

CBSE Class 5 Mathematics
NCERT Solutions
CHAPTER-11
AREA AND ITS BOUNDARY

Read the following passage and answer the questions that follow:

1. (a) Arbaz plans to tile his kitchen floor with green square tiles. Each side of the tile is 10 cm. His kitchen is 220 cm in length and 180 cm wide. How many tiles will he need?

Ans. (a) We know that,

Area of a rectangle = Length \times Breadth

Area of the floor of kitchen = (Length \times Breadth)

= (220 \times 180) square cm.

Also, we know that

Area of a square = Side \times Side

Area of one tile = (10 \times 10) square cm

Number of tiles required

$$= \frac{\text{Area of the Floor}}{\text{Area of one tile}}$$

$$= \frac{220 \times 180}{10 \times 10}$$

$$= 22 \times 18 = 396$$

(b) The fencing of a square garden is 20 m in length. How long is one side of the garden?

Ans. (b) We have, Perimeter = 20 m

$$\text{Side} = \frac{1}{4} \times \text{Perimeter}$$

$$\Rightarrow \text{Side} = \left(\frac{1}{4} \times 20 \right) m = 5m$$

(c) A thin wire 20 centimetres long is formed into a rectangle. If the width of this rectangle is 4 centimetres, what is its length?

Ans. (c) We have, Perimeter = 20 cm and Breadth = 4cm

$$\text{Length} = \frac{1}{2} \times \text{Perimeter} - \text{Breadth}$$

$$\text{Length} = \frac{1}{2} \times 20 \text{ cm} - 4 \text{ cm} = 6 \text{ cm}$$

$$= 10 \text{ cm} - 4 \text{ cm} = 6 \text{ cm}$$

(d) A square carom board has a perimeter of 320 cm. How much is its area?

Ans. (d) We have, Perimeter = 320 cm

$$\text{Side} = \frac{1}{4} \times \text{Perimeter}$$

$$\text{Side} = \frac{1}{4} \times 320 \text{ cm} = 80 \text{ cm}$$

$$\text{Area} = \text{Side} \times \text{Side}$$

$$= (80 \times 80) \text{ square cm} = 6400 \text{ square cm}$$

(e) How many tiles like the triangle given here will fit in the white design?

Area of design = Square cm

Ans. (e) Area of the design = 1 full square + 4 half square

$$= (1 + 2) \text{ full square}$$

= 3 full squares

= 3×1 square cm = 3 square cm

Area of one tile = half of the cm square

= $\frac{1}{2}$ square cm

Number of tiles = $\frac{\text{Area of the design}}{\text{Area of one tile}}$

= $\frac{3}{1/2} = 3 \times \frac{2}{1} = 6$

(f) Sanya, Aarushi, Manav and Kabir made greeting cards. Complete the table for their cards:

Whose card	Length	Width	Perimeter	Area
Sanya	10 cm	8 cm		
Manav	11 cm		44 cm	
Aarushi		8 cm		80 square cm
Kabir			40 cm	100 square cm

Ans. In case of Sanya:

We have Length = 10 cm, Width = 8 cm

Perimeter = 2 (Length + Width)

= 2 (10+8) cm

= 2×18 cm = 36 cm

Area = Length \times Width

= 10×8 square cm

In Case of Manav:

We have, Length = 11 cm, Perimeter = 44 cm

$$\Rightarrow 2 (\text{Length} + \text{Width}) = 44 \text{ cm}$$

$$\Rightarrow \text{Length} + \text{Width} = 22 \text{ cm}$$

$$\Rightarrow 11 \text{ cm} + \text{Width} = 22 \text{ cm}$$

$$\text{Width} = 22 \text{ cm} - 11 \text{ cm} = 11 \text{ cm}$$

And, Area = Length \times Width

$$= 11 \times 11 \text{ square cm}$$

$$= 121 \text{ square cm}$$

In Case of Aarushi:

We have, Width = 8 cm

Area = 80 square cm

$$\Rightarrow \text{Length} \times \text{Width} = 80 \text{ square cm}$$

$$\Rightarrow \text{Length} \times 8 \text{ cm} = 80 \text{ square cm}$$

$$\text{Length} = \frac{80}{8} \text{ cm} = 10 \text{ cm}$$

And, Perimeter = 2(Length + Width)

$$= 2(10 + 8) \text{ cm}$$

$$= 2 \times 18 \text{ cm} = 36 \text{ cm}$$

In Case of Kabir:

We have, Perimeter = 40 cm

Area = 100 square cm

$$\Rightarrow 2 (\text{Length} + \text{Width}) = 40 \text{ cm}$$

And, Length + Width = Length and Width

i.e. Length + Width = 20

$$\Rightarrow \text{Width} = 20 - \text{Length} \dots\dots(1)$$

$$\therefore \text{Length} \times \text{Width} = 100$$

$$\therefore \text{Length} (20 - \text{length})$$

$$\therefore 20 (\text{length}) - (\text{length})^2 = 100$$

$$\Rightarrow \text{Length}^2 - 20 \text{Length} + 100 = 0$$

$$\Rightarrow (\text{Length} - 10)^2 = 0 \Rightarrow \text{Length} - 10 = 0$$

$$\Rightarrow \text{Length} = 10$$

$$\therefore \text{Width} = 20 - \text{Length} = 20 - 10 = 10$$

i.e. Length = 10 cm and Width = 10 cm

Therefore, the complete table is as under:

Whose card	Length	Width	Perimeter	Area
Sanya	10 cm	8 cm	36 cm	80 square cm
Manav	11 cm	11 cm	44 cm	121 square cm
Aarushi	10 cm	8 cm	36 cm	80 square cm
Kabir	10 cm	10 cm	40 cm	100 square cm

2. Take a thick paper sheet of length 14 cm and width 9 cm. You can also use an old postcard.

(a) What is its area? What is its perimeter?

Ans. (a) We know that,

Area of a rectangle = Length \times Breadth

Area of a thick paper sheet = (Length \times Breadth)

$$= (14 \times 9) \text{ square cm} = 126 \text{ square cm}$$

Perimeter of a rectangular sheet

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

$$= 2(14 + 9) \text{ cm}$$

$$= 2 \times 23 \text{ cm} = 46 \text{ cm}$$

(b) Now cut strips of equal sizes out of it.

Ans. (b) Let us cut strips of equal sizes out of the given paper sheet of length 14 cm and width 9 cm.

(c) How long is your belt?

Ans. (c) Strips having width 1 cm:

There will be 9 strips of width 1 cm and length 14 cm. Let us join these strips end to end using tape to make a belt.

Its length

$$= (14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14)$$

$$= 9 \times 14 \text{ cm} = 126 \text{ cm}$$

$$\text{It's perimeter} = 2(126 + 1) \text{ cm} = 2 \times 127 \text{ cm} = 254 \text{ cm}$$

(d) What is its Perimeter?

Ans. (d) Strips having length $1\frac{1}{2}$ cm:

There will be 6 strips of width $1\frac{1}{2}$ cm and length 14 cm. Let us join these strips end to end using tape to make a belt.

$$\text{It's length} = (14 + 14 + 14 + 14 + 14 + 14) \text{ cm}$$

$$= 6 \times 14 \text{ cm} = 84 \text{ cm}$$

It's perimeter = $2(84 + 1.5) \text{ cm} = 2 \times 85.5 \text{ cm} = 171 \text{ cm}$

(e) Whose belt is the longest in the class?

Ans. (e) Strips having width 3 cm:

There will be 3 strips of width 3 cm and length 14 cm.

Let us join these strips end to end using tape to make a belt.

It's length = $(14+14+14) \text{ cm} = 3 \times 14 \text{ cm} = 42 \text{ cm}$

It's perimeter = $2(42+3) \text{ cm} = 2 \times 45 \text{ cm} = 90 \text{ cm}$

Clearly, the belt with shortest width is the longest one. Thus, the belt having width 1 cm is the longest in the class. So, my belt is the longest.

3. Let's Discuss:

(a) Why did some of your friends get longer belt than others?

Ans. (a) Some of my friends gets longer belts than others as the width of their belts are shorter than that of the other's belt.

(b) Is the area of your belt as the same as the area of the postcard? Why or why not?

Ans. (b) The area of the belt is the same as the area of the postcard because it is made of the postcard without wastage.

(c) What will you do to get the longer belt next time?

Ans. (c) I will get the longer belt next time by ensuring that the width of my belt should be shorter than other's belt.

4. People People Everywhere:

(A) You can play this game in a ground.

Make two squares of one square metre each.

Divide your class in two teams. Ready to play!

Try these in your teams:

(a) How many of you can sit in one square metre?

Ans. (a) Three of us can sit in one square metre.

(b) How many of you can stand in it?

Ans. (b) Four of us can stand in it.

(c) Which team could make children stand in their square? How many?

Ans. (c) Team A could make more children to stand in their square. They are five in number.

(d) Which team could make more children sit in their square? How many?

Ans. (d) Team A could make more children to sit in their square. They are four in number.

(B) Measure the length of the floor of your children in metres. Also measure the width.

(a) What is the area of the floor of your children in square metres?

Ans. (a) Let's measure the floor of the classroom in metres.

We find that its length = 10 metres and width = 6 metres

Its area = (Length \times Breadth)

= (10 \times 6) square metres

= 60 square metres.

(b) How many children are there in your class?

Ans. (b) There are 60 children in my class.

(c) So how many children can sit in one square metre?

Ans. (c) Number of children who can sit in one square metre = $\frac{\text{Total no. of Children}}{\text{Total area of floor}}$

$$= \frac{60}{60} = 1$$

Thus, one child can sit in one square metre.

(d) If you want to move around easily then how many children do you think should be there in one square metre?

Ans. (d) To move around easily, I think 2 children may sit in 3 square metres space.

5. Share the Land:

Nasreena is a farmer who want to divide her land equally among her three children, Chumki, Jhumri and Imran. She wants to divide the land so that each piece of land has one tree. Her land looks like this.

(a) Can you divide the land equally? Show how you will divide it. Remember each person has to get a tree. Colour each person's piece of land differently.

Ans. (a) Yes, I can divide the land equally among Nasreena's three children. Chumki, Jhumri and Imran such that each gets one tree. Each person's piece of land is coloured differently as shown in the figure.

(b) If each square on this page is equal to 1 square metre of land, how much land will each of her children get? ... sq. m

Ans. (b) Let Chumki's land be ABCDEF, Jhumri's land be BGHIJC and that of Imran be DJIHKE.

Total land in area = $10 \times 9 \text{ m} = 90 \text{ square metres}$

Since each person gets equal land.

Each share = $\frac{90}{3}$ square metres = 30 square metres

Thus, each chold gets 30 square metres of land.

(c) Chumki Jumhri and Imran need wire to make a fence.

Ans. (c) For Fencing:

Perimeter of Chumki's land ABCDEF = AB + BC + CD + DE + EF + FA

$$= (4 + 6 + 2 + 3 + 2 + 9) \text{ m} = 26 \text{ m}$$

Perimeter of Jhumri's land BGHIJC = BG + GH + HI + IJ + JC + CB

$$= (6 + 4 + 3 + 2 + 3 + 6) \text{ m} = 24 \text{ m}$$

Perimeter of Imran's land DJIHKE = DJ + JI + IH + HK + KE + ED

$$= (5 + 2 + 3 + 5 + 8 + 3) \text{ m} = 26 \text{ m}$$

(d) Who will need the longest wire for fencing?

Ans. (d) Clearly, Chumki and Imran needs longest but equal wires to make a fence.

(e) How much wire in all will the three need?

Ans. (e) Total wire needed = $(26 + 24 + 26) \text{ m} = 76 \text{ m}$

6. Answer these:

(a) The perimeter of square A is .. cm.

Ans. (a) The perimeter of square A is $4 \times 3 \text{ cm} = 12 \text{ cm}$.

(b) The side of square B is .. cm.

Ans. (b) The side of square B is $2 \times 3 \text{ cm} = 6 \text{ cm}$.

(c) The area of square B is .. square cm.

Ans. (c) The area of square B is $6 \text{ cm} \times 6 \text{ cm} = 36 \text{ sq. cm}$.

(d) The area of square B is .. the times the area of square A.

Ans. (d) The area of sq. B is four times of the area of square A.

(e) The perimeter of square B is .. cm.

Ans. (e) The perimeter of square B is $4 \times 6 \text{ cm} = 24 \text{ cm}$.

(f) The perimeter of square B is .. times the perimeter of square A.

Ans. (f) The perimeter of square B is two times the perimeter of square A.

7. Thread and Play

(A) Which shape has the biggest area? How much?

Ans. (A) To find the area of shape A

Figure A contains 9 complete squares, 2 half squares, 7 more than half squares and 8 less than half squares. Neglecting less than half squares and consider more than half square as complete squares. Therefore, the approximate area of figure A.

$$= \left(9 + 2 \times \frac{1}{2} + 7 \right) \text{ square cm} = (9 + 1 + 7) \text{ square cm} = 17 \text{ square cm}$$

Similarly, the area of shape B will be approximately equal to

$$\left(2 + 2 \times \frac{1}{2} + 7 \right) \text{ square cm} = 10 \text{ square cm.}$$

$$\text{And, the area of shape C} = \left(9 + 2 \times \frac{1}{2} + 7 \right) \text{ square cm}$$

$$= 16 \frac{1}{2} \text{ sq.cm}$$

Clearly, the shape A has the biggest area.

It is $(17 - 10)$ i.e. 7 sq.cm more than that of shape B and $\left(17 - 16 \frac{1}{2} \right)$ i.e. $\frac{1}{2}$ sq.cm more than that of the slope.

(B) Which shape has the smallest area? How much? What is the perimeter of the shape?

Also make a triangle, a square, a rectangle and a circle. Find which shape has the biggest area and which has the smallest?

Ans. (B) The shape B has the smallest area.

It is $(17-10)$ i.e. sq. cm less than of shape A and $\left(16\frac{1}{2}-10\right)$ i.e. $6\frac{1}{2}$ sq.cm less than that of shape C.

The perimeter of this shape is 15 cm.

Let us also make a triangle, a square, a rectangle and circle using the same 15 cm thread.

Area of the triangle = $\left(6+0\times\frac{1}{2}+6\right)$ sq.cm = 12 sq.cm (approx.)

Area of square = $\left(9+0\times\frac{1}{2}+7\right)$ sq.cm = 16 sq.cm (approx.)

Area of the triangle = $\left(10+5\times\frac{1}{2}+0\right)$ sq.cm = $12\frac{1}{2}$ sq.cm (approx.)

Area of the circle = $\left(9+2\times\frac{1}{2}+6\right)$ sq.cm = 16 sq.cm (approx.)

The circle and the square have the biggest area and the triangle has the smallest area.

8. Save the Birds:

There are two beautiful lakes near a village. People come for boating and picnics in both the lakes. The village Panchayat is worried that with the noise of the boats the birds will stop coming. The Panchayat wants motor boats in only one lake. The other lake will be saved for the birds to make their nests.

(a) How many cm in the length of the boundary of lake A in the drawing?

Ans. (a) The length of the boundary of lake A in the drawing is 33 cm.

(b) What is the length of the boundary of lake B in the drawing?

Ans. (b) The length of the boundary of lake B in the drawing is 26 cm.

(c) A longer boundary around the lake will help more birds to lay their eggs. So which lake should be kept for birds? Which lake should be used for boats?

Ans. (c) Since 1 cm on drawing = 1 km on the ground

∴ 33 cm represents 33×1 km i.e. 33 km.

(d) Find the area of lake B on the drawing in square cm. What is the actual area in square km?

Ans. (d) Lake B contains 15 complete squares, 3 half squares, 8 more than half squares and 2 less than half squares. Neglecting less than half squares and considering more than half squares the approximate area of lake B on drawing.

$$= \left(15 + 3 \times \frac{1}{2} + 8 \right) \text{ square cm} = \left(15 + 1\frac{1}{2} + 8 \right) \text{ square cm}$$

$$\text{Actual area of lake B} = 24\frac{1}{2} \text{ square km}$$

9. King's Story:

The king was very happy with carpenters Chaggu and Anar. They had made a very big and beautiful bed for him. So as gifts the king wanted to give some land to Chaggu, and some gold to Anar.

Chaggu was happy. He took 100 metres of wire and tried to make different rectangles. He made a $10\text{m} \times 40\text{m}$ rectangle. Its area was 400 square metres. So he next made a $30\text{m} \times 20\text{m}$ rectangle.

(a) What is its area? Is it more than the first rectangle?

Ans. (a) The area of this rectangle = $30\text{ m} \times 20\text{ m} = 600$ square m.

Yes, its area is more than that of the first rectangle.

(b) What other rectangle can he make with 100 metres of wire? Discuss which of these rectangles will have the biggest area.

Ans. (b) Many other rectangles can be made with 100 metres of wire. For Example,

5m × 45m having area 225 square metres.

15m × 35m having area 525 square metres.

20 m × 30m having area 600 square metres.

25m × 25 m having area 625 square metres.

The rectangle having length = breadth i.e. a square will have the biggest area.

10. So Anar also tried many different ways to make a boundary for 800 square metres of land.

(a) He made rectangles A, B, C of different sizes. Find out the length of the boundary of each. How much gold wire will he get for these rectangles?

Ans. (a) Boundary of a rectangle = 2(Length + Breadth)

Boundary for A = $2(40+20)$ m = 2×60 m = 120 m

Gold Wire for A = 120 metres

Boundary for B = $2(80+10)$ m = 2×90 m = 180 m

Gold Wire for B = 180 metres

Boundary for C = $2(800+1)$ m = 2×801 m = 1602 m

Gold Wire for C = 1602 metres

Boundary for D = $2(8000+0.1)$ m = 2×8000.1 m = 16000.2 m

So he will get 16000.2 metres of gold wire.

(b) Can you make a rectangle with a still longer boundary? I made a rectangle 1 cm wide and 80000 m long. Imagine how long that boundary will be!! With that much gold wire I can become the king!

Ans. (b) Yes, a rectangle with a still longer boundary can be made.

Boundary of a rectangle 1 cm $\left(\text{i.e. } \frac{1}{100} \text{ m} = 0.01 \text{ m} \right)$ wide and 80000 m long.

$$= 2(0.01+80000) \text{ m} = 2 \times 80000.01 \text{ m} = 160000.02 \text{ m}$$