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

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

$= 4\ m^2$