CHAPTER 10

VI-MATHEMATICS-NCERT (2024-25)
10 .MENSURATION (notes)
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https://sureshmathsmaterial.com/

Perimeter: Perimeter is the distance covered along the boundary forming a closed figure. When you go round the figure once.
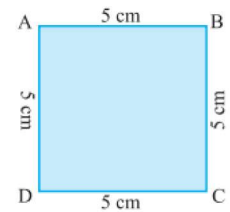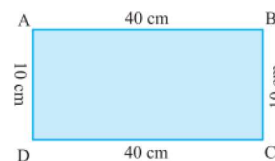
1. **Meera went to a park 150 m long and 80 m wide. She took one complete round on its boundary. What is the distance covered by her?**

Sol: The distance covered by Meera=150 m+80 m+150 m+80 m=460 m

2. **Find the perimeter of the following figures:**

(a) Perimeter = AB + BC + CD + DA

   =40 cm+10 cm+40 cm+10 cm=100 cm

(b) Perimeter = AB + BC + CD + DA

   =5 cm+5 cm+ 5 cm+ 5 cm= 20 cm

(C) Perimeter = AB + BC + CD + DE + EF + FG + GH +HI + IJ + JK + KL + LA

   =1 cm+ 3 cm+ 3 cm+ 1 cm+3 cm+ 3 cm+1 cm+3 cm+ 3 cm

   +1 cm+ 3 cm+ 3cm

   = 28 cm
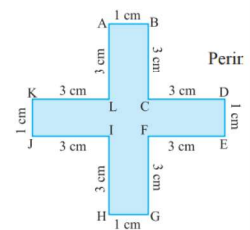
(d) Perimeter = AB + BC + CD + DE + EF + FA
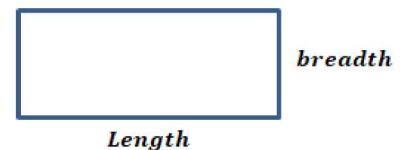
   =100 cm+ 120 cm + 90 cm+ 45 cm+60 cm+80 cm

   =495 cm
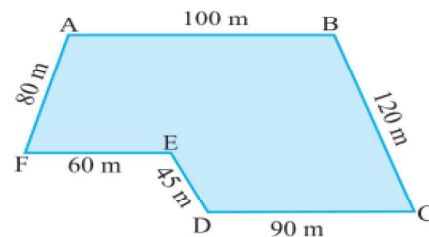
Perimeter of a rectangle:

Perimeter of a rectangle = 2 × (length + breadth)=$2(l + b)$

Try These

Find the perimeter of the following rectangles:

(i) Length=25 cm, Breadth= 12 cm

Perimeter by adding all the sides=25 cm+12 cm+25 cm+12 cm=74 cm

Perimeter = 2×(Length +Breadth)= 2×(25 cm+12 cm)=2×(37 cm)=74 cm

(ii) Length=0.5 cm, Breadth= 0.25 cm

Perimeter by adding all the sides=0.5 cm+0.25 cm+0.5 cm+0.25 cm=1.5 cm

Perimeter = 2×(Length + Breadth)= 2×(0.5 cm+0.25 cm)=2×(0.75 cm)=1.5 cm

(iii) Length=18 cm, Breadth= 15 cm

Perimeter by adding all the sides=18 cm+15 cm+18 cm+15 cm=66 cm

Perimeter = 2×(Length +Breadth)= 2×(18 cm+15 cm)=2×(33 cm)=66 cm

(iv) Length=10.5 cm, Breadth= 8.5 cm

Perimeter by adding all the sides=10.5 cm+8.5 cm+10.5 cm+8.5 cm=38 cm

Perimeter = 2×(Length +Breadth)= 2×(10.5 cm+8.5 cm)=2×(19 cm)=38 cm

Example 1 : Shabana wants to put a lace border all around a rectangular table cover 3 m long and 2 m wide. Find the length of the lace required by Shabana.

Sol: Length= 3 m , Breadth=2 m

Perimeter =2 × (length + breadth)

$= 2 × (3 m + 2 m) = 2 × 5 m = 10 m$

So, required length of the lace is 10 m.

Example 2 : An athlete takes 10 rounds of a rectangular park, 50 m long and 25 m wide. Find the total distance covered by him.

Sol: Length of the rectangular park = 50 m

Breadth of the rectangular park = 25 m

Perimeter of the rectangular park= = 2 × (length + breadth)

$= 2 × (50 m + 25 m)$

$= 2 × 75 m = 150 m$

The distance covered by the athlete in one round=150 m.

Distance covered in 10 rounds = 10 × 150 m = 1500 m.

The total distance covered by the athlete is 1500 m.
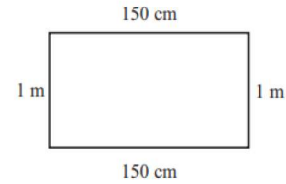
Example 3 : Find the perimeter of a rectangle whose length and breadth are 150 cm and 1 m respectively.

Sol: Length = 150 cm, Breadth = 1m = 100 cm.

Perimeter of the rectangle= 2 × (length + breadth)

$\qquad$ = 2 × (150 cm + 100 cm)

$\qquad$ = 2 × (250 cm) = 500 cm = 5 m.

Example 4 : A farmer has a rectangular field of length and breadth 240 m and 180 m respectively. He wants to fence it with 3 rounds of rope as shown in figure 10.4. What is the total length of rope he must use?

Sol: Length=240 m, Breadth=180 m.

Perimeter of the field = 2 × (length + breadth)

$\qquad$ = 2 × (240 m + 180 m)

$\qquad$ = 2 × 420 m = 840 m

Total length of rope required = 3 × 840 m = 2520 m.
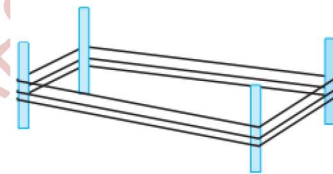
Example 5 : Find the cost of fencing a rectangular park of length 250 m and breadth 175 m at the rate of ₹ 12 per metre.

Sol: Length of the rectangular park = 250 m

Breadth of the rectangular park = 175 m

Perimeter of the rectangle = 2 × (length + breadth)

= 2 × (250 m + 175 m) = 2 × (425 m) = 850 m

Cost of fencing 1m of park = ₹ 12

The total cost of fencing the park = ₹ 12 × 850 = ₹ 10200

Perimeter of a square:

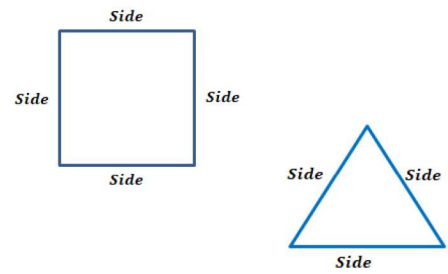Perimeter of a square = 4 × side

Perimeter of an equilateral triangle:

Perimeter of an equilateral triangle = 3 × side

Example 6 : Find the distance travelled by Shaina if she takes three rounds of a square park of side 70 m.

Sol: Length of side=70 m

Perimeter of the square park = 4 × length of a side = 4 × 70 m = 280 m

Distance covered in one round = 280 m.

Distance travelled in three rounds=3×280m = 840m.

Example 7 : Pinky runs around a square field of side 75 m, Bob runs around a rectangular field with length 160 m and breadth 105 m. Who covers more distance and by how much?

Sol: Perimeter of the square = 4 × length of a side= = 4 × 75 m = 300 m

Distance covered by Pinky in one round=300 m.

Perimeter of the rectangle= 2 × (length + breadth)

$$= 2 \times (160\ m + 105\ m)$$

$$= 2 \times 265\ m = 530\ m.$$

Distance covered by Bob in one round=530 m

Difference in the distance covered = 530 m – 300 m = 230 m.

Therefore, Bob covers more distance by 230 m.

Example 8 : Find the perimeter of a regular pentagon with each side measuring 3 cm.

Sol: Side=3 cm,

Perimeter of the regular pentagon=5× side=5×3 cm=15 cm.
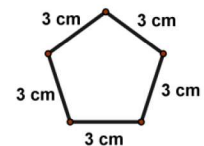
Example 9 : The perimeter of a regular hexagon is 18 cm. How long is its one side?

Sol: perimeter of a regular hexagon = 18 cm

6×Side=18 cm

$$\text{Side} = \frac{18}{6} = 3 \; cm$$

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EXERCISE 10.2

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1. Find the perimeter of each of the following figures :
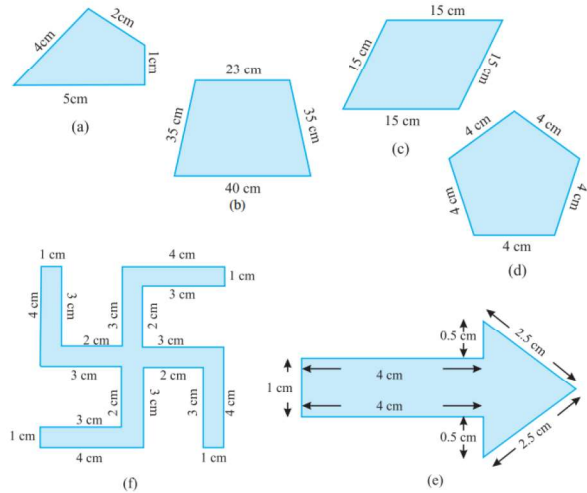
 (a) Perimeter=2+1+5+4=12cm

(b) Perimeter=23+35+40+35=133 cm

(c) Perimeter=15+15+15+15=60 cm

(d) Perimeter=4+4+4+4+4=20 cm

(e) Perimeter=2.5+2.5+0.5+4+1+4+0.5=15 cm

2. **The lid of a rectangular box of sides 40 cm by 10 cm is sealed all round with tape. What is the length of the tape required?**

Sol: Length of lid=40 cm, Breadth of lid=10 cm

    Perimeter=2 × (length + breadth)

       = 2 × (40 + 10)=2×50=100 cm

    The length of the tape required=100 cm. =1 m.

3. **A table-top measures 2 m 25 cm by 1 m 50 cm. What is the perimeter of the table-top?**

Sol: Length =2 m 25 cm=2.25 m, Breadth=1 m 50 cm=1.50 m

    Perimeter=2 × (length + breadth)

       =2×(2.25+1.50)

       =2×3.75=7.50 m=7 m 50 cm

4. **What is the length of the wooden strip required to frame a photograph of length and breadth 32 cm and 21 cm respectively?**

Sol: Length of frame=32 cm

    Breadth of frame=21 cm

    Perimeter of the frame=2× (length + breadth)

$=2\times(32+21)=2\times53=106\ cm$

∴ The length of the wooden strip required=106 cm.

5. **A rectangular piece of land measures 0.7 km by 0.5 km. Each side is to be fenced with 4 rows of wires. What is the length of the wire needed?**

Sol: Length of land=0.7 km

Breadth of land=0.5 km

Perimeter of the land=2× (length + breadth)

$=2\times(0.7+0.5)=2\times1.2=2.4$ km

The length of the wire needed to fence=4×2.4 km=9.6 km.

6. **Find the perimeter of each of the following shapes :**

(a) **A triangle of sides 3 cm, 4 cm and 5 cm.**

Sol: Perimeter of triangle= 3 cm+4 cm+5 cm=12 cm.

(b) **An equilateral triangle of side 9 cm.**

Sol: Perimeter of An equilateral triangle=3×side=3×9 cm=27 cm.

(c) **An isosceles triangle with equal sides 8 cm each and third side 6 cm**

Sol: Perimeter of An isosceles triangle=8 cm+8 cm+6 cm=22 cm

7. **Find the perimeter of a triangle with sides measuring 10 cm, 14 cm and 15 cm.**

Sol: The perimeter of triangle=10+14+15=39 cm.

8. **Find the perimeter of a regular hexagon with each side measuring 8 m.**

Sol: The perimeter of regular hexagon=6×side=6×8 m=48 m.

9. **Find the side of the square whose perimeter is 20 m.**

Sol: Perimeter of square= 20 m

4×side =20 m

Side of the square $= \dfrac{20\ m}{4} = 5\ m$

10. **The perimeter of a regular pentagon is 100 cm. How long is its each side?**

Sol: The perimeter of a regular pentagon = 100 cm

5× side of pentagon=100 cm

$$\text{Side of pentagon} = \frac{100 \text{ cm}}{5} = 20 \text{ cm}$$

11. A piece of string is 30 cm long. What will be the length of each side if the string is used to form :

(a) a square?

Sol: Perimeter of square=30 cm

4× side of square=30 cm

$$\text{Side of square} = \frac{30 \ cm}{4} = 7.5 \ cm$$

(b) an equilateral triangle?

Sol: Perimeter of an equilateral triangle =30 cm

3× side of an equilateral triangle =30 cm

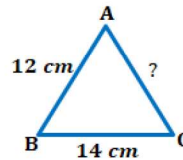$$\text{Side of an equilateral triangle} = \frac{30 \text{ cm}}{3} = 10 \text{ cm}$$

(c) a regular hexagon?

Sol: Perimeter of a regular hexagon =30 cm

6× side of a regular hexagon =30 cm

$$\text{Side of a regular hexagon} = \frac{30 \ cm}{6} = 5 \ cm$$

12. Two sides of a triangle are 12 cm and 14 cm. The perimeter of the triangle is 36 cm. What is its third side?

Sol: The perimeter of the triangle = 36 cm

AB+BC+CA=36 cm

12 cm+14 cm + CA=36 cm

26 cm + CA=36 cm

$CA = 36 \text{ cm} - 26cm = 10 \text{ cm}$

The third side=10 cm.

13. Find the cost of fencing a square park of side 250 m at the rate of ₹ 20 per metre.

Sol: side of the square park=250 m

Perimeter of the square park=4×side=4×250 m=1000 m.

Cost of fencing per 1 m=₹ 20

Total cost of fencing =₹20×1000=₹ 20,000

14. Find the cost of fencing a rectangular park of length 175 m and breadth 125 m at the rate of ₹ 12 per metre.

Sol: length =175 m and breadth =125 m

Perimeter of rectangular park=2×(Length + Breadth)=2×(175+125)=2×300=600 m

The cost of fencing per 1 m=₹ 12

Total cost of fencing= ₹ 12×600=₹ 7200

15. Sweety runs around a square park of side 75 m. Bulbul runs around a rectangular park with length 60 m and breadth 45 m. Who covers less distance?

Sol: Side of square park=75 m.
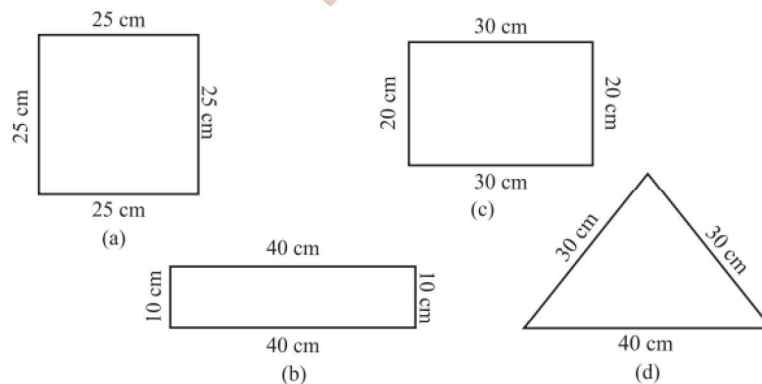
Perimeter of the square park=4×side=4×75 m=300 m.

Rectangular park : Length=60m , Breadth=45 m

Perimeter of rectangular park=2× (Length+Breadth)=2×(60 m+45 m)=2×105m=210 m.

Sweety covers 300 m and Bulbul covers 210 m.

∴ Bulbul covers less distance.

16. What is the perimeter of each of the following figures? What do you infer from the answers?

(a) Side of the square=25 cm.

Perimeter of the square=4×side=4×25 cm=100 cm.

(b) Length=40 cm, Breadth=10 cm.

Perimeter of rectangular $=2\times$(Length + Breadth)$=2\times$(40cm+10cm)$=2\times50$ cm$=100$ cm

(c) Length$=30$ cm, Breadth$=20$ cm.

Perimeter of rectangular $=2\times$(Length + Breadth)$=2\times$(30cm+20cm)$=2\times50$ cm$=100$ cm

(d) Perimeter of triangle$=$Sum of all sides$=30$ cm$+30$ cm$+40$ cm$=100$ cm.
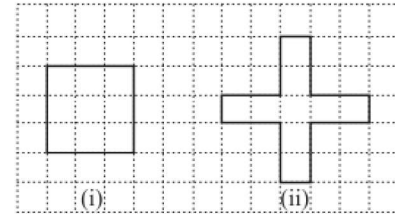
We observe all the figures have same perimeter.

17. Avneet buys 9 square paving slabs, each with a side of $\frac{1}{2}$m. He lays them in the form of a square.

(a) What is the perimeter of his arrangement [Fig 10.7(i)]?

Sol: Side of square $= 3 \times \dfrac{1}{2}$m. $= \dfrac{3}{2}\ m = 1.5\ m$

Perimeter of the square $= 4 \times 1.5$ m $= 6$ m

(b) Shari does not like his arrangement. She gets him to lay them out like a cross. What is the perimeter of her arrangement [(Fig 10.7 (ii)]?

Sol: Perimeter of the cross figure $= 20 \times \dfrac{1}{2}m = 10\ m$

(c) Which has greater perimeter?

Sol: The cross figure has greater perimeter.

(d) Avneet wonders if there is a way of getting an even greater perimeter. Can you find a way of doing this? (The paving slabs must meet along complete edges i.e. they cannot be broken.)

Sol:

Length$=9\times0.5=4.5$ m, Breadth$=0.5$ m

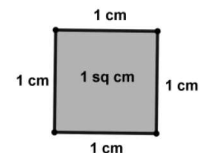Perimeter$=2\times$(4.5 m$+0.5$ m)$=2\times5$ m$=10$ m.

Area

The amount of surface enclosed by a closed figure is called its area.

(i) The area of one full square is taken as 1 sq unit.

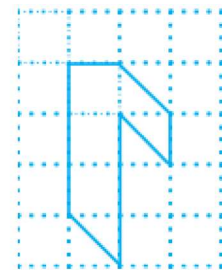(ii) The area of one full square with side 1 cm will be 1 sq cm.

Example 10 : Find the area of the shape shown in the figure 10.10.

Sol: Fully-filled squares $= 3$

Area covered by full squares $= 3 \times 1$ sq units $= 3$ sq units

Half-filled squares $= 3$

Area covered by half squares $= 3 \times \dfrac{1}{2}$ sq units $= \dfrac{3}{2} = 1 \dfrac{1}{2}$ sq units

Total area $= 3 + 1\dfrac{1}{2} = 4\dfrac{1}{2}$ sq units

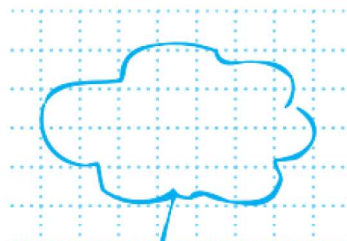**Example 11 :** By counting squares, estimate the area of the figure

Sol: Full-filled squares $=11$

  More than half-filled squares$=7$

Half-filled squares$=3$

Total area $= (11 + 7) \times \dfrac{1}{2}$ sq unit $+ 3 \times \dfrac{1}{2}$ sq unit

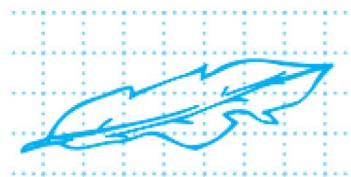$= 18 + 1\dfrac{1}{2} = 19\dfrac{1}{2}$ sq units

Example 12 : By counting squares, estimate the area of the figure 10.9 a.

Sol: Full-filled squares $=1$

More than half-filled squares$=7$
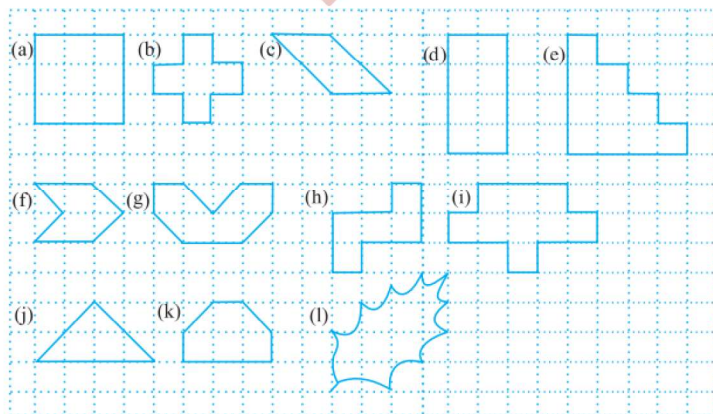
Half-filled squares$=0$

Total area $= (1 + 7) \times 1$ sq unit $= 8$ sq unit.

EXERCISE 10.2

1. **Find the areas of the following figures by counting square:**

(a) Full filled squares$=9$

   Area of the figure$=9\times1$sq unit$=9$ sq units.

(b) Full filled squares$=5$

   Area of the figure$=5\times1$sq unit$=5$ sq units.

(c) Full filled squares=2

 Half-filled squares=4

 Area of the figure $= 2 \times 1 + 4 \times \dfrac{1}{2} = 2 + 2 = 4$ sq units.

(d) Full filled squares=8

 Area of the figure=8×1sq unit=8 sq units

(e) Full filled squares=10

 Area of the figure=10×1sq unit=10 sq units.

(f) Full filled squares=2

 Half-filled squares=4

 Area of the figure $= 2 \times 1 + 4 \times \dfrac{1}{2} = 2 + 2 = 4$ sq units.

(g) Full filled squares=4

 Half-filled squares=4

 Area of the figure $= 4 \times 1 + 4 \times \dfrac{1}{2} = 4 + 2 = 6$ sq units.

(h) Full filled squares=5

 Area of the figure=5×1sq unit=5 sq units.

(i) Full filled squares=9

 Area of the figure=9×1sq unit=9 sq units.
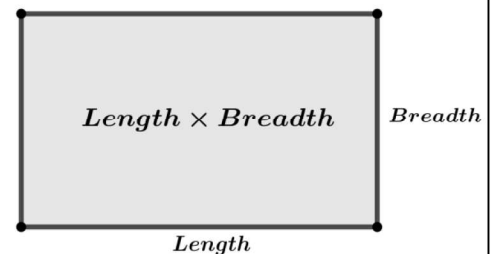
(j) Full filled squares=2

 Half-filled squares=4

 Area of the figure $= 2 \times 1 + 4 \times \dfrac{1}{2} = 2 + 2 = 4$ sq units.

Area of a rectangle:

Area of a rectangle = length × breadth

Area of a square:

Area of the square = side × side

Example 13 : Find the area of a rectangle whose length and breadth are 12 cm and 4 cm respectively.

Sol: Length=12 cm, Breadth=4 cm.

 Area of the rectangle = length × breadth

   = 12 cm × 4 cm = 48 sq cm.

Example 14 : Find the area of a square plot of side 8 m.

Sol: Side = 8 m

 Area of the square = side × side

   = 8 m × 8 m = 64 sq m.

Example 15 : The area of a rectangular piece of cardboard is 36 sq cm and its length is 9 cm. What is the width of the cardboard?

Sol: Length = 9 cm, Width= ?

Area of the rectangle = 36 sq cm

length × width=36 sq cm

9 × width=36

Width $= \dfrac{36}{9} = 4$ cm

∴ The width of the rectangular cardboard is 4 cm.

Example 16 : Bob wants to cover the floor of a room 3 m wide and 4 m long by squared tiles. If each square tile is of side 0.5 m, then find the number of tiles required to cover the floor of the room.

Sol: Length = 4 m, Breadth=3m

Area of the floor = length × breadth = 4 m × 3 m = 12 sq m

Area of one square tile = side × side=0.5 m×0.5 m=0.25 sq m

Number of tiles required $= \dfrac{\text{Area of the floor}}{\text{Area of one tile}} = \dfrac{12 \times 100}{0.25 \times 100} = \dfrac{1200}{25} = 48$

Example 17 : Find the area in square metre of a piece of cloth 1m 25 cm wide and 2 m long.

Sol: Length=2 m, Breadth=1 m 25 cm=1.25 m

Area of the cloth = length × breadth

=2 m×1.25 m=2.50 sq.m

EXERCISE 10.3

1. Find the areas of the rectangles whose sides are :

(a) 3 cm and 4 cm

Sol: Length=3 cm, Breadth=4 cm.

Area of the rectangle = length × breadth =3 cm×4 cm=12 sq cm

(b) 12 m and 21 m

Sol: Length=12 m, Breadth=21 m.

Area of the rectangle = length × breadth =12 cm×21 cm=252 sq m

(c) 2 km and 3 km

Sol: Length=2 km, Breadth=3 km.

Area of the rectangle = length × breadth =2 km ×3 km =6 sq km

(d) 2 m and 70 cm

Sol: Length=2 m, Breadth=70 cm=0.70 m.

Area of the rectangle = length × breadth =2 m×0.70 m=1.40 sq cm

2. Find the areas of the squares whose sides are :

(a) 10 cm

Sol: Side= 10 cm

Area of the square=side × side

=10 cm×10 cm=100 sq cm

(b) 14 cm

Sol: Side= 14 cm

Area of the square=side × side

=14 cm×14 cm=196 sq cm

(c) 5 m

Sol: Side= 5 m

Area of the square=side × side

=5 m×5 m=25 sq m

3. **The length and breadth of three rectangles are as given below : Which one has the largest area and which one has the smallest?**

(a) 9 m and 6 m, (b) 17 m and 3 m. (c) 4 m and 14 m

Sol: Area of the rectangle (a) =9 m×6 m=54 sq m

Area of the rectangle (b) =17 m×3 m=51 sq m

Area of the rectangle(c) =4 m×14 m=56 sq m

The rectangle (c) has the largest area and (b) has the smallest area.

4. **The area of a rectangular garden 50 m long is 300 sq m. Find the width of the garden.**

Sol: The area of a rectangular garden =300 sq m.

long × width = 300 sqm

50 × width = 300

$\text{width} = \dfrac{300}{50} = 6\ m$

The width of the garden=6 m

5. **What is the cost of tiling a rectangular plot of land 500 m long and 200 m wide at the rate of ₹ 8 per hundred sq m.?**

Sol: Length=500m, Breadth=200 m

Area of rectangular plot=length × breadth =500 m× 200 m=100000 sq m

Cost of tiling per 100 sq m=₹8

Cost of tiling per 100000 $sq\ m = \dfrac{100000 \times 8}{100} = ₹\ 8000$

The cost of tiling a rectangular plot of land=₹ 8000

6. **A table-top measures 2 m by 1 m 50 cm. What is its area in square metres?**

Sol: Length=2 m, Breadth=1 m 50 cm=1.50 m

Area of table top= length × breadth=2 m×1.50 m=3 sq m

7. **A room is 4 m long and 3 m 50 cm wide. How many square metres of carpet is needed to cover the floor of the room?**

Sol: Length =4 m, Bredth=3 m 50 cm=3.50 m

Area of room= length × breadth=4 m×3.50 m=14 sq m

The area of required carpet=14 sq m

8. **A floor is 5 m long and 4 m wide. A square carpet of sides 3 m is laid on the floor. Find the area of the floor that is not carpeted.**

Sol: Length =5 m, breadth =4 m

Area of floor= length × breadth=5 m×4 m=20 sq m

Side of square carpet=3 m

Area of square carpet=side × side=3 m× 3 m=9 sq m

The area of the floor that is not carpeted =20 sq m − 9 sq m = 11 sq m

9. **Five square flower beds each of sides 1 m are dug on a piece of land 5 m long and 4 m wide. What is the area of the remaining part of the land?**

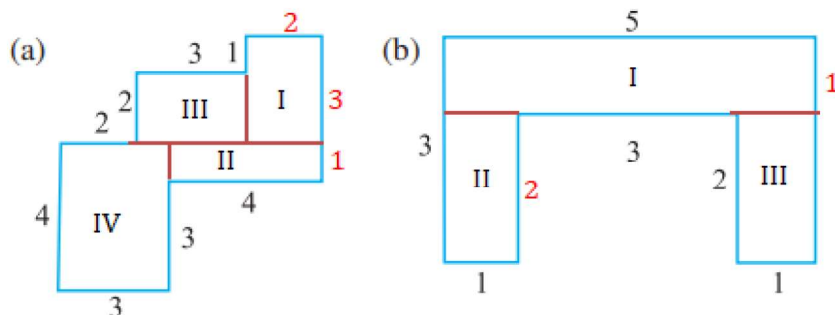**Sol:** Side of square flower bed=1 m

Area of flower bed=side × side=1 m×1 m=1 sq m

Area of 5 flower beds=5×1 sq m=5 sq m

Area of land=5 m× 4 m=20 sq m

The area of the remaining part of the land = 20 sq m − 5 sq m = 15 sq m

10. By splitting the following figures into rectangles, find their areas (The measures are given in centimetres).

Sol: (a) Area of rectangle (I)=2×3=6 sq cm

Area of rectangle (II)=4×1=4 sq cm

Area of rectangle (III)=2×3=6 sq cm

Area of rectangle (IV)=4×3=12 sq cm

Total area of the figure(a)=6+4+6+12=28 sq cm

(b) Area of rectangle (I)=5×1=5 sq cm

Area of rectangle (II)=2×1=2 sq cm

Area of rectangle (III)=2×1=2 sq cm

Total area of the figure(b)=5+2+2=9 sq cm

11. Split the following shapes into rectangles and find their areas. (The measures are given in centimetres)
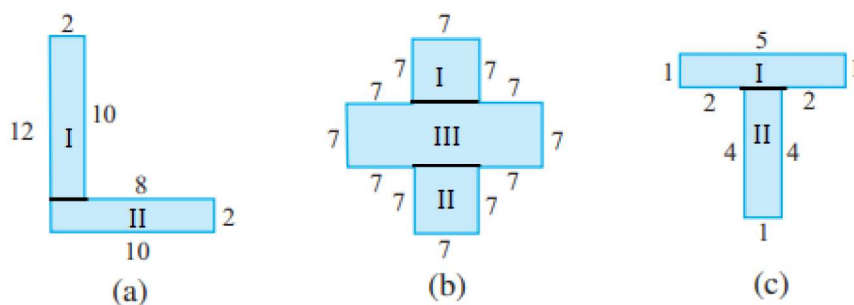
Sol: (a) Area of rectangle (I)=10×2=20 sq cm

Area of rectangle (II)=10×2=20 sq cm

Total area of the figure=20+20=40 sq cm

(b) Area of square (I)=7×7=49 sq cm

Area of square (II)=7×7=49sq cm

Area of rectangle (III)=21×7=147 sq cm

Total area of the figure=49+49+147=245 sq cm

(c) Area of rectangle (I)=5×1=5 sq cm

Area of rectangle (II)=4×1=4 sq cm

Total area of the figure=5+4=9 sq cm

12. **How many tiles whose length and breadth are 12 cm and 5 cm respectively will be needed to fit in a rectangular region whose length and breadth are respectively: (a) 100 cm and 144 cm (b) 70 cm and 36 cm.**

Sol: Area of tile=12 cm×5 cm

(a) Area of rectangular region=100 cm×144 cm

$$\text{The number of tiles needed} = \frac{\text{Area of rectangular region}}{\text{Area of tile}} = \frac{100 \times 144}{12 \times 5} = 20 \times 12 = 240$$

(b) Area of rectangular region=70 cm×36 cm

$$\text{The number of tiles needed} = \frac{\text{Area of rectangular region}}{\text{Area of tile}} = \frac{70^{14} \times 36^3}{12 \times 5} = 14 \times 3 = 42$$

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