RD SHARMA

Solutions

Class 7 Maths

Chapter 20

Ex 20.2

Q1: A rectangular grassy lawn measuring 40 m by 25 m is to be surrounded externally by a path which is 2 m wide. Calculate the cost of leveling the path at the rate of Rs 8.25 per square metre.

A1: We have,

Length AB = 40 m and breadth BC = 25 m

Area of lawn ABCD = 40 m x 25 m = 1000 m^2

Length PQ = (40 + 2 + 2) m = 44 m

Breadth QR = (25 + 2 + 2) m = 29 m

Area of PQRS = 44 m x 29 m = 1276 m^2

Now, Area of the path = Area of PQRS – Area of the lawn ABCD

= 1276 m^2 – 1000 m^2 = 276 m^2

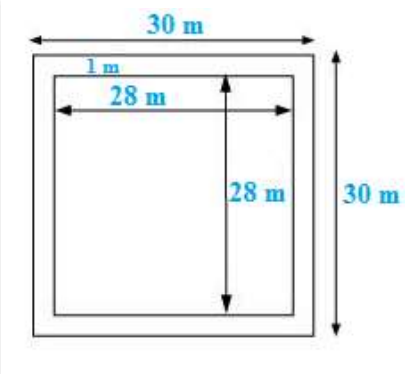
Rate of leveling the path = Rs. 8.25 per m^2

Cost of leveling the path = Rs.(8.25 x 276) = Rs. 2277

Q2: One metre wide path is built inside a square park of side 30 m along its sides. The remaining part of the park is covered by grass. If the total cost of covering by grass is Rs 1176, find the rate per square metre at which the park is covered by the grass.

A2: We have,

Side of square garden (a) = 30 m



Area of the square garden including the path = a^2= $(30)^2$ = 900 m^2

From the figure, it can be observed that the side of the square garden, when the path is not included, is 28 m.

Area of the square garden not including the path = (28)2 = 784 m^2

Total cost of covering the park with grass = Area of the park covering with green grass x Rate per square metre

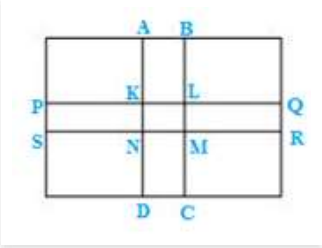
1176 = 784 x Rate per square metre

Rate per square metre at which the park is covered with grass = Rs. (1176 ÷ 784) = Rs. 1.50

Q3: Through a rectangular field of sides 90 m x 60 m, two roads are constructed which are parallel to the sides and cut each other at right angles through the centre of the field. if the width of the roads is 3 m, find the total area covered by the two roads.

A3: Length of the rectangular sheet = 90 m

Breadth of the rectangular sheet = 60 cm



Area of the rectangular field = 90 m x 60 m = 5400 m^2

Area of the road PQRS = 90 m x 3 m = 270 m^2

Area of the road ABCD = 60 m x 3 m = 180 m^2

Clearly, area of KLMN is common to the two roads.

Thus, area of KLMN = 3 m x 3 m = 9 m^2

Hence, Area of the roads = Area (PQRS) + Area (ABCD) – Area (KLMN)

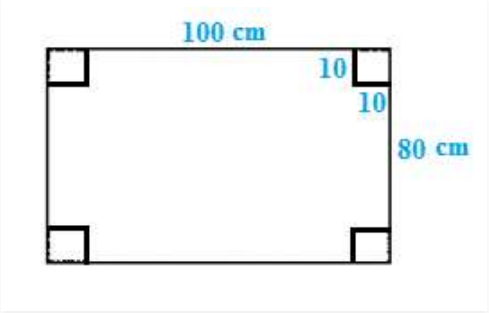
= (270 + 180) m^2 – 9 m^2 = 441 m^2

Q4: from a rectangular sheet of tin, of size 100 cm by 80 cm, are cut four squares of side 10 cm from each corner. Find the area of the remaining sheet.

A4:

Length of the rectangular sheet = 100 cm

Breadth of the rectangular sheet = 80 cm



Area of the rectangular sheet of tin = 100 cm x 80 cm

= 8000 c m^2

Side of the square at the corner of the sheet = 10 cm

Area of one square at the corner of the sheet = (10 cm)^2 = 100 cm^2

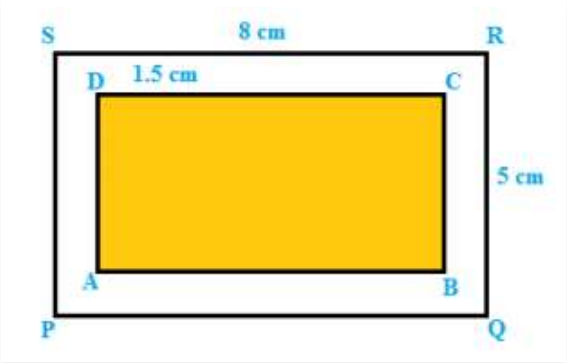
Area of 4 squares at the corner of the sheet = 4 x 100 cm^2 = 400 cm^2

Hence, Area of the remaining sheet of tin = Area of the rectangular sheet – Area of the 4 squares

Area of the remaining sheet of tin = (8000 – 400) cm^2 = 7600 cm^2

Q 5: A painting 8 cm long and 5 cm wide is painted on a cardboard such that there is a margin of 1.5 cm along each of its sides. Find the total area of the margin.

A5: We have, Length of the cardboard = 8 cm and breadth of the cardboard = 5 cm



Area of the cardboard including the margin = 8 cm x 5 cm = 40 c m^2

From the figure, it can be observed that,

New length of the painting when the margin is not included = 8 cm – (1.5 cm + 1.5 cm)

= (8 – 3) cm = 5 cm

New breadth of the painting when the margin is not included = 5 cm – (1.5 cm + 1.5 cm)

= (5 – 3) cm = 2 cm

Area of the painting not including the margin = 5 cm x 2 cm = 10 cm^2

Hence, Area of the margin = Area of the cardboard including the margin – Area of the painting

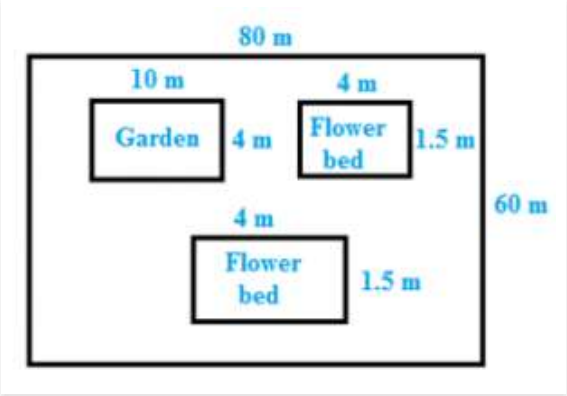
$= (40 - 10)\ cm^2 = 30\ cm^2$

Q6: Rakesh has a rectangular field of length 80 m and breadth 60 m. In it, he wants to make a garden 10 m long and 4 m broad at one of the corners and at another corner, he wants to grow flowers in two floor-beds each of size 4 m by 1.5 m. In the remaining part of the field, he wants to apply manures. Find the cost of applying the manures at the rate of Rs 300 per area.

A6:

Length of the rectangular field = 80 m

Breadth of the rectangular field = 60 m



Area of the rectangular field = 80 m x 60 = 4800 m^2

Again, Area of the garden = 10 m x 4 m = 40 m^2

Area of one flower bed = 4 m x 1.5 m = 6 m^2

Thus, Area of two flower beds = 2 x 6 m^2 = 12 m^2

Remaining area of the field for applying manure = Area of the rectangular field – (Area of the garden + Area of the two flower beds)

Remaining area of the field for applying manure = 4800 m^2 – (40 + 12) m^2

$= (4800 - 52)\ m^2 = 4748\ m^2$

Since 100 m^2 = 1 acre => 4748 m^2 = 47.48 acres

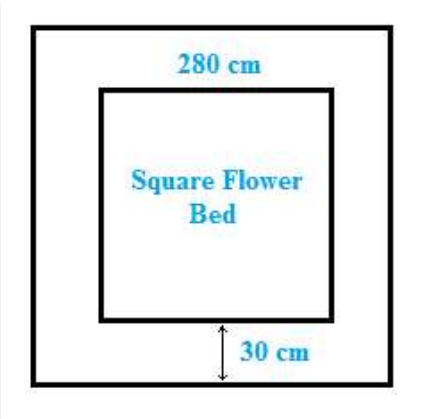
So, cost of applying manure at the rate of Rs. 300 per are will be Rs. (300 x 47.48) = Rs. 14244

Q7: Each side of a square flower bed is 2 m 80 cm long. It is extended by digging a strip 30 cm wide all around it. Find the area of the enlarged flower bed and also the increase in the area of the flower bed.

A7:

We have ,

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

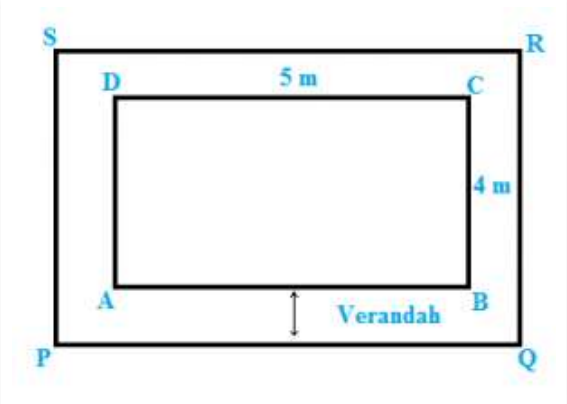
Thus, Increase in the area of the flower bed = 11.56 m^2 – 7.84 m^2 = 3.72 m^2

Q8: A room 5 m long and 4 m wide is surrounded by a verandah. If the verandah occupies an area of 22 m^2***, find the width of the varandah.***

A8:

Let the width of the verandah be x m.

Length of the room AB = 5 m and BC = 4 m



Area of the room = 5 m x 4 m = 20 m^2

Length of the verandah PQ = (5 + x + x) = (5 + 2x) m

Breadth of the verandah QR = (4 + x + x) = (4 + 2x) m

Area of verandah PQRS = (5 + 2x) x (4 + 2x) = (4×2 + 18x + 20) m^2

Area of verandah = Area of PQRS – Area of ABCD

=> 22 = $4x^2$ + 18x + 20 – 20

22 = $4x^2$ + 18x

11 = $2x^2$ + 9x

$2x^2$ + 9x – 11 = 0

$2x^2$ + 11x – 2x – 11 =0

x(2x+11)-1(2x+11)=0

(x- 1)(2x+11)= 0

When x – 1 = 0, x = 1

When 2x + 11 = 0, x = -11/2

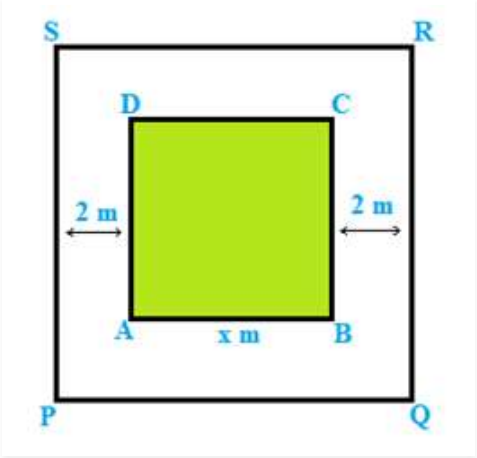
The width cannot be a negative value. So, width of the verandah = x = 1 m.

Q9: A square lawn has a 2 m wide path surrounding it. If the area of the path is 136 m^2***, find the area of the lawn.***

A9: Let ABCD be the square lawn and PQRS be the outer boundary of the square path.

Let side of the lawn AB be x m.

Area of the square lawn = x^2



Length PQ = (x m + 2 m + 2 m) = (x + 4) m

Area of PQRS = $(x + 4)^2 = (x^2 + 8x + 16)$ m^2

Now, Area of the path = Area of PQRS – Area of the square lawn

$136 = x^2 + 8x + 16 - x^2$

$136 = 8x + 16$

$136 - 16 = 8x$

$120 = 8x$

$x = 120/ 8 = 15$

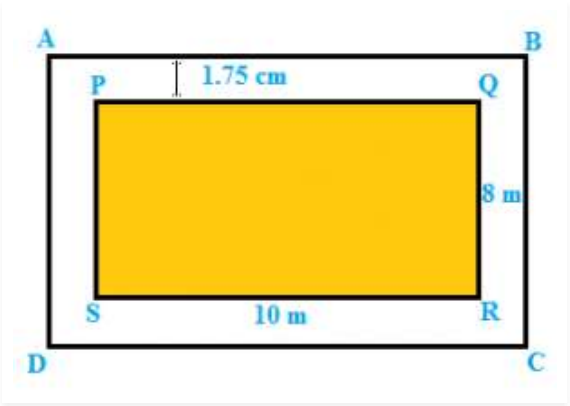
Side of the lawn = 15 m Hence, Area of the lawn = $(Side)^2 = (15 m)^2 = 225$ m^2

Q 10: A poster of size 10 cm by 8 cm is pasted on a sheet of cardboard such that there is a margin of width 1.75 cm along each side of the poster. Find (i) the total area of the margin (ii) the cost of the cardboard used at the rate of Re 0.60 per c m^2***.***

A 10: We have,

Length of poster = 10 cm and breadth of poster = 8 cm

Area of the poster = Length x Breadth = 10 cm x 8 cm = 80 cm^2



From the figure, it can be observed that,

Length of the cardboard when the margin is included = 10 cm + 1.75 cm + 1.75 cm = 13.5 cm

Breadth of the cardboard when the margin is included = 8 cm + 1.75 cm + 1.75 cm = 11.5 cm

Area of the cardboard = Length x Breadth = 13.5 cm x 11.5 cm = 155.25 c m^2

Hence,

(i) Area of the margin = Area of cardboard including the margin – Area of the poster

= 155.25 c m^2 – 80 c m^2

= 75.25 c m^2

(ii) Cost of the cardboard = Area of cardboard x Rate of the cardboard Rs 0.60 per cm^2

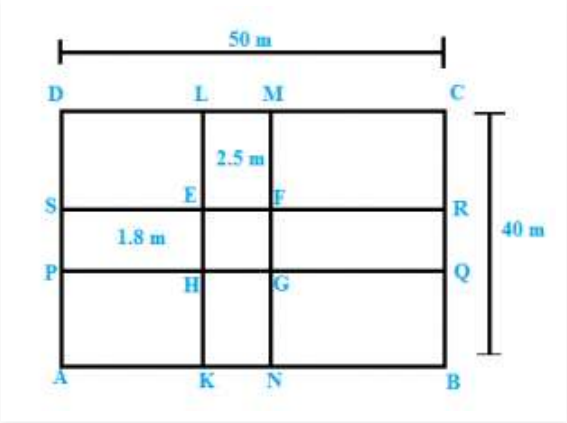
= Rs. (155.25 x 0.60)

= Rs. 93.15

Q11: A rectangular field is 50 m by 40 m. It has two roads through its centre, running parallel to its sides. The widths of the longer and shorter roads are 1.8 m and 2.5 m respectively. Find the area of the roads and the area of the remaining portion of the field.

A11:

Let ABCD be the rectangular field and KLMN and PQRS the two rectangular roads with width 1.8 m and 2.5 m, respectively.



Length of the rectangular field CD = 50 cm and breadth of the rectangular field BC = 40 m

Area of the rectangular field ABCD = 50 m x 40 m = 2000 m^2

Area of the road KLMN = 40 m x 2.5 m = 100 m^2

Area of the road PQRS = 50 m x 1.8 m = 90 m^2

Clearly area of EFGH is common to the two roads.

Thus, Area of EFGH = 2.5 m x 1.8 m = 4.5 m^2

Hence, Area of the roads = Area (KLMN) + Area (PQRS) – Area (EFGH)

= (100 m^2 + 90 m^2) – 4.5 m^2

= 185.5 m^2

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

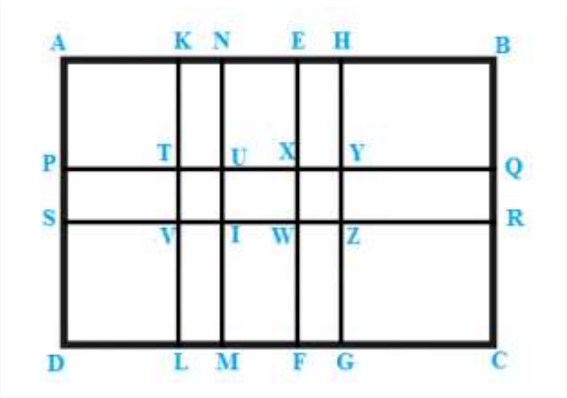
= (2000 – 185.5) m^2

= 1814.5 m^2

Q12: There is a rectangular field of size 94 m x 32 m. Three roads each of 2 m width pass through the field such that two roads are parallel to the breadth of the field and the third is parallel to the length. Calculate: (i) area of the field covered by the three roads (ii) area of the field not covered by the roads.

A12:

Let ABCD be the rectangular field.



Here, Two roads which are parallel to the breadth of the field KLMN and EFGH with width 2 m each. One road which is parallel to the length of the field PQRS with width 2 m.

Length of the rectangular field AB = 94 m and breadth of the rectangular field BC = 32 m

Area of the rectangular field = Length x Breadth = 94 m x 32 m = 3008 m^2

Area of the road KLMN = 32 m x 2 m = 64 m^2

Area of the road EFGH = 32 m x 2 m = 64 m^2

Area of the road PQRS = 94 m x 2 m = 188 m^2

Clearly area of TUVI and WXYZ is common to these three roads.

Thus, Area of TUV1 = 2 m x 2 m = 4 m^2

Area of WXYZ = 2 m x 2 m = 4 m^2

Hence,

(i) Area of the field covered by the three roads: = Area (KLMN) + Area (EFGH) + Area (PQRS) – {Area (TUVI) + Area (WXYZ)}

= [64+ 64 + 188 – (4 + 4)] m^2

= 316 m^2 – 8 m^2

= 308 m^2

(ii) Area of the field not covered by the roads: = Area of the rectangular field ABCD – Area of the field covered by the three roads

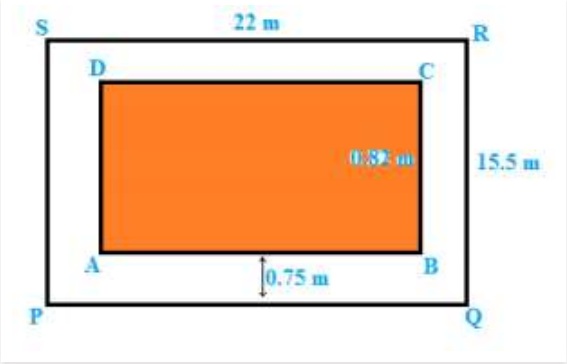
= 3008 m^2 – 308 m^2

= 2700 m^2

Q13: A school has a hall which is 22 m long and 15.5 m broad. A carpet is laid inside the hall leaving all around a margin of 75 cm from the walls. Find the area of the carpet and the area of the strip left uncovered. If the width of the carpet is 82 cm, find the cost at the rate of Rs 18 per metre.

A13: *We have,*

Length of hall PQ = 22 m and breadth of hall QR = 15.5 m



Area of the school hall PQRS = 22 m x 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 x 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

Again, Area of the 1 m length of carpet = 1 m x 0.82 m = 0.82 m^2

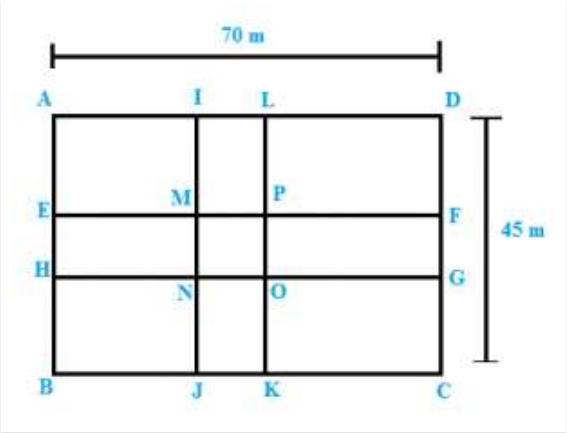
Thus, Length of the carpet whose area is 287 m^2 = 287 m^2+ 0.82 m^2 = 350 m

Cost of the 350 m long carpet = Rs. 18 x 350 = Rs. 6300

Q14: Two cross roads, each of width 5 m, run at right angles through the centre of a rectangular park of length 70 m and breadth 45 m parallel to its sides. Find the area of the roads. Also, find the cost of constructing the roads at the rate of Rs 105 per m^2***.***

A14: :

Let ABCD be the rectangular park then EFGH and IJKL the two rectangular roads with width 5 m.



Length of the rectangular park AD = 70 cm

Breadth of the rectangular park CD = 45 m

Area of the rectangular park = Length x Breadth = 70 m x 45 m = 3150 m^2

Area of the road $EFGH$ = 70 m x 5 m = 350 m^2

Area of the road $JKIL$ = 45 m x 5 m = 225 m^2

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

Thus, Area of $MNOP$ = 5 m x 5 m = 25 m^2

Hence,

Area of the roads = Area $(EFGH)$ + Area $(JKIL)$ – Area $(MNOP)$

= (350 + 225) m^2 – 25 m^2 = 550 m^2

Again, it is given that the cost of constructing the roads = Rs. 105 per m^2

Therefore,

Cost of constructing 550 m^2 area of the roads = Rs. (105 x 550)

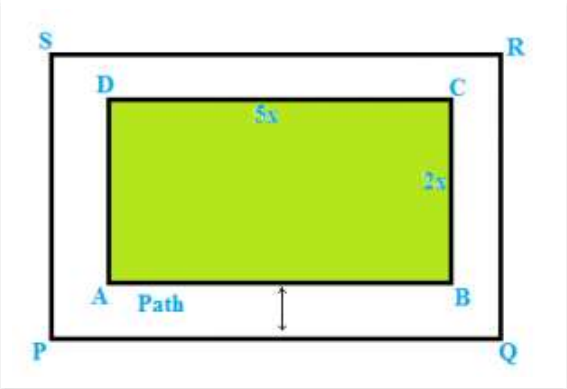
= Rs. 57750.

Q15: The length and breadth of a rectangular park are in the ratio 5: 2. A 2.5 m wide path running all around the outside the park has an area 305 m^2***. Find the dimensions of the park.***

A15: We have,

Area of path = 305 m^2

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



Thus,

Area of the rectangular park = (5x) x (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 $PQRS$ = $(5x + 5)$ m x (2x + 5) m = ($10x^2$ + 25x + 10x + 25) m^2= ($10x^2$ + 35x + 25) m^2

Area of the path = $[(10x^2 + 35x + 25) - 10x^2]$ m^2

=> $305 = 35x + 25$

=> $305 - 25 = 35x$

=> $280 = 35x$

=> $x = 280 + 35 = 8$

Therefore,

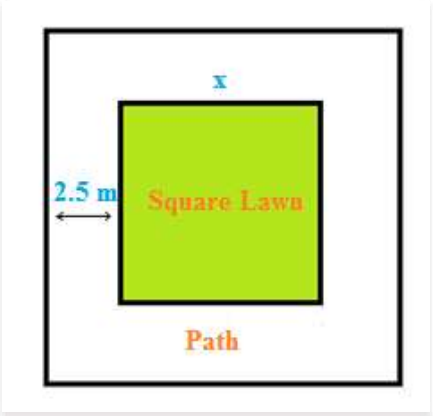
Length of the park = 5x = 5 x 8 = 40 m

Breadth of the park = 2x = 2 x 8 = 16 m

Q16: A square lawn is surrounded by a path 2.5 m wide. If the area of the path is 165 m^2***, find the area of the lawn.***

A16:

Let the side of the lawn be *x* m.



Given that width of the path = 2.5 m

Side of the lawn including the path = $(x + 2.5 + 2.5)$ m = $(x + 5)$ m

So, area of lawn = (Area of the lawn including the path) – (Area of the path)

We know that the area of a square = $(Side)^2$

Area of lawn $(x^2) = (x + 5)^2 - 165$

=> $x^2 = (X^2 + 10X + 25) - 165$

=> $165 = 10x + 25$

=> $165 - 25 = 10x$

=> $140 = 10x$

Therefore $x = 140 / 10 = 14$

Thus the side of the lawn = 14 m

Hence,

The area of the lawn = $(14 \text{ m})^2 = 196$ m^2