## 27 Scale Drawings

By studying this chapter you will be able to get a good understanding of
$\star$ selecting suitable scales.
$\star$ drawing and reading scale drawings of rectangular shapes.

### 27.1 Scale Drawings

What is given in the figure is a part extracted from the plan of the land in which Mr. Perera's house is situated.

A plot of land is a part of a large land. This plot of land cannot be drawn on paper in the same size. Hence such things as plans of lands of large size, and houses have to made small and drawn. Maps are examples for such things. Similarly, small things that cannot be seen by the naked eye have to be drawn enlarged.

Here is an example of an enlargement. What is given here is how a small fruit fly and a flea have been drawn enlarged.


Fruit fly

flea

When such figures are drawn it has to be done according a certain scale. Such figures are called "scale drawings".
Let us find out what a scale is.
Can a long distance such as 10 m be drawn on a paper? In such a situation a scale can be given as follows.


That is 1 cm in the scale drawing represents an actual distance of 500 cm . It is given as a ratio as $1: 500$. Accordingly, the scale considered in a scale drawing is the real length which is represented


When the scale $1: 300$ is given in another form it is,


- Let us find the scale $2 \mathrm{~cm} \rightarrow 700 \mathrm{~cm}$

- When the statement " 1350 centimetres are represented by 3

- Let us write $4 \mathrm{~cm} \rightarrow 8 \mathrm{~mm}$ as a scale.
$4 \mathrm{~cm} \rightarrow 8 \mathrm{~mm}$

$$
1 \mathrm{~cm} \rightarrow 2 \mathrm{~mm}
$$

$1 \mathrm{~cm} \rightarrow 0.2 \mathrm{~cm}$
Since a scale has to be always with "whole numbers." $1 \mathrm{~cm} \times 5 \rightarrow 0.2 \mathrm{~cm} \times 5$


Hence when $4 \mathrm{~cm} \rightarrow 8 \mathrm{~mm}$ is given as a scale it is $5: 1$. Accordingly, when a small object is drawn enlarged the relevant scale will be as above.

## Exercise 27.1

(1) Write the scale relevant to each of the following situations as a ratio.
(i) Representing 4 m by 2 cm
(ii) Representing 1 m by 1 cm
( iii ) Representing 6 m by 2 cm
(iv) Representing 7 m by 2 cm
( v ) Representing 1 mm by 2 cm
(2) In a map of which the scale is 1:300
(i) what is the real distance relevant to 2.5 cm ?
(ii) what length should be shown on the map to represent a real length of 9 m ?

### 27.2 Making Scale Drawings

## Activity 27.1

If your teacher directs you to make a scale drawing related to your classroom, what information should you collect first?
You may give various answers for this. Even then you should primarily pay attention to the following.

- The shape of the area of which the scale drawing has to be drawn should be identified.
- The real measurements relevant to that area should be obtained.
- A suitable scale to make the scale drawing should be selected.

After collecting information relevant to the above three items, attention should be directed to making the scale drawing.

As an example, let us consider that a scale drawing of a classroom of length 9 m and breadth 6 m , has to be made.

For this, let us identify the shape relevant to the class room. According to this information, the class room is of rectangular shape. Now what is needed are the measurements of the classroom.

Since the relevant measurements are given, selection of a scale should be considered.
Since the length of the class room is $9 \mathrm{~m}(900 \mathrm{~cm})$ and the breadth 6 m $(600 \mathrm{~cm})$, if 150 cm is represented by 1 cm , the length and the breadth of the scale drawing would be,
$\frac{900}{150}=6 \mathrm{~cm}$ and $\frac{600}{150}=4 \mathrm{~cm}$ respectively.
Now by drawing a rectangle having this length and breadth, the scale drawing of the class room can be made. For this, the given steps could be followed.

Step 1: Draw a straight line segment by using a pencil and a ruler and mark a length of 6 cm on it.


Step 2: Draw angles of $90^{\circ}$ at the two ends of the line 6 cm long, by using the protractor.


Step 3: Mark the breadth 4 cm , and complete the rectangle.

Then the following figure could be obtained.


6 cm
Scale 1:150

## Exercise 27.2

(1) Select the scale from column ' $B$ ' relevant to the information in column 'A'.

| A |
| :--- |
| (i) Representing 7 m by 2 cm |
| (ii) Representing 12 m by 30 cm |
| (iii) Representing 4 mm by 2 cm |
| (iv) Representing 3 cm by 6 cm |
| (v) Representing 10 m by 10 cm |


| B |
| :---: |
| $5: 1$ |
| $1: 100$ |
| $1: 350$ |
| $1: 40$ |
| $2: 1$ |

(2) The length and breadth of the bottom of a swimming pool of a certain school are 50 m and 20 m respectively.
(i) Draw a rough figure of the bottom of the swimming pool.
(ii) Select a suitable scale and write it as a ratio.
(iii) Using this scale, draw a scale drawing of the swimming pool.
(iv) If three swimming tracks have to be made lengthwise in the swimming pool by using strings, by what length should the strings needed be shown in the scale drawing?

## 27. 3 Reading scale drawings

A teacher who brought a scale drawing of the school playground asked questions by exhibiting it to the students.
Discuss whether you can answer them.


A rough figure of a scale drawing made to the scale 1:1000 is given in the figure.
The dotted lines in this indicate the tracks for a certain running event. The long jump pitch is marked by the rectangle of length 3 mm and breadth 2 mm .
(i) Find the actual length and breadth of the play ground.
(ii) What is the actual length of the running track? Accordingly, what could be the running event?
(iii) What is the actual area of a running track?
(iv) Find the actual length and breadth of the long jump pitch and calculate its area.
(v) Find the ratio of the real area of the long jump pitch to the area of a running track.

Compare your answers with the following values calculated using the measurements of the scale drawing.

What is understood by the scale 1: 1000 is that 1 cm in the scale drawing indicates a real length of 1000 cm or 10 m .
Accordingly,
(i) The real length of the play ground $=12 \times 10 \mathrm{~m}=120 \mathrm{~m}$ The real breadth of the play ground $=7.5 \times 10 \mathrm{~m}=75 \mathrm{~m}$
(ii) The length of the running track $=10 \times 10 \mathrm{~m}=100 \mathrm{~m}$ Hence the event is the 100 m running event.
(iii) The actual length of a running track $=100 \mathrm{~m}$

The real width of a running track $=0.1 \times 10=1 \mathrm{~m}$ Hence the area of a running track $\quad=100 \mathrm{~m} \times 1 \mathrm{~m}=100 \mathrm{~m}^{2}$
(iv) The length of the long jump pitch $=0.3 \times 10 \mathrm{~m}=3 \mathrm{~m}$ The breadth of the long jump pitch $=0.2 \times 10 \mathrm{~m}=2 \mathrm{~m}$ Hence the area of the long jump pitch $=3 \mathrm{~m} \times 2 \mathrm{~m}=6 \mathrm{~m}^{2}$
( v) The ratio of the area of the long jump pitch $=6: 100$ to the area of a running track
$=3: 50$

## Exercise 27.3

(1) The length and the breadth of a rectangle in a scale drawing drawn to the scale $1: 600$ are 4.8 cm and 3.5 cm respectively. Find its real length and breadth.
(2) Calulate the real measurements according to the information given in the following table.

| The actual <br> object and its shape | Scale | Measurements in the <br> scale drawing. |
| :--- | :---: | :--- |
| Rectangular land | $1: 750$ | length $=20 \mathrm{~cm}$, breadth $=15 \mathrm{~cm}$ |
| Square flower bed | $1: 100$ | length of one side $=4.5 \mathrm{~cm}$ |
| A small rectangular <br> part of an electric <br> instrument | $1: 10$ | length $=1 \mathrm{~cm}$, breadth $=0.5 \mathrm{~cm}$ |

(3) The scale drawing of a teacher's table drawn to the scale 1:10 is given by the figure below.


The key to the scale drawing is given on the right hand side. Accordingly, identify the places mentioned in short terms. Using the measurements of the scale drawing answer the following questions.
(i) Calculate the real length and breadth of the teacher's table.
(ii) Calculate the real length and breadth of each of the places where the box of chalk is kept, the flower pot is kept and the record book is kept. Calculate the area of each of them.
(iii) If it is proposed to place a table cloth to cover the surface of the table, what should be the minimum area of the table cloth needed?

## Summary

- A scale drawing can be large or small depending on the real measurements.
- The scale of a scale drawing can be given as below.
* $1 \mathrm{~cm} \rightarrow x$ cm in units.
* 1: $x$ as a ratio.
- When drawing a scale drawing it is needed to,
* get the necessary measurements.
* select a suitable scale.
* draw the scale drawing according to the relevant shape.

