CHAPTER 4

Enlargement and Reduction of Maps

WE need sometimes to show additional information or special details on a map. To accommodate additional information we need more space on a map and thus need to enlarge it. A map is also enlarged when it is required to have the enlarged map on a scale that suits our purpose.

At times we may have only a large-sized map of an area. But we may need only a small-sized map showing only the administrative boundaries say of a state and its districts for preparing special-purpose maps namely a map showing the distribution of population for a book, journal or a dissertation. We reduce maps when we need to represent on them only limited information.

The maps appearing in books, atlases, etc., and numerous other maps are much smaller than the original draft maps. We first prepare a map of a size two or three times the size of the map actually required. This is done with a view to having sufficient space for amassing the required information precisely and do lettering in hand or with stencils easily and clearly. The map after it is complete, is reduced with a photographic camera. On reduction, letters, figures, and lines of the map look sharp and well-shaped though small.

We also reduce or enlarge maps on different scales when it is necessary to combine them and form one map on a particular scale.

METHODS OF ENLARGING AND REDUCING MAPS

Maps are enlarged and reduced by graphical as well as mechanical methods.

Graphical methods. There are several graphical methods of enlarging and reducing maps. We shall discuss only two such methods.

I. SQUARE METHOD

A network of squares is drawn on the original map. The lines forming the squares are generally 0.5 cm apart or even closer and are drawn softly with a lead pencil so that they can be erased without leaving pencil marks when not required. It is, however, better to trace the map on a piece of tracing paper and draw squares on it. The squares are numbered (Fig. 22) with a view to facilitate the locating of the objects on the map. Draw another set of squares on a piece of drawing paper on which the new map is to be drawn. The length of the side of a square on the drawing paper is found out with the help of the scale on which the new map is to be enlarged or reduced. The number of squares drawn for drawing the new map should be equal to the number of squares drawn on the original map. The squares are numbered in the same way as which they have been numbered on the original map. For better results, draw diagonal lines in the squares.

Details from the original map are transferred square by square to the squares drawn for dra new map until the map is complete. Details when transferred with the eye may result in errors in the distances between the points on the new map. To minimise such errors, diagonals of the square original as well as on the new map are also drawn.

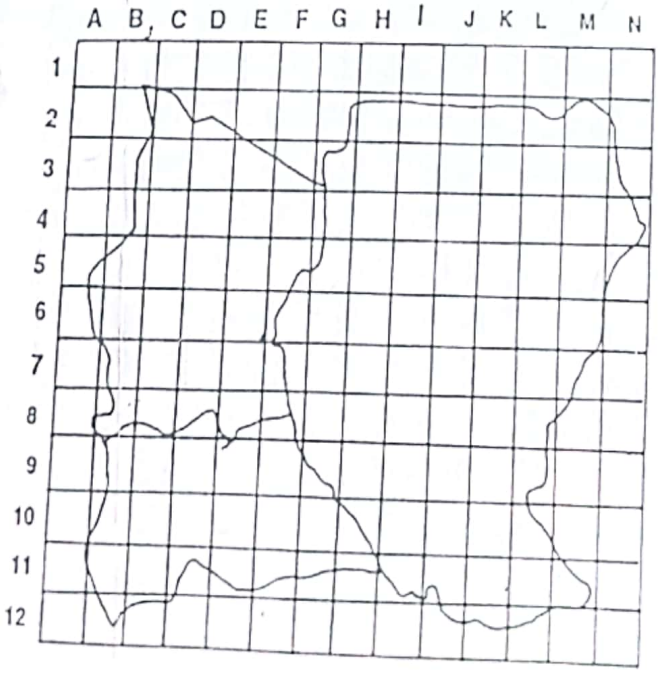
Errors arising while transferring the relative positions of points from the original map to the n are minimised by using a pair of *proportional compasses* also know as a *proportional dividers*. A proportional compasses consist of two metallic bars each having a long slit in its middle part. T are pointed at both the ends. They are joined together by means of a sliding bolt and a nut in such that both the parts can move freely and can cross each other diagonally. The ratio between the between the pointed ends of the bars on one side of the pair of proportional compasses and that the pointed ends of its bars on the other side, is fixed by placing the bolt against the scale marked upper as well as the lower bar. The pair of the pointed ends of the bars (meant for the original m opened according to the distance between two points on the original map. The pair of the pointed the other end of the bars are used to plot the distances on the new map.

It should be borne in mind that it is not only the outline of a country, state or a district that is e or reduced but also all the important features given on the map are enlarged or reduced. When a reduced, its size is less than the size of the original map. Therefore, irrelevant information is delet a reduced map. Conventional signs such as those representing roads, railways, trees, temples, bou of states, districts, etc., are not drawn to scale. Such signs are, therefore, neither enlarged nor red size when shown on the enlarged or reduced maps.

FINDING THE SIDE OF A SQUARE ON THE REDUCED OR ENLARGED M

It is easier to find out the side of a square on the reduced or enlarged map if the R.F. (repres fraction) of the original map and the R.F. of the new map are known. Therefore, first convert the sta of scale into R.F. if the R.F. is not given.

Example 1. The scale of a map (Fig. 22) is 1 cm to 400 km. What is the length of the side of a on the enlarged map if the side of a square on the original map is 0.5 cm. and the enlargement made on the scale of 1 cm. to 250 km.?



Scale 1 cm. to 400 km.

Fig. 22

Solution: (a) Find out the R.F. of the original map.

1 cm. on the map represents 400 km. or 40,000,000 cm. on the ground.

$$\therefore \text{R.F.} = \frac{\text{Map distance}}{\text{Ground distance}} = \frac{1}{40{,}000{,}000}$$

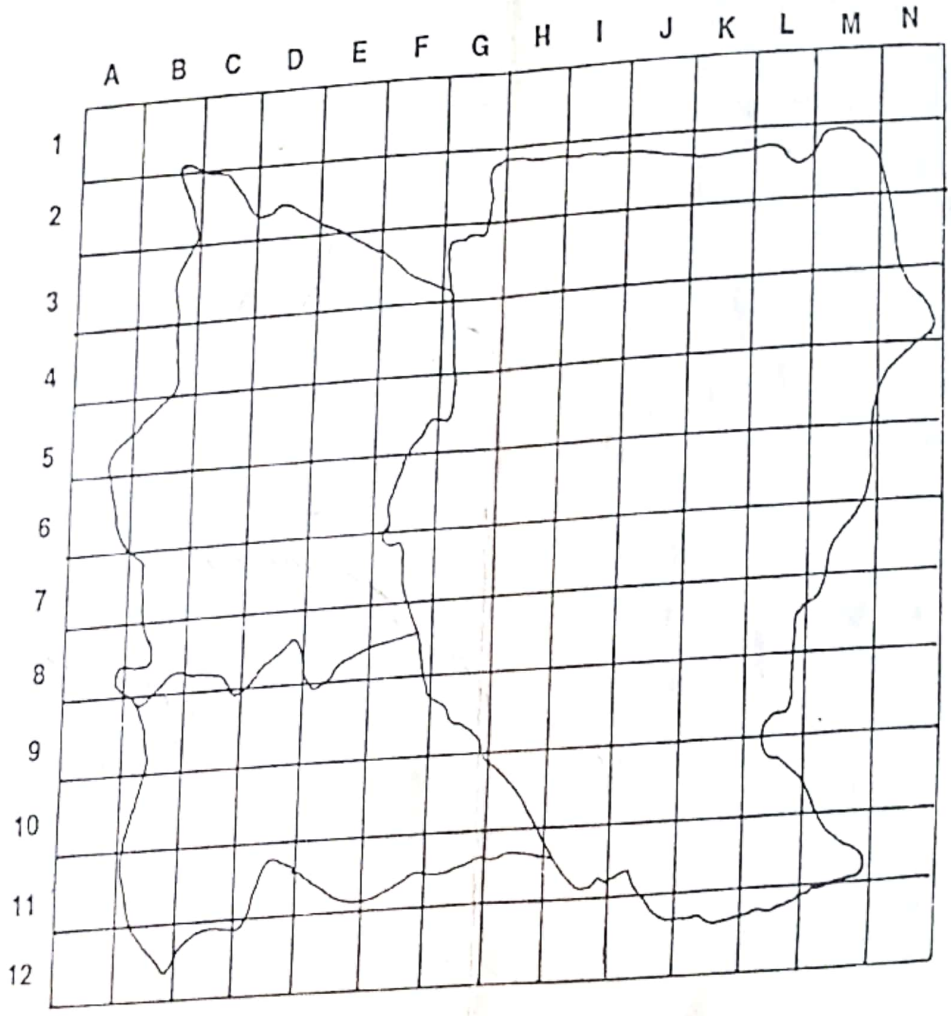
(b) Find out the R.F. of the new map.

1 cm. on the map represents 250 km. or 25,000,000 cm. on the ground.

$$\therefore \text{R.F.} = \frac{\text{Map distance}}{\text{Ground distance}} = \frac{1}{25{,}000{,}000}$$

Since the side of a square on the original map is 0.5 cm., the side (X) of a square on the new map (Fig. 23) is found as under:

$$X : 0.5 :: \frac{1}{25{,}000{,}000} : \frac{1}{40{,}000{,}000}$$



Scale 1 cm. to 250 km.

Fig. 23

$$\therefore X \times \frac{1}{40,000,000} = 0.5 \times \frac{1}{25,000,000}$$

$$\text{or } X = 0.5 \times \frac{1}{25,000,000} \times \frac{40,000,000}{1}$$

$$= 0.8 \text{ cm.}$$

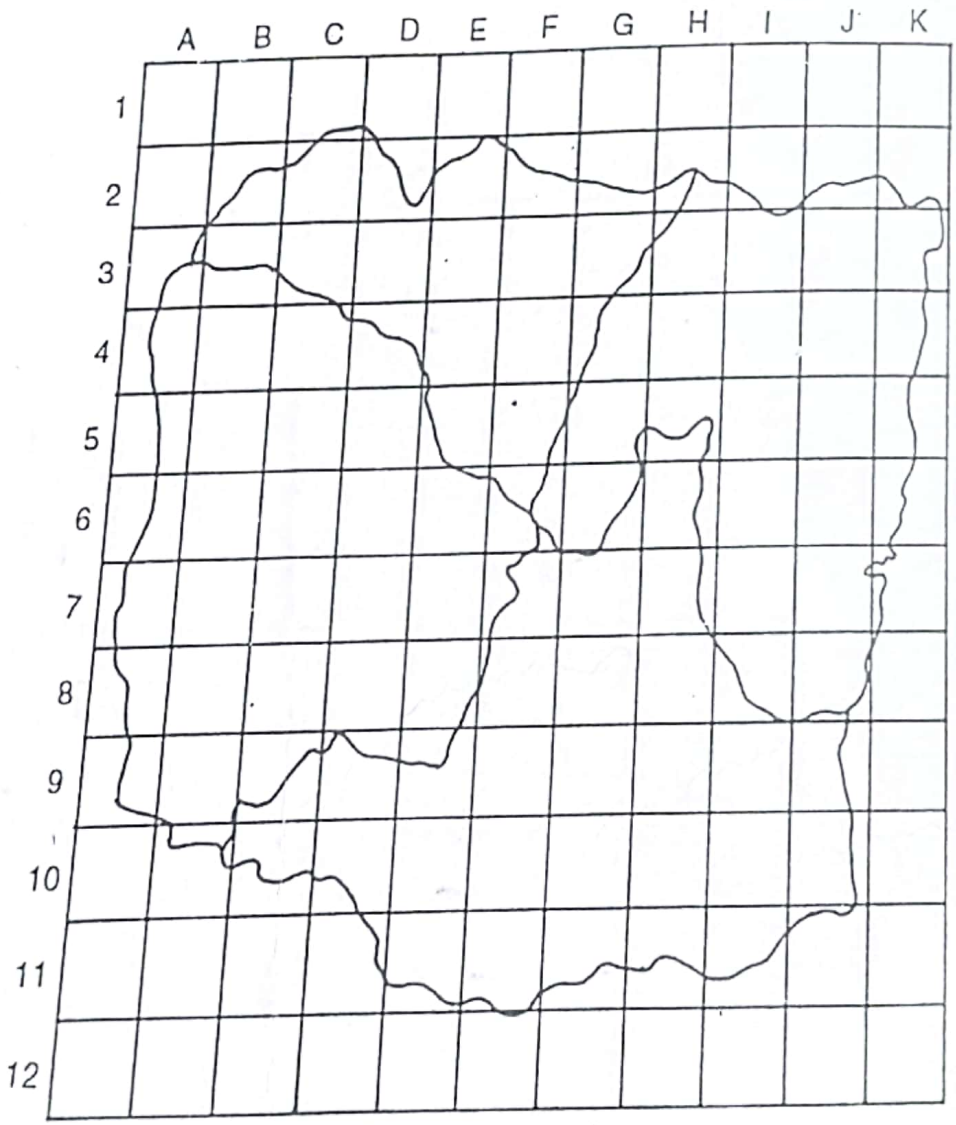
OR when the scale is 1/40,000,000, the side of a square=0.5 cm.

∴ when the scale is 1/25,000,000, the side of a square

$$= 0.5 \times \frac{40,000,000}{1} \times \frac{1}{25,000,000} = 0.8 \text{ cm.}$$

The length of the side of a square on the new map is thus

$$= \frac{\text{Side of a square on the original map} \times \text{Denominator of the R.F. of original map}}{\text{Denominator of the R.F. of the new map}}$$



Scale 2 cm. to 1 km

Fig. 24

Example 2. The scale of a map is 2 cm. to 1 km. What is the length of the side of a square on the reduced map if the side of a square on the original map (Fig. 24) is 0.9 cm. and the scale of the reduced map is 1 cm. to 750 metres?

Solution. (a) Find out the R.F. of the original map.

2 cm. on the map represent 1 km. or 100,000 cm. on the ground.

$\therefore$ R.F. of the map $= \frac{2}{100,000}$ or $\frac{1}{50,000}$

(b) Find out the R.F. of the new map.

1 cm. on the map represents 750 metres or 75,000 cm. on the ground.

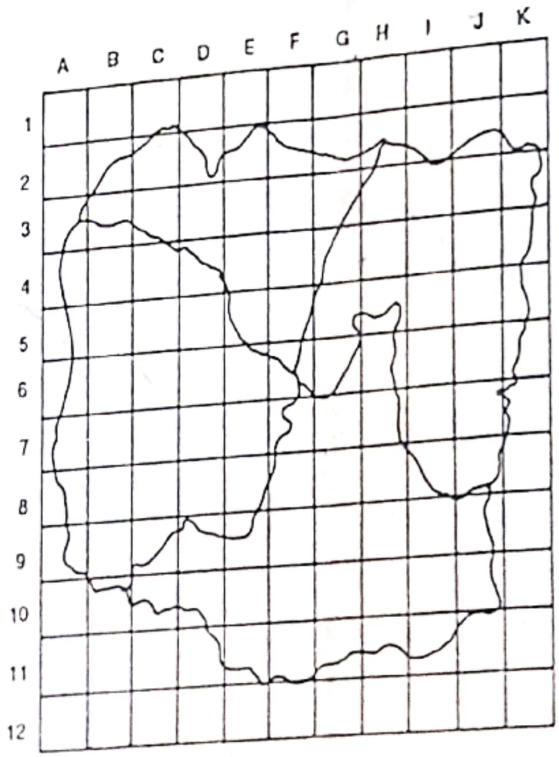
$\therefore$ R.F. of the new map $= \frac{1}{75,000}$ (Fig. 25)

Since the side of a square on the original map is 0.9 cm., the side of a square on the new map is $\frac{0.9 \times 50,000}{75,000}$ or 0.6 cm.

Example 1. You are given a map drawn on the scale of 1:21,000,000.

Redraw this map on the scale of 1:35,000,000.

Solution. We shall redraw the given map by square method. The scale of the given map is larger than the scale of the new map. The size of a square on the new map will, therefore, be reduced in size. Keeping this in view we draw squares of sufficiently large size on the given map. Let the side of a square in the given map be 1.0 cm. (Fig. 26).



Scale 1 cm. to 750 metres.

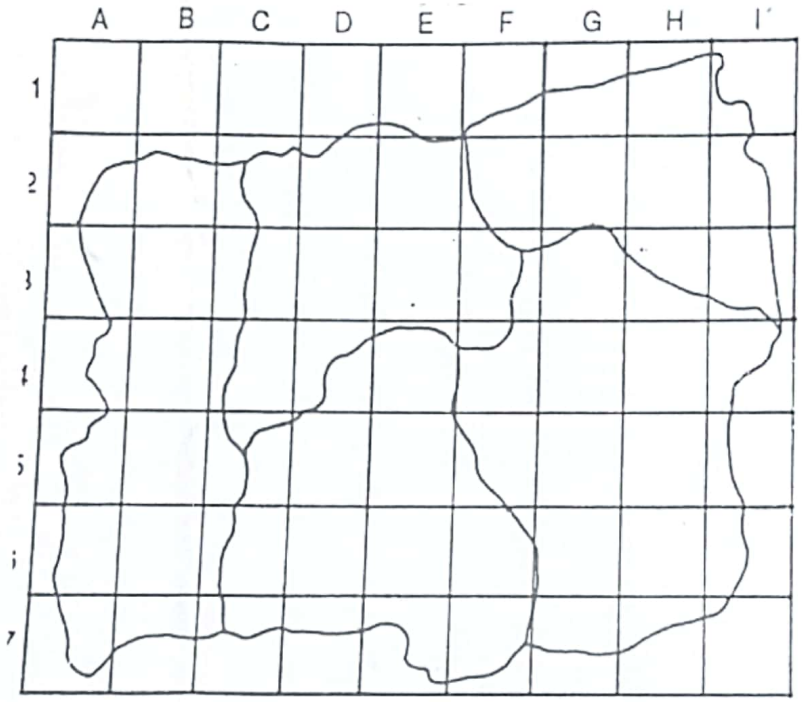
Fig. 25

The side of a square on the new map

$$= \text{Side of a square on the given map} \times \frac{\text{Denominator of the R.F. of the given map}}{\text{Denominator of the R.F. of the new map}}$$

$$= 1.0 \times \frac{21{,}000{,}000}{35{,}000{,}000} \text{ or } 0.6 \text{ cm.}$$

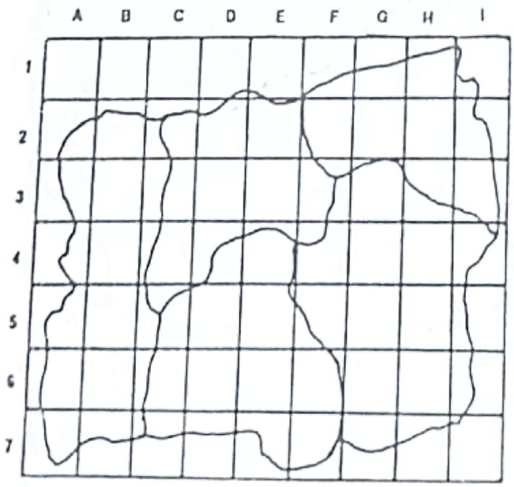
Draw a net work of squares on the given map. The lines forming the squares are 1.0 cm. ap the result that the side of a square on the given map is 1.0 cm. long. The squares are drawn ligh a lead pencil so that the lines can be erased without leaving pencil marks. Starting from the north- corner of the map, number the squares as shown in Fig. 26.



Scale 1 : 21,000,000

Fig. 26

Take a piece of drawing paper for redrawing the map on the scale of 1:35,000,000 and dra of squares on it with a lead pencil. The lines forming the squares are 0.6 cm. apart with the res



Scale 1:35,000,000

Fig. 27

the side of a square on it is 0.6 cm. long (Fig. 27). Draw here the same number of squares that you have drawn on the given map and number the squares in the same way in which they have been numbered on the given map.

Details from the given map are transferred square by square with the eye, to the squares drawn for the new map until the map has been drawn completely. A pair of proportional compasses if available, can also be used for transferring the details from the given map correctly to the new map.

It may be noted that the conventional signs representing roads, railways, temples, etc., are not drawn to scale on maps. The sizes of these signs are, therefore, not reduced (or enlarged) on the new map. The new map drawn with a pencil is inked in without inking in the lines making squares. The squares drawn with pencil are erased and a scale is appended to the new map.