HOW TO DRAW A MAP

Chapter 8

Raju forgot to bring his ball to school one day. So he asked his friend Venkat to go to his house and get the ball. But Venkat did not know where the ball was kept in the house. So Raju had to tell him exactly where to look.

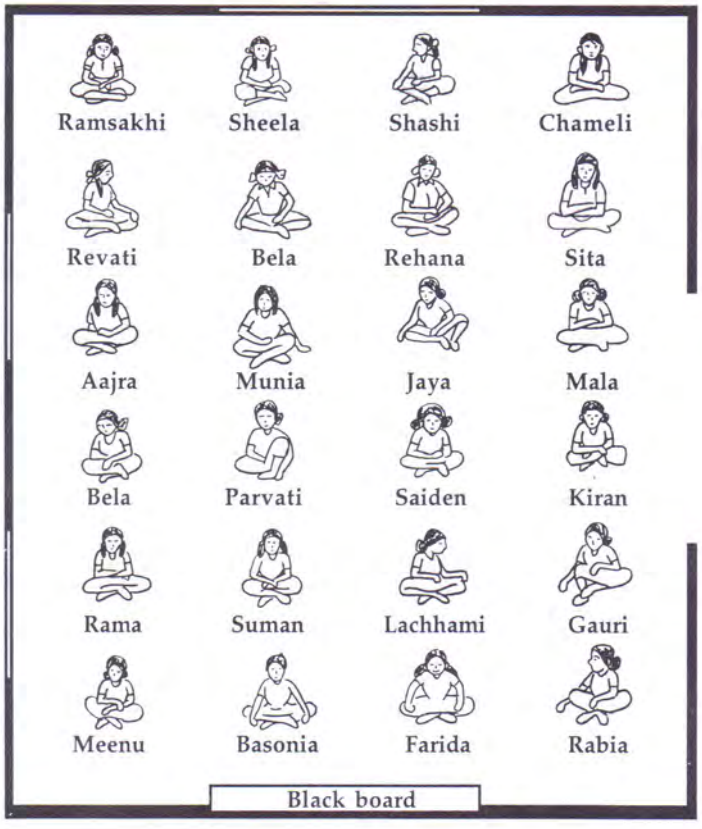
How do you think Raju gave directions to Venkat? (1)

We often need to give directions to people. For example, we may have to tell them the way to a particular place or where something has been kept or hidden. There are different ways of showing someone the location of a place or object. Such methods are used in science as well. We shall discuss one method here.

Symbols that show position

Figure 1 shows the seating arrangement in a classroom in which 24 girls are appearing for an examination.

Figure 1



Suppose you had to tell your friend where Basonia is seated, how would you do it? (2)

Who is the second girl in the third column? (3)

Did everyone in your class give the same answers to both these questions? (4)

If the answers were different, what could be the reason? (5)

Suppose we decide to number the columns in which the girls are seated in Figure 1 serially from left to right and the rows from front to back.

Would all the girls then give the same answers? Let's try to understand this with the help of a sheet of square-lined paper (Figure 2).

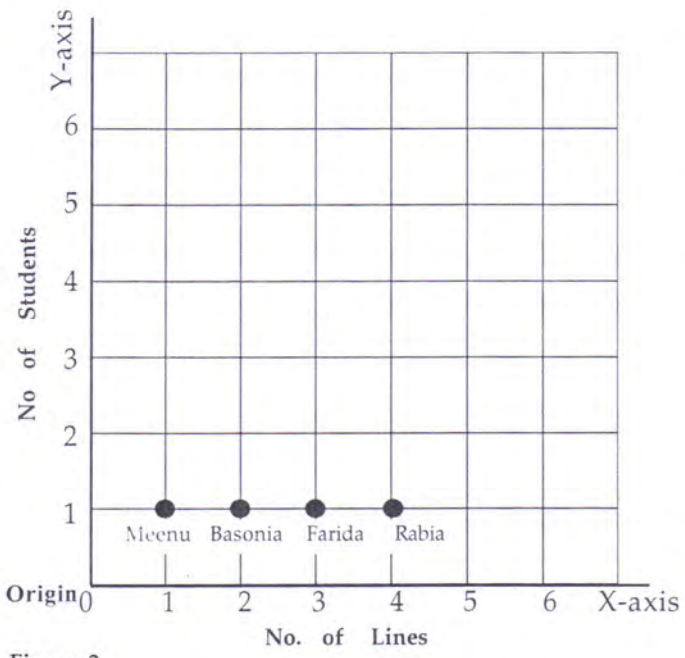


Figure 2

Who is the second student in the first column? (6)

Where is Lachhami sitting? (7)

Did everyone give the same answers this time? (8)

We can use symbols to indicate the position in which any one of the girls is sitting. So, Gauri's position would be fourth column, second row.

Write the position of the following students using this method:

a) Suman, b) Farida, c) Sheela. (9)

Identify the students from the following information:

a) Third column, third row;

b) First column, fifth row. (10)

Using numbers as symbols of position: Coordinates

If we want to write these symbols of position in a shorter form, we can use numbers. Numbers are more convenient to write than words. They also take less time to write.

We can now show Gauri's position (fourth column, second row) as simply (4, 2). All we have to remember is that the first number refers to the column and the second number to the row in which the student is sitting.

Suppose we make a mistake in writing Gauri's position, giving it in reverse order (2,4). What problem would this create? (11)

Use numbers to give the positions of the following students:
a) Basonia, b) Chameli, c) Jaya. (12)

The numbers that give the position are called **coordinates**.

Is it enough to write only 3 to give Shashi's position? (13)

Can we tell where Shashi is sitting if we write only 6? (14)

To give the correct position of a student what should we write? (15)

In Figure 2 the thick horizontal line at the bottom is called the **X-axis** and the thick vertical line at the left is called the **Y-axis**. When we give the position coordinates of anything, we always write the number for the X-axis first and the number for the Y-axis second.

Some coordinates for Figure 2 are given below. Write the names of the students sitting in these positions:

a) (4,1) b) (4,4) c) (1,2) d) (2,1) e) (3,1) f) (1,4) (16)

Write the coordinates of the following students:

a) Rehana b) Munia c) Ramsakhi (17)

Exercise 1

Write the coordinates of the following points in Figure 3:

1) a
2) b
3) c
4) d
5) e
6) f
7) g
8) h (18)

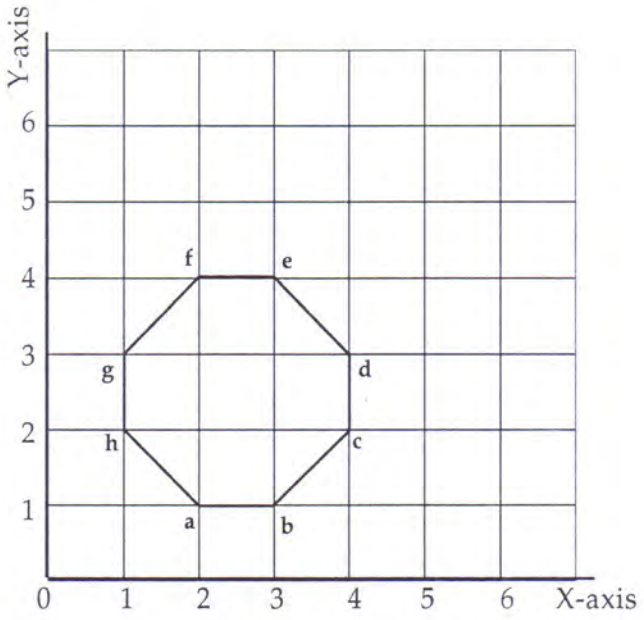


Figure 3

Exercise 2

Identify the figure by joining the dots

Draw the X-axis and Y-axis on a sheet of graph paper.

Mark the following 12 points on it in the order in which they are given.

Point	Coordinates	Point	Coordinates	Point	Coordinates
1	(1,6)	2	(2,8)	3	(3,9)
4	(4,8)	5	(4,4)	6	(10,8)
7	(11,5)	8	(14,5)	9	(9,1)
10	(5,1)	11	(3,4)	12	(3,7)

Can you identify any figure just by looking at the dots? Now join the dots with straight lines, starting from point 1, going in sequence up to point 12 and finally to point 1 to finish.

What is the figure you have made? (19)

Reducing and enlarging figures: Choosing the correct scale

Let us now learn how to reduce and enlarge figures. Figure 4 shows the picture of a cat. Draw a reduced version of the same cat on a sheet of cm graph paper. Every line in your picture should be exactly half the length of the corresponding line in Figure 4.

Remember that the side of each square on your graph paper is 1 cm.

What is the length of the reduced cat's tail? (20)

What is the distance between the tips of its ears? (21)

What is the width of its stomach? (22)

In this exercise you reduced each line in Figure 4 by half.

What should you do to double the length of each line in the figure?

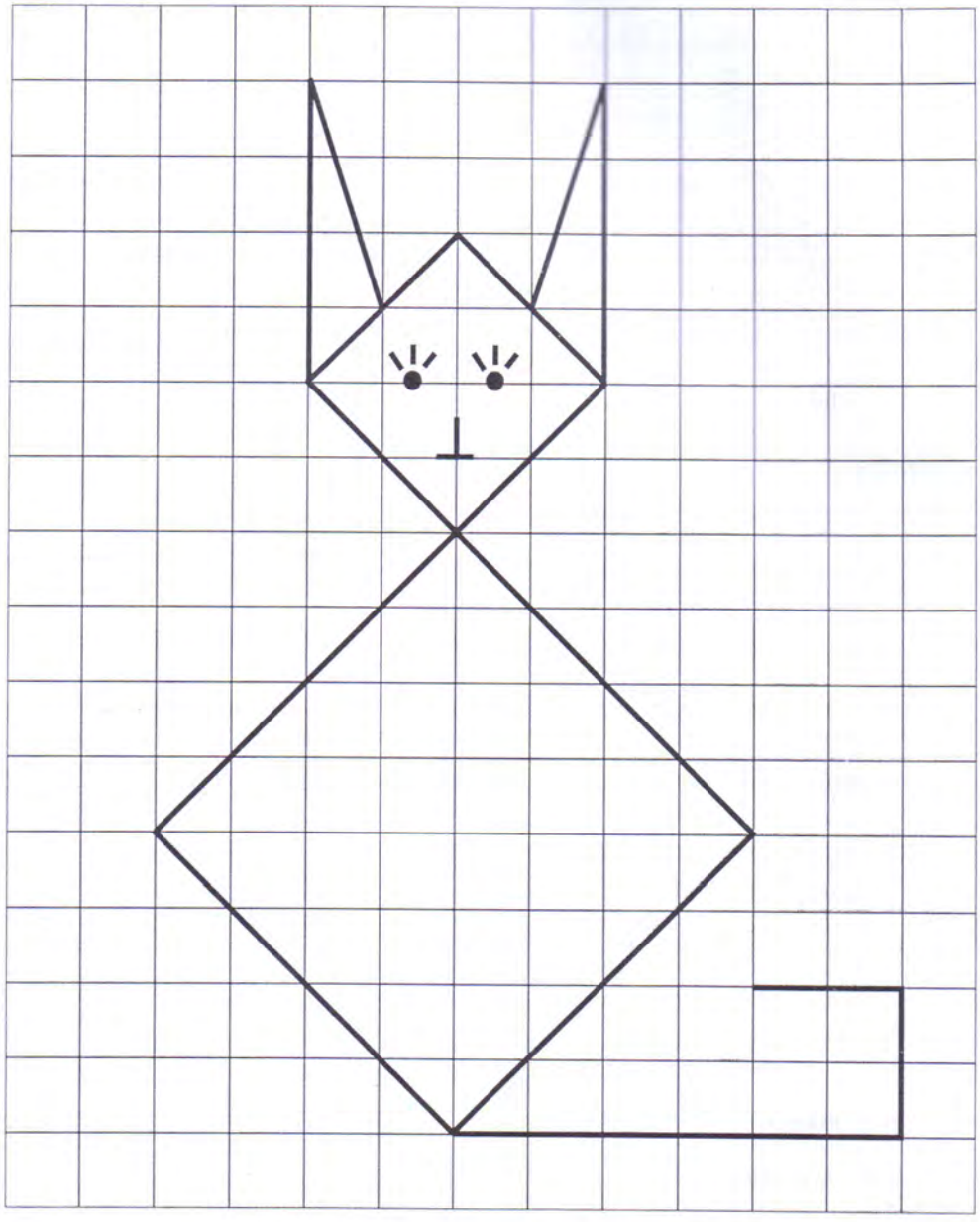


Figure 4

You need to select the correct **scale** for reducing or enlarging a figure and it is important that each part of the figure is reduced or enlarged by the same scale. Only then will the **ratio** between the parts of the reduced or enlarged picture be the same as the ratio between the parts of the original picture. Only then will the picture you draw look like a reduced or enlarged version of the original.

In Figure 4 you used the squares on the paper to reduce the size of the cat. How would you reduce or enlarge the figure if the paper had no squares?

Let us learn one way of doing this.

Enlarging figures without using squares

We need to enlarge each side of triangle ABC in Figure 5 to twice its length.

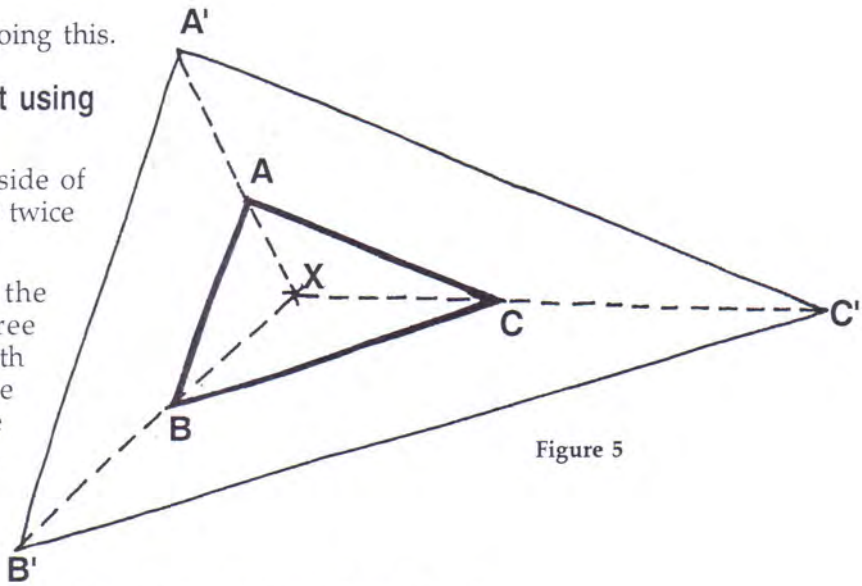


Figure 5

Mark a point X inside the triangle and join its three corners A, B and C to X with straight lines. Extend these straight lines beyond the triangle. Now measure the length of line XA. Double this length and mark the new point A' on the extended line XA. The length of XA' is twice that of XA. A' is read as A-dash or A-prime. Similarly, draw lines XB' and XC' which are twice the length of lines XB and XC respectively. If you now join A', B' and C' with straight lines you get the triangle A'B'C'.

On the basis of what you learned in the earlier chapter "Area", how many times would the area of the triangle increase if the length of each side is doubled? (23)

In Exercise 2 you made a figure by joining 12 points. Now double the length of each side. To do this, first cut the figure out neatly and paste it on a large sheet of paper. The sheet should be at least 40 cm long and 25 cm wide.

Mark a point X somewhere in the centre of the figure. Join all the corners of your figure to the point X with straight lines. Measure the distance from X to each corner.

Double the length of each side of your figure in the same way as you did in the case of the triangle. (24)

Draw Figure 6 in your exercise book. Reduce each side by half and draw the reduced figure. (25)

Figure 6

Draw the map of a field

Let's now draw the map of a field. To do this, you will have to reduce the size of the field so that it fits on a sheet of paper. The first step in the process is to select a proper scale.

Selecting the scale

Assume that the field is 20 m long and 16 m wide. Suppose the graph paper on which you want to draw the map is 24 cm long and 20 cm wide. You could draw 1 m on the field equal to 1 cm on the graph paper. You should mark this scale on your map:

1 m on the field = 1 cm on the map.

This is the scale of your map. Anyone reading your map will know that 1 cm on the map represents 1 m on the field.

Suppose you are asked to draw a map of a field 80 m long and 60 m wide. Would this scale suit your graph paper? (26)

What would be a suitable scale for drawing a map of this field? (27)

Selecting the scale depends on the length and breadth of the field and of the sheet of graph paper you are going to use.

Preparation for drawing a map

Go to a field or an open space with your teacher.

Select a point somewhere near the centre of the field. Actually, this point, called the **origin**, could be anywhere in the field. Place a table or stool at the origin and put a flat wooden board on it. Tape a sheet of graph paper on the board with adhesive tape.

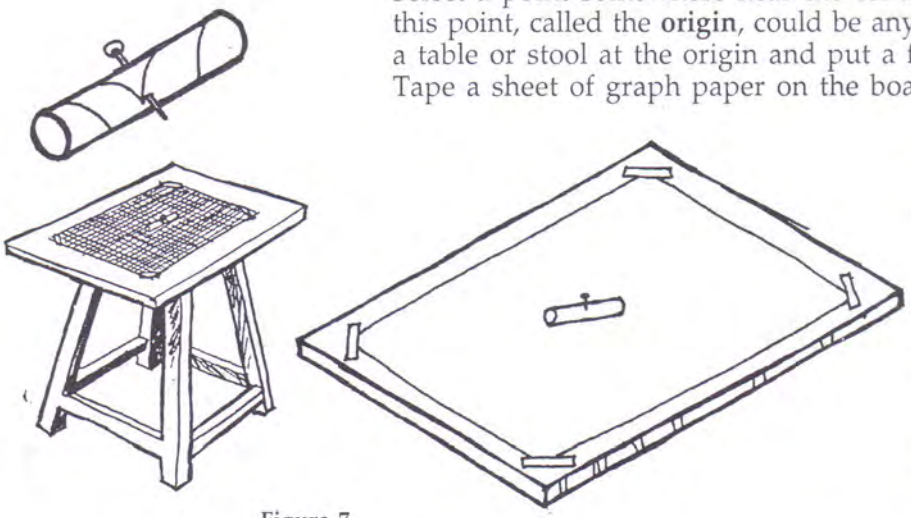


Figure 7

Use a sharp pencil to mark a point X on your graph paper approximately corresponding to the origin of the field. Fix a pin at X. If possible, attach a small paper tube or a piece of a plastic straw at X with the pin (Figure 7). This tube will help you in making your map. You must ensure that the graph paper remains firmly taped to the board and does not shift its position or orientation while you are drawing the map.

If the position or orientation of the graph paper shifts while you are drawing the map, what problems would it cause? (28)

Marking points on the map

To mark points on the map, we need to know two things. One is the direction in which the point lies and the other is its distance from the origin. Select any spot along the boundary of the field that you would like to mark on the map. Ask your friend to stand at this spot or drive a **stake** into the ground at this point. Look at your friend (or the stake) from one side of the pin. Mark a point on the paper along this line of sight between the origin and your friend. To do this, take a sharp pencil and hold it on the graph paper between the origin and your friend. The origin, the pencil and your friend should all fall on the same straight line. Since the origin and your friend are stationary, you can shift the pencil to bring it in line with the pin and your friend. It is easier to do this if you look through the paper tube fixed at the origin. When all three are in a straight line, mark the point

Figure 8

where the pencil is and draw a small circle around it (Figure 8).

Draw a straight line passing through this point and the origin. This line shows the direction of the spot on the boundary from the origin.

Suppose the field is the same shape as the one shown in Figure 9. You will have to mark the points A, B, C, D, E, F and G along its boundary on your graph paper. If you take O as the origin and select point A, the first thing you need to do is measure the distance from O to A on the field. You can use a metre scale or a long string to do this. Suppose the distance between O and A is 16 m and 40 cm. You will now have to select a scale to

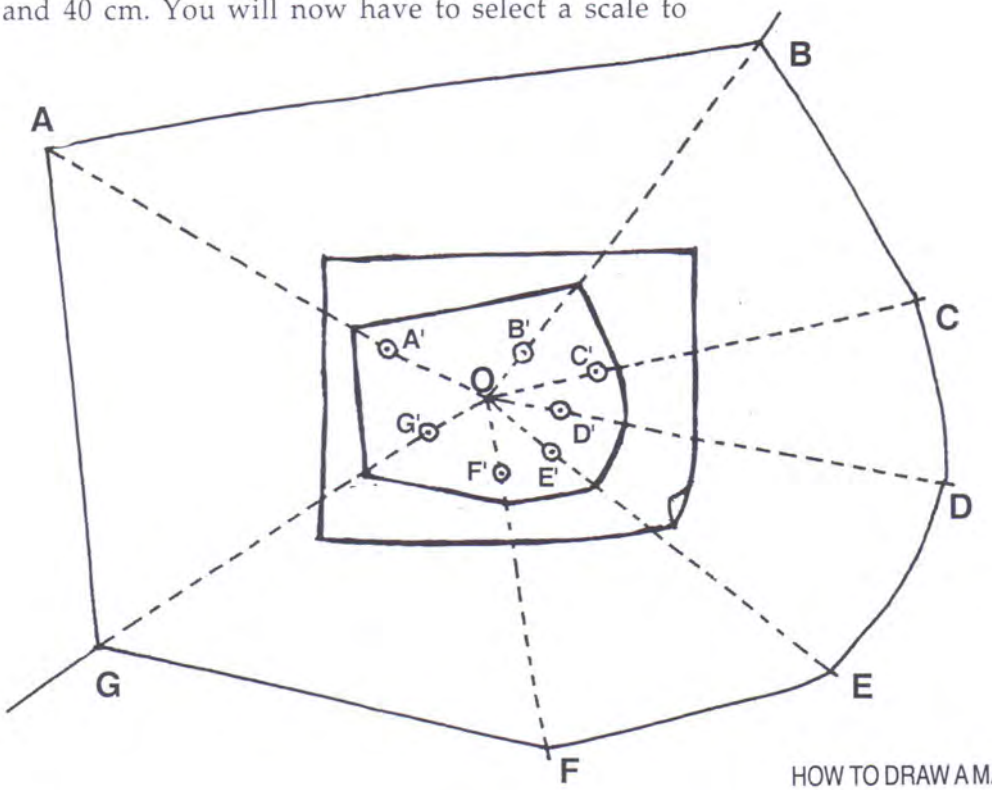


Figure 9

show this distance on the graph paper. If you take a scale of 1 m on the field equal to 1 cm on the graph paper, point A′ on the map, which represents point A on the field, must be 16.4 cm from O.

Mark point A′ on the line OA at a distance of 16.4 cm from O. Point A′ shows the correct location on the map of point A on the boundary.

Now take the other points along the boundary one by one and mark their direction and distances on the map using the same method. Name the points on the map B′, C′, D′, E′ and F′.

Don't forget to indicate the scale on your map.

How to select points along the boundary?

When you select different points along the boundary, keep the following in mind:

If the boundary forms a straight line at any place, you can select the two end points of that segment for your map. For example, in Figure 9, the segment AB is straight. Hence, when you join their representative points A′ and B′ on the map with a straight line, you get a correct picture of the boundary between A and B. The same would hold true for the segments EF, FG and GA, which are straight.

If the segment is not straight you will have to select more than two points to be able to represent the contours correctly on your map.

For example, in Figure 9 the segment from B to E is curved. To show the curvature on the map, two more points C and D have been chosen.

You can decide where more points are required, depending on the curvature or contour of the field whose map you want to draw.

To complete the map join all the points you have marked on the graph paper. You now have a map of the field you have chosen to depict.

Complete your map

Apart from the boundary of the field, there are many more details you will need to show in order to make a good map. For example, you should show features like trees, wells, pump houses, irrigation canals, electricity poles, etc in the field. You can mark their direction and distance from the origin in the same way that you marked the points along the boundary.

How correct or incorrect is your map

How can you find out whether your map is correct or not? One simple method is given on the next page.

Select two points in the field that you have shown on the map. For example, you could select A and F in Figure 9.

Measure the distance between A and F and note it in your exercise book. (29)

Now measure the distance in cm between points A′ and F′ in your map and convert this into metres, using the scale with which the map was drawn

Do all your calculations in your exercise book. (30)

Is the distance you measured between points A and F equal to the distance calculated from the map? (31)

If it is, then your map is correct. Paste your map in your exercise book.

Find the area of the field. (32)

Could you calculate the area by using the scale you chose for the map? (33)

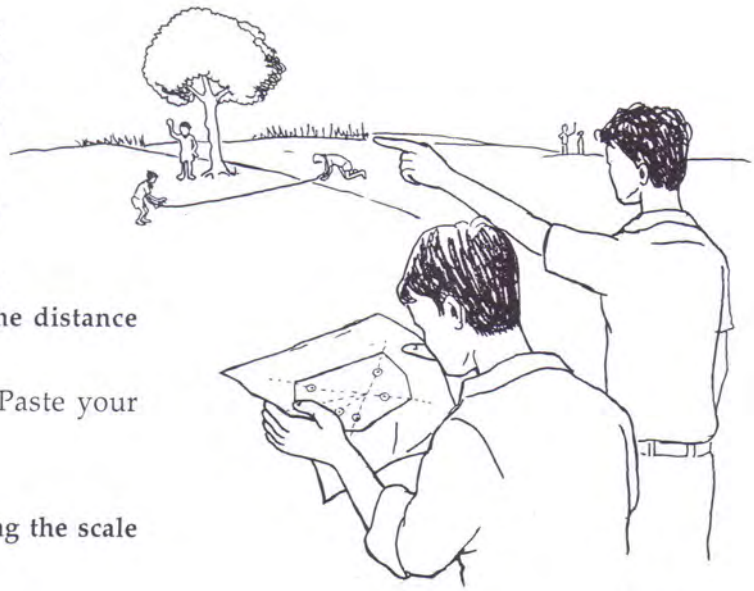


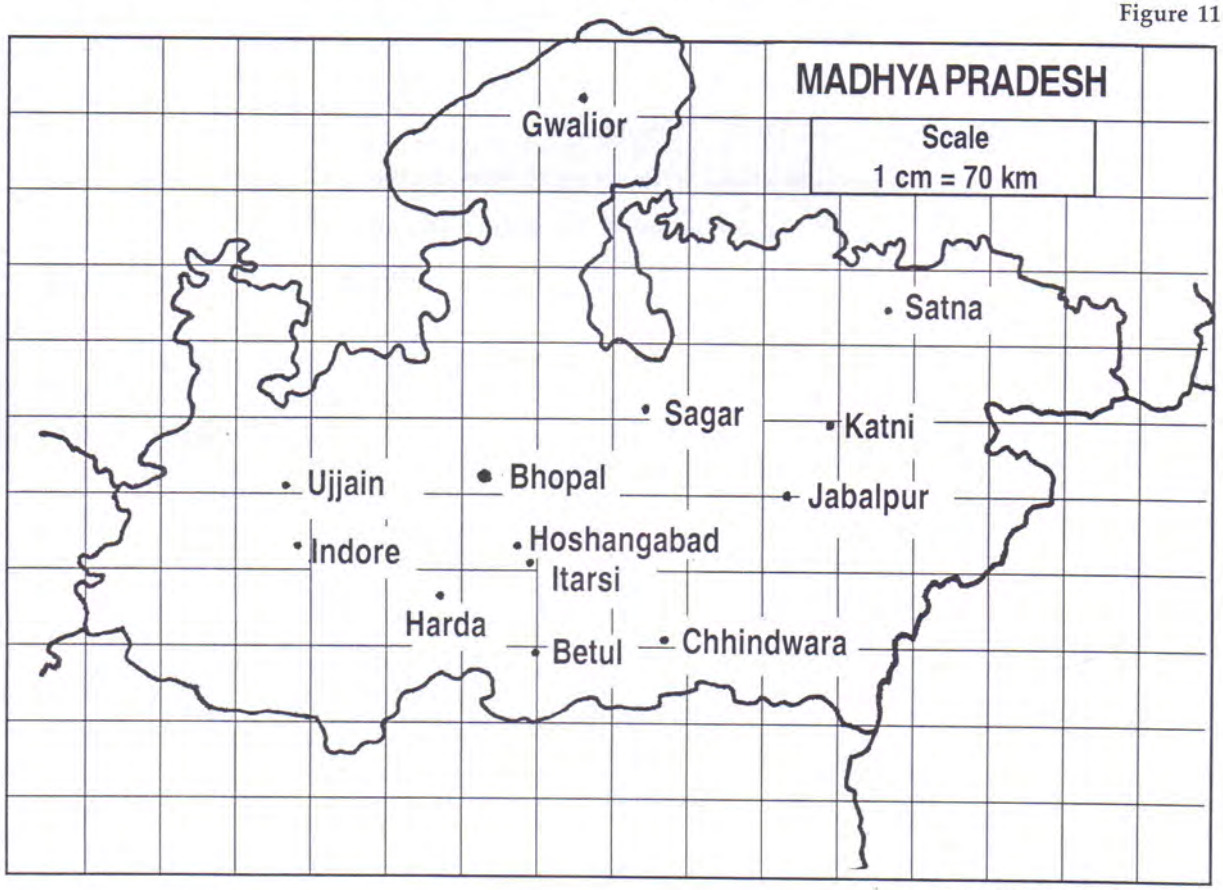
Figure 10

Exercise 3

Figure 11 shows the map of Madhya Pradesh. The names and locations of different cities are marked on this map.

Find the distance between Bhopal and five other cities. (34)

Figure 11



By counting squares and using the scale of the map, find the area of Madhya Pradesh. (35)

Some questions for revision

1. Mark the following points on a cm graph paper:

1. (14, 8)	2. (13, 7)	3. (11, 9)	4. (12, 11)
5. (13, 12)	6. (16, 12)	7. (19, 10)	8. (20, 7)
9. (20, 6)	10. (18, 4)	11. (18, 5)	12. (19, 6)
13. (18, 8)	14. (16, 8)	15. (15, 6)	16. (16, 6)
17. (14, 0)	18. (13, 4)	19. (13, 0)	20. (11, 0)
21. (11, 4)	22. (8, 4)	23. (7, 0)	24. (5, 0)
25. (5, 4)	26. (4, 0)	27. (2, 0)	28. (2, 8)
29. (1, 6)	30. (2, 9)	31. (12, 11)	

   Starting from point (14, 8), join the points in sequence with straight lines. What figure do you get?

2. Draw the X-axis and Y-axis on a sheet of graph paper. Mark the following eighteen coordinates in the order they are given.

1. (2, 6)	2. (3, 5)	3. (5, 5)	4. (7, 1)
5. (8, 1)	6. (8, 5)	7. (11, 5)	8. (12, 3)
9. (13, 3)	10. (12, 6)	11. (13, 9)	12. (12, 9)
13. (11, 7)	14. (8, 7)	15. (8, 11)	16. (7, 11)
17. (5, 7)	18. (3, 7)		

   Join them with straight lines in the given sequence.

   Write the name of the figure you obtain.

3. Enlarge the figure obtained in Question 2 by doubling the length of each of its sides.

4. You used a graph paper 24 cm long and 20 cm wide to draw the map of the field that was 20 m long and 16 m wide. What scale would you choose for drawing the same map if you are given a graph paper that is 12 cm long and 10 cm wide?

New words

Column	Row	X-axis	Y-axis	Scale
Coordinates	Origin	Ratio	Stake	