

Exercise 15B

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**Question 1:** The perimeter of a rectangular plot of land is 80 m and its breadth is 16 m. Find the length and area of the plot.

**Solution:**

Perimeter of rectangle = 80 m

Let x be the length and 16m breadth.

We know, perimeter = 2 [length + breadth]

$$80 = 2(x + 16)$$

$$80 = (2x + 32)$$

$$\text{Or } x = 24$$

Thus,

Length of the rectangle is 24 meter

Again,

Area of the rectangular plot = Length X Breadth

$$= (16 \times 24)$$

$$= 384$$

So, Area of the rectangular plot is 384 m<sup>2</sup>

Therefore, length of rectangle is 24 m and the area is 384 m<sup>2</sup>.

**Question 2:** The length of a rectangular park is twice its breadth, and its perimeter measures 840 m. Find the area of the park.

**Solution:**

The length of a rectangular park = 2(its breadth)

Perimeter = 840 m (Given)

Let x be the breadth of a rectangular park then, length of a rectangular park is 2x m.

We know, Perimeter of rectangle = 2(Length + Breadth)

$$840 = 2(\text{Length} + \text{Breadth})$$

$$840 = 2(2x + x)$$

$$840 = 6x$$

$$\text{or } x = 140$$

Breadth = x = 140 m

and Length =  $2x = 2 \times 140 = 280$  m

Area of a rectangular park = Length  $\times$  Breadth =  $140 \times 280 = 39200$  m<sup>2</sup>.

**Question 3: One side of a rectangle is 12 cm long and its diagonal measures 37 cm. Find the other side and the area of the rectangle.**

**Solution:**

Let ABCD be the rectangle in which AB

Let length of rectangle = 12 cm and diagonal = 37 m

Let breadth be the other side.

By Pythagoras theorem,

$$(\text{Breadth})^2 = \sqrt{(37)^2 - (12)^2}$$

$$= \sqrt{49 \times 25}$$

$$= \sqrt{1225}$$

$$\text{or breadth} = 35 \text{ cm}$$

Thus, length = 12 cm and breadth = 35 cm

Area of rectangle =  $(12 \times 35) = 420$

Hence, the other side is 35 cm and the area of rectangle is 420 cm<sup>2</sup>.

**Question 4: The area of a rectangular plot is 462 m<sup>2</sup> and its length is 28 m. Find the perimeter of the plot.**

**Solution:**

Area of a rectangular plot = 462 m<sup>2</sup>

Length of rectangle = 28 m

Let x m be the breadth of the plot

Now,

$$\text{Area} = \text{Length} \times \text{Breadth} = (28x)$$

$$462 = 28x$$

$$\text{or } x = 16.5$$

Again,

$$\text{Perimeter of the plot} = 2(\text{length} + \text{breadth}) = 2(28 + 16.5) = 89$$

Therefore,

Breadth of plot = 16.5 m

Perimeter of the plot = 89 m

**Question 5: A lawn is in the form of a rectangle whose sides are in the ratio 5 : 3. The area of the lawn is  $3375 \text{ m}^2$ . Find the cost of fencing the lawn at ₹65 per metre.**

**Solution:**

Cost of fencing lawn = ₹ 65 per metre.

Area of lawn =  $3375 \text{ m}^2$

Length: Breadth = 5: 3

Length =  $5x$

Breadth =  $3x$

We know, Area of lawn = Length  $\times$  Breadth

$$3375 = 5x(3x)$$

$$3375 = 15x^2$$

$$225 = x^2$$

$$\text{or } x = 15 \text{ m}$$

Therefore,

$$\text{Length} = 5x = 5 \times 15 = 75 \text{ m}$$

$$\text{Breadth} = 3x = 3 \times 15 = 45 \text{ m}$$

Now,

$$\text{Perimeter of lawn} = 2(\text{length} + \text{breadth})$$

$$= 2(75 + 45)$$

$$= 2 \times 120$$

$$= 240$$

Perimeter is 240 m

Cost of Fencing =  $240 \times ₹ 65$  per meter = ₹15600. Answer!!

**Question 6: A room is 16 m long and 13.5 m broad. Find the cost of covering its floor with 75-cm-wide carpet at ₹60 per metre.**

**Solution:**

Cost of covering room floor = ₹60 per metre.

Length of room = 16 m

Breadth of room = 13.5 m

Breadth of carpet = 75 cm = 0.75 m

We know, Area of room = Length  $\times$  Breadth  
 $= 16 \times 13.5$   
 $= 216$   
 $\Rightarrow$  Area of room is  $216 \text{ m}^2$

Length of carpet can be calculated by using below formula:

Length of carpet = (area of room)/(Breadth of carpet)

$$= 216/0.75$$

$$= 288 \text{ m}$$

Now,

Cost of covering the floor =  $288 \text{ m} \times ₹60 \text{ per meter} = ₹17280$

**Question 7:** The floor of a rectangular hall is 24 m long and 18 m wide. How many carpets, each of length 2.5 m and breadth 80 cm, will be required to cover the floor of the hall?

**Solution:**

Length of hall = 24 m

Breadth of hall = 18 m

Length of carpet = 2.5 m

Breadth of carpet = 80 cm = 0.8 m

Area of hall = Length  $\times$  Breadth

$$= 24 \times 18$$

$$= 432 \text{ m}^2$$

And, Area of carpet = Length  $\times$  Breadth

$$= 2.5 \times 0.8$$

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

Number of carpets = (area of hall)/(Area of carpet) =  $432/2 = 216$

That is, number of carpets are 216.

**Question 8:** A 36 m-long, 15m-broad verandah is to be paved with stones, each measuring 6 dm by 5 dm. How many stones will be required?

**Solution:**

Length of verandah = 36 m

Breadth of verandah = 15 m

Length of stones = 6 dm = 0.6 m  
Breadth of stones = 5 dm = 0.5 m

Now,

Area of verandah = Length  $\times$  Breadth  
= 36  $\times$  15  
= 540  
Area = 540 m<sup>2</sup>

Area of stones = Length  $\times$  Breadth  
= 0.6  $\times$  0.5  
= 0.3  
Area of stone = 0.3 m<sup>2</sup>

Number of stones = (area of verandah)/(Area of stones) = 540/0.3 = 1800

That is, number of stones required are 1800.

**Question 9: The area of a rectangle is 192 cm<sup>2</sup> and its perimeter is 56 cm. Find the dimensions of the rectangle.**

**Solution:**

The area of a rectangle is 192 cm<sup>2</sup> and its perimeter is 56 cm.  
let l cm be the length and b cm be the breadth.

Area of rectangle = Length  $\times$  Breadth  
192 = l  $\times$  b

$$\Rightarrow l = 192/b \dots(1)$$

Perimeter of rectangle = 2(length + breadth)

$$56 = 2(l + b)$$

from (1)

$$56 = 2(192/b + b)$$
$$28 = (192 + b^2)/b$$
$$b^2 - 28b + 192 = 0$$
$$(b - 12)(b - 16) = 0$$

$$b = 12 \text{ cm or } b = 16 \text{ cm}$$

Choose  $b = 12\text{cm}$  then  $l = 16 \text{ cm}$

Hence, Length is 16 cm and Breadth is 12 cm.

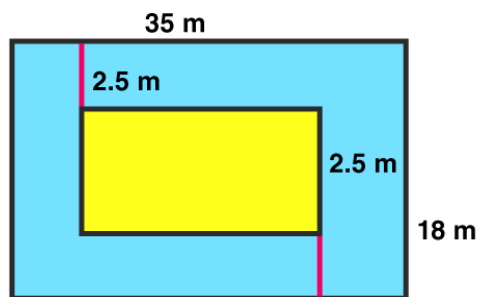
**Question 10:** A rectangular park 35 m long 18 m wide is to be covered with grass, leaving 2.5 m uncovered all around it. Find the area to be laid with grass.

**Solution:**

Given:

Length of the park = 35 m

Breadth of the park = 18 m



Area of the park = Length  $\times$  Breadth

$$= 35 \times 18$$

$$= 630 \text{ m}^2$$

Length of the park with grass =  $(35 - 5) = 30 \text{ m}$

Breadth of the park with grass =  $(18 - 5) \text{ m} = 13 \text{ m}$

Area of park with grass =  $(30 \times 13) = 390 \text{ m}^2$

Area of path without grass = Area of the whole park area of park with grass

$$= 630 - 390$$

$$= 240 \text{ m}^2$$

Hence, area of the park to be laid with grass =  $240 \text{ m}^2$

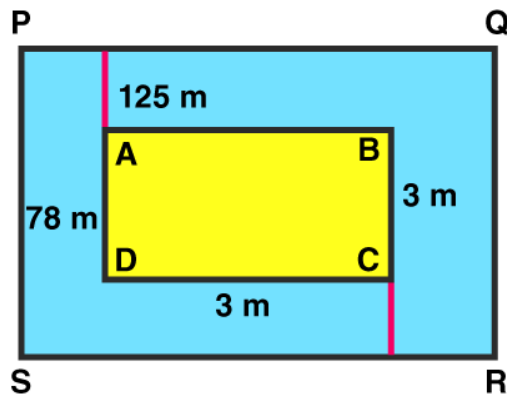
**Question 11:** A rectangular plot measures 125m by 78m. It has gravel path 3m wide all around on the outside. Find the area of the path and the cost of gravelling it at ₹ 75 per  $\text{m}^2$ .

**Solution:**

Given:

Length of the plot = 125 m

Breadth of the plot = 78 m



$$\begin{aligned} \text{Area of plot ABCD} &= \text{Length} \times \text{Breadth} \\ &= 125 \times 78 \\ &= 9750 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Length of the plot including the path} &= (125 + 3 + 3) \text{ m} = 131 \text{ m} \\ \text{Breadth of the plot including the path} &= (78 + 3 + 3) \text{ m} = 84 \text{ m} \end{aligned}$$

Now,

$$\begin{aligned} \text{Area of plot PQRS including the path} &= \text{Length} \times \text{Breadth} \\ &= (131 \times 84) \\ &= 11004 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of path} &= \text{Area of plot PQRS} - \text{Area of plot ABCD} \\ &= 11004 - 9750 \\ &= 1254 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Cost of gravelling} &= ₹75 \text{ per m}^2 \\ \text{Cost of gravelling the whole path} &= ₹ (1254 \times 75) = ₹ 94050 \\ \text{Hence, cost of gravelling the path is } &₹ 94050. \end{aligned}$$

**Question 12: (i)** A footpath of uniform width runs all around the inside of a rectangular field 54 m long and 35m wide. If the area of the path is 420 m<sup>2</sup>, find the width of the path.

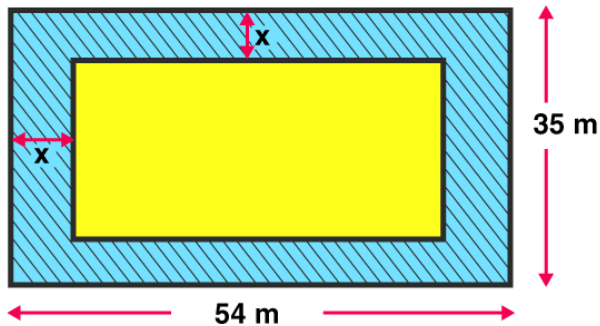
**Solution:**

Given:

Length of field = 54 m

Breadth of field = 35 m

Let  $x$  m be the width of the path.



$$\begin{aligned} \text{Area of field} &= \text{Length} \times \text{Breadth} \\ &= 54 \times 35 \\ &= 1890 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Length of field without path} &= 54 - (x + x) = 54 - 2x \\ \text{Breadth of field without path} &= 35 - (x + x) = 35 - 2x \end{aligned}$$

Now,

$$\begin{aligned} \text{Area of field without path} &= \text{Length without path} \times \text{Breadth without path} \\ &= (54 - 2x)(35 - 2x) \\ &= 1890 - 70x - 108x + 4x^2 \\ &= 4x^2 - 178x + 1890 \dots(1) \end{aligned}$$

$$\text{Area of path} = \text{Area of field} - \text{Area of field without path}$$

$$420 = 1890 - (1890 - 178x + 4x^2)$$

(Using equation (1))

$$420 = 178x - 4x^2$$

$$\text{or } 4x^2 - 178x + 420 = 0$$

$$\text{or } 2x^2 - 89x + 210 = 0$$

On solving above equation, we have

$$x = 42 \text{ or } x = 5/2$$

As width of park cannot be more than breadth of field, so width of park is 42 m.

**(ii) A carpet is laid on the floor of a room 8m by 5m. There is a border of constant width all around the carpet. If the area of the border is 12 m<sup>2</sup>, find its width.**



**Solution:**

Area of border =  $12 \text{ m}^2$

Length of room =  $8 \text{ m}$

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

Let  $x$  be the width of carpet

Length of carpet =  $8 - x - x = (8 - 2x) \text{ m}$

Breadth of carpet =  $5 - x - x = (5 - 2x) \text{ m}$

Area of room (carpet + border) =  $8 \times 5 = 40 \text{ m}^2$

Area of carpet =  $(8 - 2x)(5 - 2x)$   
 $= (40 - 16x - 10x + 4x^2)$

$= (4x^2 - 26x + 40)$

Now,

Area of ground = Area of border + Area of carpet

$40 = 12 + 4x^2 - 26x + 40$

$2x^2 - 13x + 6 = 0$

After solving above equation, we have

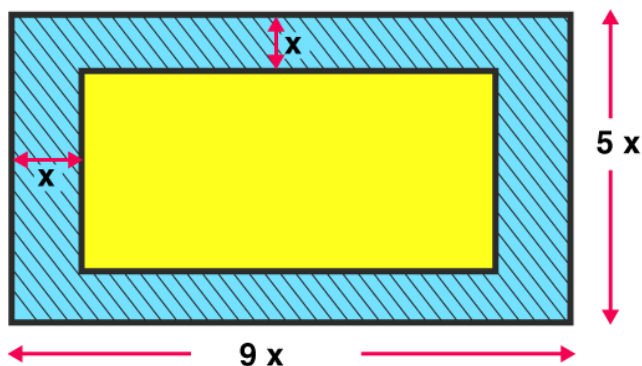
$x = 1/2$  or  $x = 6$  (ignore as it is longer than room)

So, Width of border =  $0.5 \text{ m}$

**Question 13:** The length and the breadth of a rectangular garden are in the ratio  $9 : 5$ . A path  $3.5 \text{ m}$  wide, running all around inside it has an area of  $1911 \text{ m}^2$ . Find the dimensions of the garden.

**Solution:**

Let the length and breadth of a rectangular garden be  $9x$  and  $5x$ .



$$\begin{aligned} \text{Area of field} &= \text{Length} \\ &\times \text{Breadth} \\ &= 9x(5x) \\ &= 45x^2 \end{aligned}$$

$$\begin{aligned} \text{Length of field without path} &= 9x - (3.5 + 3.5) = 9x - 7 \\ \text{Breadth of field without path} &= 5x - (3.5 + 3.5) = 5x - 7 \end{aligned}$$

$$\begin{aligned} \text{Area of field without path} &= \text{Length without path} \times \text{Breadth without path} \\ &= (9x - 7) \times (5x - 7) \\ &= 45x^2 - 35x - 63x + 49 \\ &= 45x^2 - 98x + 49 \end{aligned}$$

Now,  
Area of path = Area of field - Area of field without path

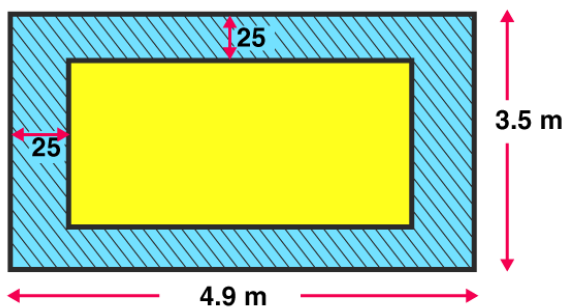
$$\begin{aligned} 1911 &= 45x^2 - (45x^2 - 98x + 49) \\ 1911 &= 98x - 49 \\ x &= 20 \end{aligned}$$

Therefore:  
Length of field =  $9x = 9 \times 20 = 180$  m  
Breadth of field =  $5x = 5 \times 20 = 100$  m

**Question 14:** A room 4.9 m long and 3.5 m broad is covered with carpet, leaving an uncovered margin of 25 cm all around the room. If the breadth of the carpet is 80 cm, find its cost at ₹ 80 per meter.

**Solution:**

Length of room = 4.9 m  
Breadth of room = 3.5 m  
Margin = 25 cm = 0.25 m  
Breadth of carpet = 80 cm = 0.8 m



Cost = ₹ 80 per meter

Now,

$$\text{Length to be carpeted} = 4.9 \text{ m} - (0.25 + 0.25) \text{ m} = 4.4 \text{ m}$$

$$\text{Breadth to be carpeted} = 3.5 \text{ m} - (0.25 + 0.25) \text{ m} = 3 \text{ m}$$

Therefore,

$$\text{Area to be carpeted} = \text{Length to be carpeted} \times \text{Breadth to be carpeted}$$

$$= 4.4 \times 3$$

$$= 13.2 \text{ m}^2$$

$$\text{Area of carpet} = \text{Area to be carpeted} = 13.2 \text{ m}^2$$

Now,

$$\text{Length of carpet} = (\text{area of carpet}) / (\text{breadth of carpet}) = 13.2 / 0.8 = 16.5$$

Length of carpet is 16.5 m

Now,

$$\text{Cost of 1 m carpet} = ₹ 80$$

Therefore,

$$\text{Cost of 16.5 m carpet} = ₹ 80 \times 16.5 \text{ m} = ₹ 1,320$$

**Question 15:** A carpet is laid on the floor of a room 8 m by 5 m. There is a border of constant width all around the carpet. If the area of the border is  $12 \text{ m}^2$ , find its width.

**Solution:**

A carpet is laid on the floor of a room 8 m by 5 m.

$$\text{Area of the border} = 12 \text{ m}^2$$

Let the width of the carpet be  $x$  meter

$$\text{Area of floor} = \text{Length} \times \text{Breadth}$$

$$= 8 \times 5$$

$$= 40 \text{ m}^2$$

$$\text{Length without border} = 8 \text{ m} - (x + x) = (8 - 2x) \text{ m}$$

$$\text{Breadth without border} = 5 \text{ m} - (x + x) \text{ m} = (5 - 2x) \text{ m}$$

$$\text{Area without border} = \text{Length without border} \times \text{Breadth without border}$$

$$= (8 - 2x) \times (5 - 2x)$$

$$= 40 - 16x - 10x + 4x^2$$

$$\text{Area of border} = \text{Area of floor} - \text{Area without border}$$

$$12 = 40 - (40 - 16x - 10x + 4x^2)$$

$$\text{or } 4x^2 - 26x + 12 = 0$$

Solving above equation, we have

$$(x - 6)(4x - 2) = 0$$

$$x = 6 \text{ or } x = 1/2$$

Since Border cannot be greater than carpet.

Therefore, width of border is  $1/2$  m.

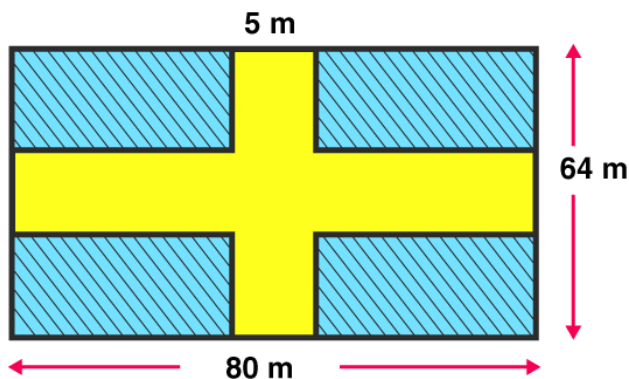
**Question 16:** A 80 m by 64 m rectangular lawn has two roads, each 5 m wide, running through its middle, one parallel to its length and the other parallel to its breadth. Find the cost of gravelling the roads at ₹40 per  $m^2$ .

**Solution:**

Length of rectangular lawn = 80 m

Breadth = 64 m

Width of road = 5 m



$$\text{Area of horizontal road} = 5 \times 80 = 400 \text{ m}^2$$

$$\text{Area of vertical road} = 5 \times 64 = 320 \text{ m}^2$$

$$\text{Area of common part to both roads} = 5 \times 5 = 25 \text{ m}^2$$

Now,

Area of roads to be gravelled = Area of horizontal road + Area of vertical road - Area of common part to both roads

$$= 400 + 320 - 25$$

$$= 695$$

Therefore, Area of roads to be gravelled is  $695 \text{ m}^2$

$$\text{Cost of gravelling} = 695 \times ₹ 40 \text{ per } m^2 = ₹27800$$

**Question 17:** The dimensions of a room are 14m x 10 m x 6.5 m. There are two doors and 4 windows in the room. Each door measures 2.5 m x 1.2 m and each window measures 1.5 x 1 m. Find the cost of painting the four walls of the room at ₹35 per  $m^2$ .

**Solution:**

Dimensions of wall:

Length = 14 m

Breadth = 10 m

Height = 6.5 m

Dimensions of windows

Length = 1.5 m

Breadth = 1 m

And,

Length of doors = 2.5 m

Breadth of doors = 1.2 m

Cost = ₹35 per m<sup>2</sup>

Now,

Area of four walls = 2(Length of walls × Height of walls) + 2(Breadth of walls × Height of walls)

$$= 2(14 \times 6.5) + 2(10 \times 6.5)$$

$$= 182 + 130$$

$$= 312$$

 $\Rightarrow$  Area of four walls is 312 m<sup>2</sup>

Area of two doors = 2(Length of doors × Breadth of doors)

$$= 2(2.5 \times 1.2)$$

$$= 6$$

 $\Rightarrow$  Area of two doors is 6 m<sup>2</sup>

Area of four windows = 4(Length of windows × Breadth of windows)

$$= 4(1.5 \times 1)$$

$$= 6$$

 $\Rightarrow$  Area of four windows is 6 m<sup>2</sup>

Therefore,

Area to be painted = Area of 4 walls – (Area of 2 doors + Area of 4 windows)

$$= 312 - (6 + 6)$$

$$= 300$$

 $\Rightarrow$  Area to be painted is 300 m<sup>2</sup>Cost of painting = 300 m<sup>2</sup> × ₹ 35 per m<sup>2</sup>

$$= ₹10500$$

**Question 18:** The cost of painting the four walls of a room 12 m long at ₹ 30 per m<sup>2</sup> is ₹ 7560 and the cost of covering the floor with mat at ₹25 per m<sup>2</sup> is ₹ 2700. Find the dimensions of the room.

**Solution:**

Length of a wall = 12 m

Cost per meter = ₹30

Total cost = ₹ 7560

Cost per meter for floor = ₹ 25

Total cost for floor = ₹ 2700

Let h be the height.

Breadth = (area of the floor) / Length = 108/12 = 9m

Area of the floor = (total cost)/ (cost per meter) = 2700/25 = 108 m<sup>2</sup>

Again,

Area of walls = (total cost)/ (cost per meter) = 7560/30 = 252 m<sup>2</sup>

Now,

Area of 4 walls = 2(Length of walls × Height of walls) + 2(Breadth of walls × Height of walls)

$$252 = 2(12 \times h) + 2(9 \times h)$$

$$252 = 24h + 18h$$

$$252 = 42h$$

$$h = 6$$

=> Height is 6 m

Therefore dimensions of the room are : 12 m × 9 m × 6 m

**Question 19:** Find the area and perimeter of a square plot of land whose diagonal is 24 m long. [Take  $\sqrt{2} = 1.41$ ]

**Solution:**

Diagonal of a square plot = 24 m (given)

Let the side of square be 'a'

Area of square =  $\frac{1}{2} \times \text{Diagonal}^2$

$$= \frac{1}{2} \times 24^2$$

$$= 288 \text{ m}^2$$

Area of square = (side)<sup>2</sup>

$$288 = a^2$$

$$a = 12\sqrt{2} = 12 \times 1.41 = 16.92$$

or  $a = 16.92$  m

Now,

Perimeter of square =  $4a = 4 \times 16.92 = 67.68$

Perimeter of square is 67.68m.

**Question 20:** Find the length of the diagonal of a square of area  $128 \text{ cm}^2$ . Also find its perimeter.

**Solution:**

Area of a square =  $128 \text{ cm}^2$  (given)

Let the side of square be 'a'

Area of square =  $\frac{1}{2} \times \text{Diagonal}^2$

$128 = \frac{1}{2} \times \text{Diagonal}^2$

Diagonal = 16 cm

Area of square =  $(\text{side})^2$

$128 = a^2$

$\Rightarrow a = 11.31$  cm

Perimeter of square =  $4a = 4 \times 11.31 = 45.24$

Perimeter of square is 45.24 cm.