Unit 9

Maps and Scale

Chapter Outline

8AXVFJ

Learning Objectives:

- *Know about the types of maps and scales.*
- *Convert the scales from one form to another.*
- *Draw the various types of scale.*
- *Identify the components of the map.*

9.1 Introduction

A map is a visual representation of an entire world or a part of the earth, represented on a flat surface drawn to scale. Maps attempt to represent both physical and cultural features like relief, climate, natural resources, political boundaries, roads, population, economic activities and so on.

Components of a map

Basic Components of a map are title, legend, direction, scale and source. It gives the extent of latitude and longitude of the area mapped.

Title

Title tells about the content of the map and is placed mostly at the top centre or at the bottom centre of the map.

Scale

The scale of the map is ratio between two places on the map and their corresponding distance in the ground. It can be expressed as statements, representative fraction, or as linear scale. The scale of a map should be placed at a prominent place. It can be placed just below the title or somewhere at the bottom.

Legend

It explains about different signs and symbols used in a map and is usually placed at the left or right corner at the bottom of the map.

Direction

It is a convention that top of the map is oriented towards north and this is

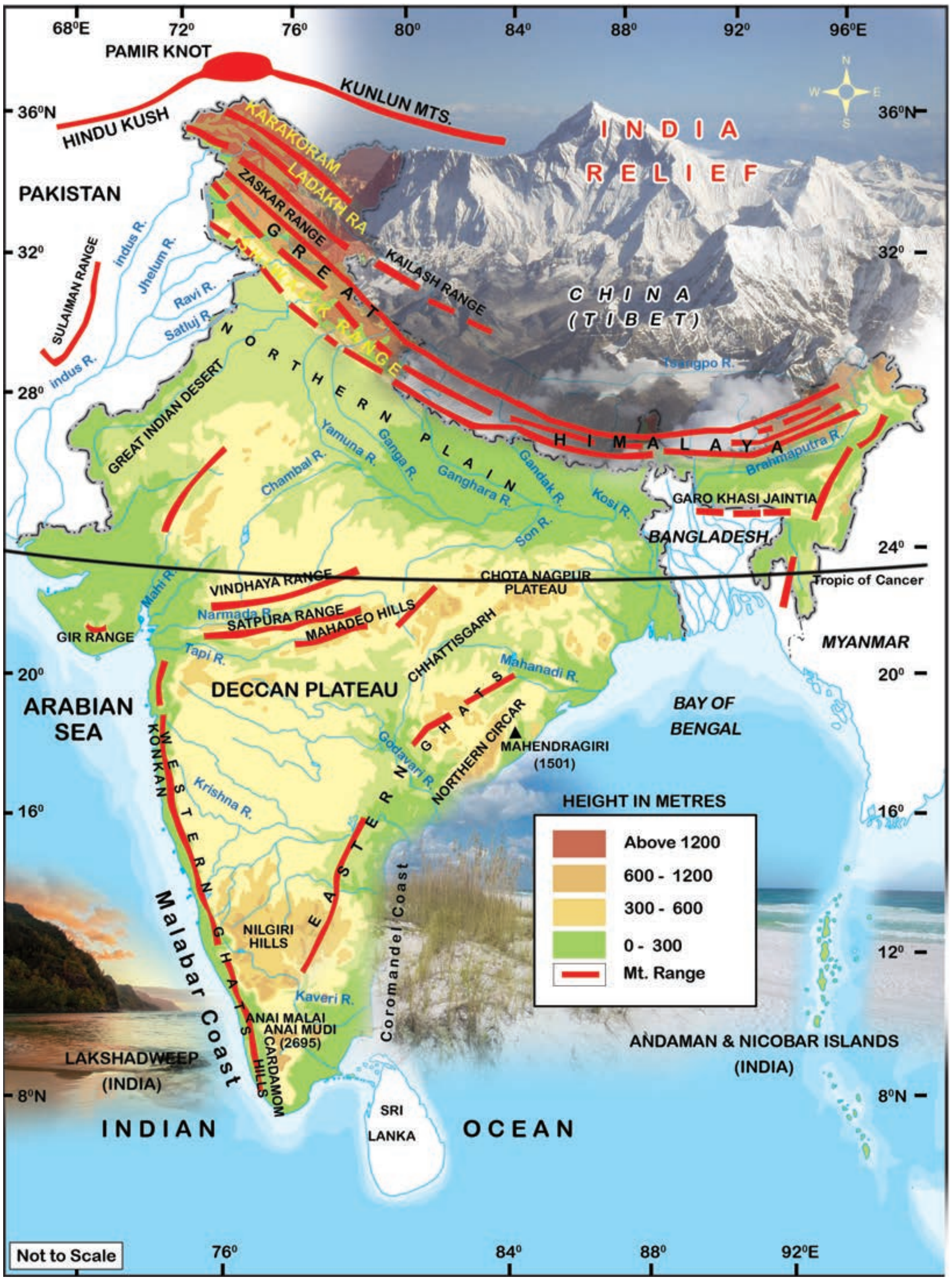


Figure 9.1 Physical map of India

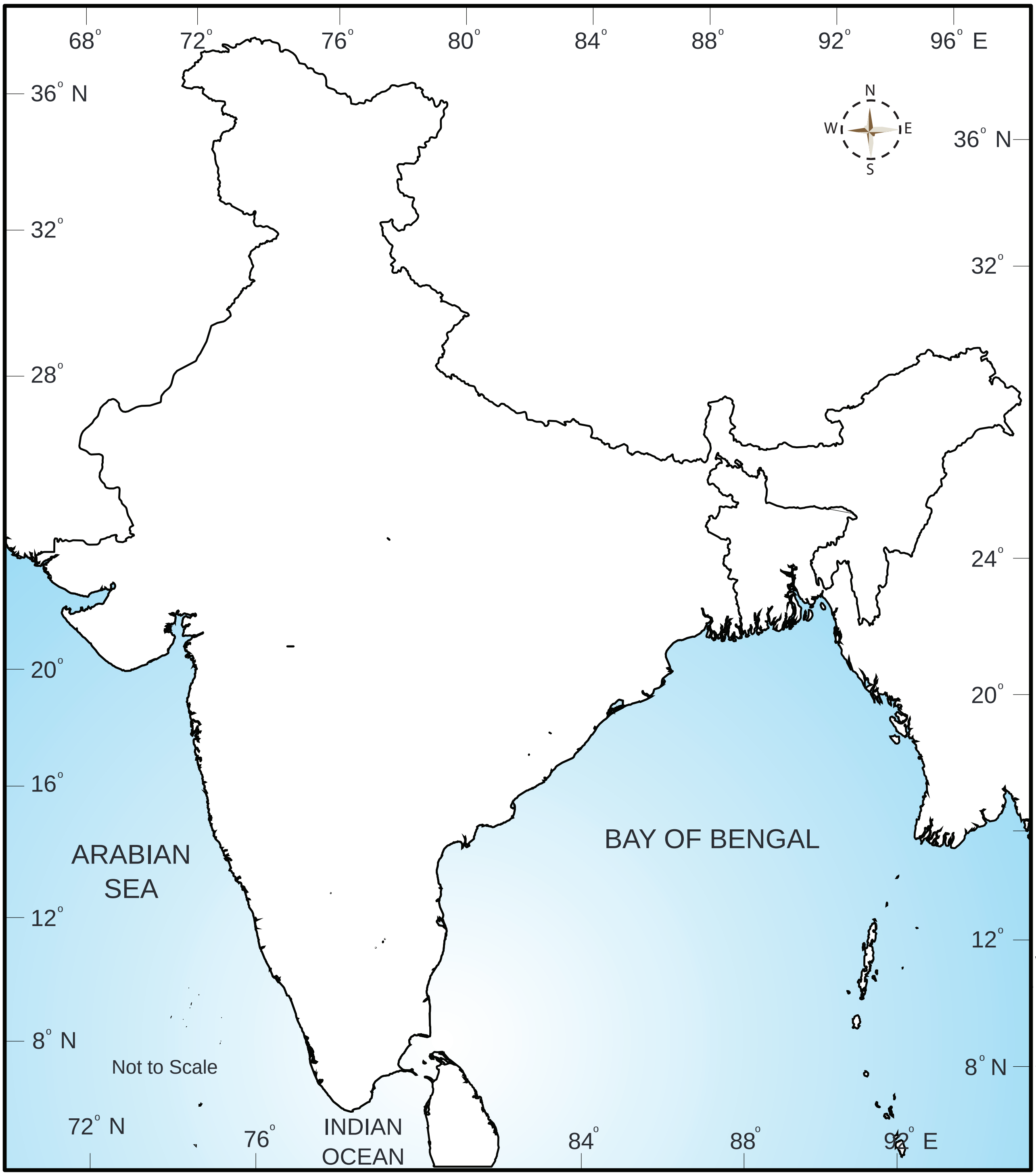
represented by an arrow pointing upward placed at the top right corner of the map. Sometimes a Compass Rose is used instead of an arrow to show the direction.

Source

Every map must give the source of the data used. The source should normally be given outside the frame of the map on the bottom right. On the bottom left the name of the author, publisher, place of publication and year of publication should be given.

Excercise 1

Refer the map (Figure 9.1) and label the components of a map on the outline map of India



Excercise 2

Based on the details given below, mark the components of the map in their appropriate place in the map of Tamil Nadu.

Title: Tamil Nadu - Distribution of rainfall during Northeast Monsoon 2017

Scale : 1 : 2,00, 000 ,000

Legend low rainfall, moderate rainfall, heavy rainfall

Latitude 8°N to 13°N. Longitude 74°E to 80° E

Excercise 3

Draw the symbols used in topographic sheet to show various categories of

a. Railway lines
b. Roadways
c. Water features
d. Physical features
e. Cultural features
f. Vegetation

9.2 Scale

The scale is defined as the ratio between the distance of two points on the map and their corresponding distance on the ground. The scale is an essential element in all types of maps. The scale of the map permits the user to convert distance on the map to distance on the ground.

A map scale provides the relationship between the map and the whole or a part of the earth's surface shown on it. We can also express this relationship as a ratio of distances between two points on the map and their corresponding distance on the ground. The scale can be represented as a fraction where the numerator refers to map distance and the denominator refers to ground distance.

There are at least three ways of representing scale. They are:

1. Statement Scale
2. Representative Fraction (R. F.)
3. Graphical or Bar Scale

1. Statement Scale

The scale of a map may be indicated in the form of a written statement. For example, if on a map a written statement appears as stating 1 cm represents 10 km, it means that on that map a distance of 1 cm is representing 10 km of the corresponding distance on the ground.1 inch equals 16 miles. This example tells us that 1 inch on the map represents 16 miles on the ground. This is the easiest scale to understand because it generally uses familiar units.

Example :

1 centimetre to 10 kilometres

2. Representative fraction (RF)

It shows the relationship between the map distance and the corresponding ground distance in the same units of length. R. F. is generally shown as a fraction. For example, a fraction of 1 : 40,000 shows that one unit of length on the map represents 40,000 of the same units on the ground i.e; 1 cm or 1 inch on the map represents 40,000 cm and 40,000 inches, respectively on the ground.

R.F has the following characteristics :

1. If the numerator is in centimeters, then the denominator is in metres and kilometres.
2. If the numerator is in inch, then the denominator is in miles.

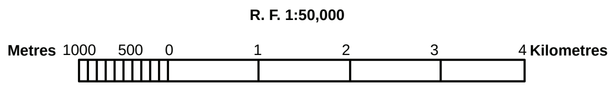
Example :

RF is represented as 1/40,000 or 1:40,000

3. Graphic or bar scale

In this type of scale the map distances and the corresponding ground distances are marked using a line bar with primary and secondary divisions on it. However, unlike the statement of the scale method, the graphical scale stands valid even when the map is reduced or enlarged. This is the unique advantage of the graphical method of representing scale.

Example:



Solved Examples

Statement of Scale into R. F.

1. Convert the given Statement of Scale of 1 inch represents 5 miles into R. F.

   Solution

   The given Statement of Scale may be converted into R. F. using the following steps.

   1 inch represents 5 miles

   or 1 inch represents 5 × 63,360 inches (1 mile = 63,360 inches)

   or 1 inch represents 316,800 inches

   Answer R. F. 1 : 316,800 or 1/316800

R. F. into Statement of Scale

2. Convert R. F of 1 : 200,000 into Statement of Scale (In Metric System)

   Solution

   The given R. F. of 1 : 200,000 may be converted into Statement of Scale using the following steps :

   1 : 200,000 means that 1 unit on the map represents 200,000 units on the ground.

   or 1 cm represents 200,000 /100,000 (1 km = 100,000 cm)

   or 1 cm represents 2 km

   Answer 1 cm represents 2 km

3. Convert the given Statement of Scale into Representative Fraction (R. F.).

   a. 5 cm represents 10 km

   b. 2 inches represents 4 miles

   c. 1 cm represents 100 metres

a. 5 cm represents 10 km

Step 1: convert into same units of measurement

(1 Km = 100000 cm)

Step 2: 10 km = 1000000 cm Therefore 5 cm: 1000000 cm

Step 3: simplify the ratio

1: 1000000/5

Answer : R.F. = 1: 200000 or 1/200000

b. 2 inches represents 4 miles

Step 1: convert into same units of measurement

(1 mile – 63,360 inches)

Step 2: 4 miles = 63,360 × 4 = 253440

Therefore 2 inches: 253440 inches

Step 3: simplify the ratio

1: 253440/2 = 126720

Answer : R.F. = 1: 126720 or 1/126720

c) 1 cm represents 100 metres

Step 1: convert into same units of measurement

(1m = 100 cm)

Step 2: 100 m = 10000 cm Therefore 1 cm: 10000 cm

Answer : R.F. = 1: 10000 or 1/10000

Construction of the Graphical/Bar Scale

1. Construct a graphical scale for an R.F. 1 : 50,000 and read the distances in kilometre and metre.

(NOTE: By convention, a length of nearly 15 cm is taken to draw a graphical scale.)

Calculations

To get the length of line for the graphical scale, these steps may be followed:

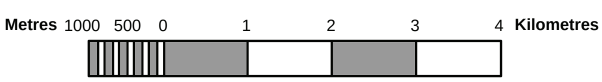
R.F. =1 : 50,000 means that 1 unit of the map represents 50,000 units on the ground or 1 cm represents 50,000 cm or 0.5 Km (1 Km = 100000 cm). Therefore, 10 cm represents 5 km

Construction

The graphical scale may be constructed by following these steps:

Draw a straight line of 10 cm and divide it into 5 equal parts these are the primary division. Mark the first division as 0. Assign the value of 1 km for the four divisions starting from 0. Therefore the primary scale has 4 divisions and is 4 km long.

Divide the extreme left side division into 10 equal parts and mark each division by a value of 100 metres, beginning from 0. This is the secondary scale representing 1000 mts.



Exercise

1. Convert the statement into RF.
   a. 1 cm to 10 km
   b. 1 cm to 5 km
   c. 1 cm to 1 km
   d. 1 cm to 50km
   e. 1 cm to 100 km
2. Convert the RF into statement:
   a. 1: 100000
   b. 1: 50000
   c. 1: 250000
   d. 1: 5000000
   e. 1: 30000
3. Construct a graphical scale for the following:
   a. 1 cm to 10 km
   b. 1 cm to 5 km
   c. 1 cm to 1 km
   d. 1 cm to 50km
   e. 1 cm to 100 km

9.3. Measurement of distance between places

The linear features shown on the maps can be classified into two broad categories, i.e.

1.Straight lines

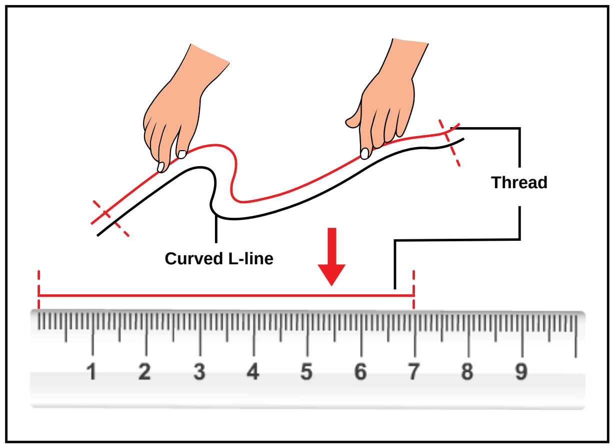
2. Erratic or zigzag lines.

Straight line features

The measurement of straight line features like roads, railway lines and canals is simple. It can be taken directly with a pair of dividers or a scale placed on the map surface.

Erratic or zig zag lines

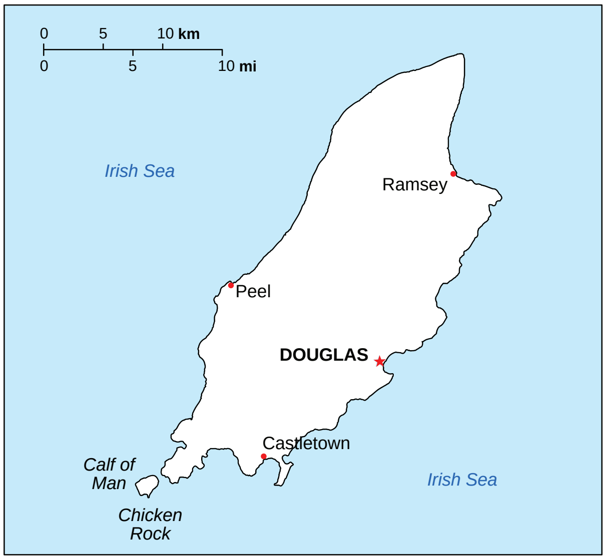
However, care should be taken to measure distances , along erratic paths, such as roads, boundaries, coastlines, rivers and streams. The distances along all such features can be measured by placing a thread at the starting point and carrying it along the line up to the end point. The thread is then stretched and measured to determine the distance. It can also be measured by using a simple instrument called Rotameter. The wheel of the ‘rotameter’ is moved along the route or line from start to end and the reading noted down.



Measuring a curved line using a thread and a ruler

Example

a. Measure the straight line distance between the towns Peel and Castle town.



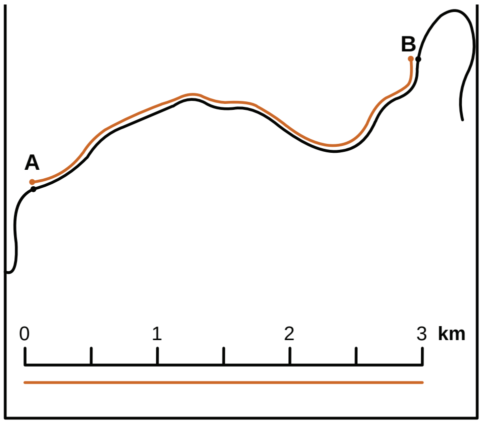
Step 1. Measure the distance between the towns Peel and Castle town with a scale or thread in cm.(example if it is 2.9 cm)

Step 2. Note the scale of the map in this case 1 cm = 10km

Step 3. Multiply the measured distance with the scale of the map.(2.9 × 10km = 29km)

Answer : The distance between the two urban centres is 29 km

a. Measure the irregular line distance between the points A and B.



Step 1. Measure the distance between the two points with the help of a thread.

Step 2. Place the thread on a scale and read the measurement in cm. (example if it is 3.2cm)

Step 3. Note the scale of the map in this case 1 cm = 1 km

Step 4. Multiply the measured distance with the scale of the map. (3.2 × 1 km = 3.2 km)

Answer : The distance between the two points is 3.2 km

Exercise

1. Measure the road and railway distance between your nearest town and Chennai city from Tamil Nadu in your atlas.
2. Measure the length of Tamil Nadu coastline .
3. Measure distance between any two nearest villages in a topo sheet.

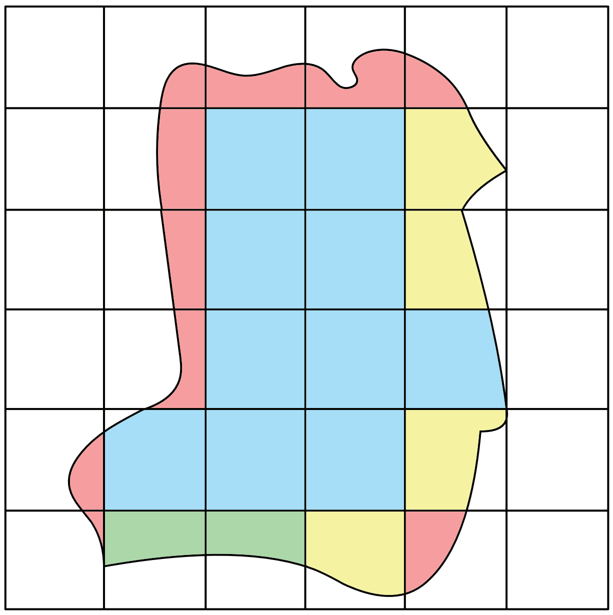
Activity

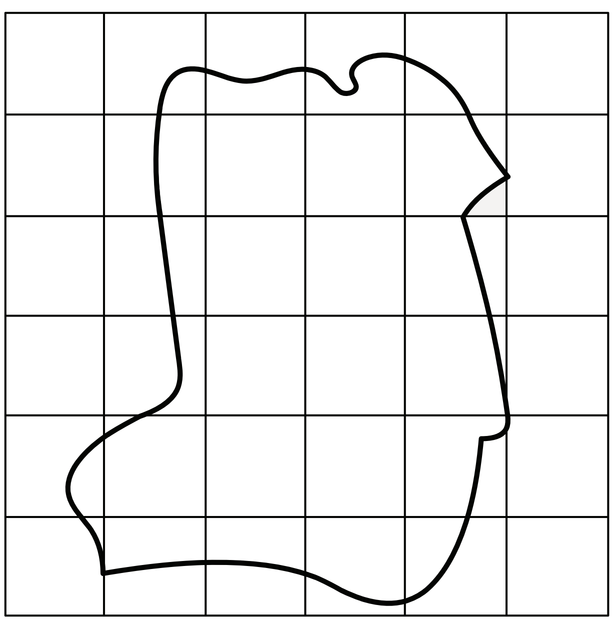
https://support.google.com/maps/answer/1628031?co=GENIE...hl=e

Using this link measure distance between any two selected places of your choice.

9.4 Measurement of Area

The measurement of a geographical area can be carried out on a map. There are number of methods used to measure area on a map. One of the simplest methods is by means of similar squares.





Square method: The square method is the most common method to measure area. In this method, the area to be measured is covered by squares by placing a sheet of graph paper beneath the map on an illuminated tracing table or by tracing the area onto the graph sheet. The squares pertain to a scale.

Example:1

Calculate the area of the given map whose scale is 1 centimetre = 1 kilometre cover the given area with a set of squares of side.

Area of 1 small square = 1 km^2

Step 1: Count the number of full squares first = 10 (shaded blue) 1 small square = 1 cm^2

Step 2: Next, count the numbers of the fractional squares

¾ square (yellow) = 4,

½ square (green) = 2 and

¼ square (pink) = 10

Step 3: Calculate the total number of squares 10

10 × 1 =**10**,

Number of 3/4 square

4 × 3/4 = **3**

Number of 1/2 squares

2 × 1/2= **1** and

number of 1/4 squares

10 × 1/4 = **2.5**

Step 4: Add all these values

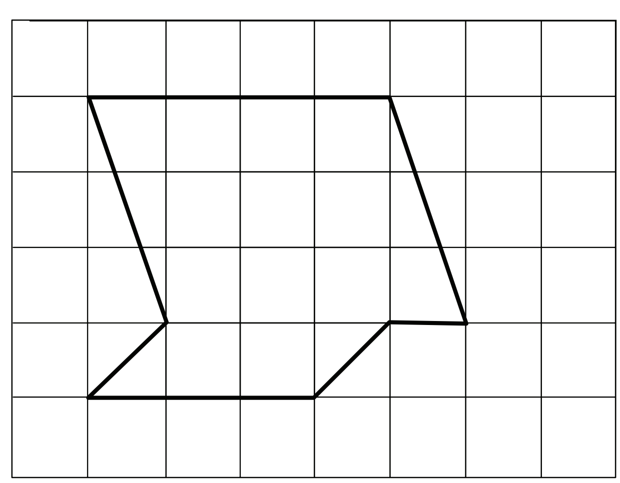
(**10** + **3** + **1** + **2.5** = **16.5** squares)

Step 5: Multiply 16 with the scale of the map

16.5 × 1 km^2 =16.5 km^2

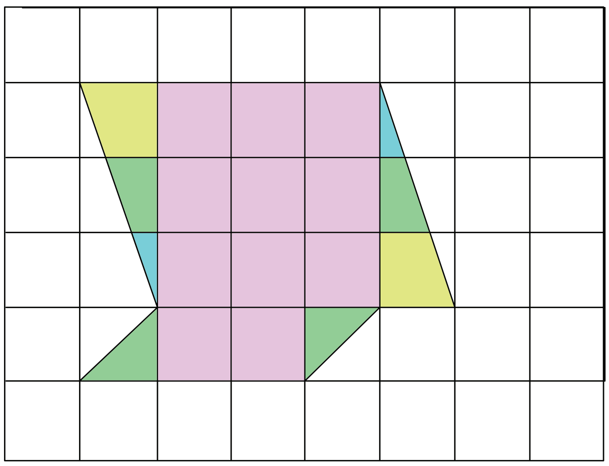
Hence the area of the given place is = 16 square Km.

Example:2



Measure the given area using square method: scale is 1 centimetre = 1 kilometre (area of one small square = 1 square Km)

Solution:



Step 1: Count the number of full squares first = 11

Step 2: Next, count the numbers of the fractional squares

¾ square = 2,

½ square = 4 and

¼ = 2

Step 3: Calculate the total number of squares

$11 \times 1 = 11$

Number of 3/4 square:

$2 \times 3/4 = 1.5$

Number of 1/2 squares:

$4 \times 1/2 = 2$ and

number of 1/4 squares:

$2 \times 1/4 = 0.5$)

Step 4: Add all these values

(**11 + 1.5 + 2 + 0.5 = 15** squares)

Step 5: Multiply 15 with the scale of the map

$15 \times 1 = 15\ km^2$

Hence the area of the given place is = 15 square Km.

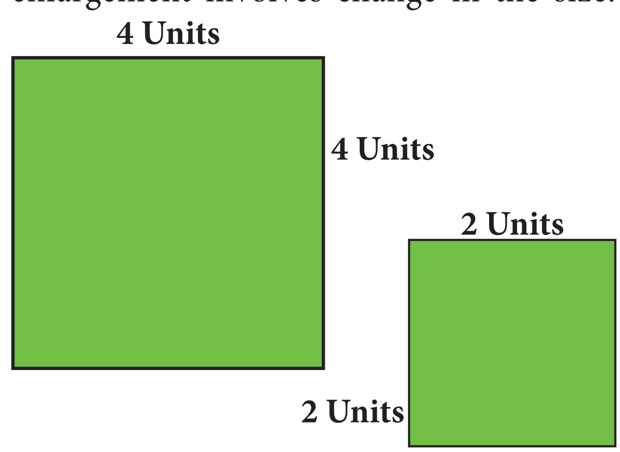
Activity

https://www.makeuseof.com › Internet

Measure the area of any selected village/plot /area of your choice using this link.

9.5 Enlargement and reduction of maps

In the process of compiling maps ~~cartographers are often required to either~~ reduce or enlarge maps. Reduction or enlargement involves change in the size.



An enlargement provides the same map but proportionally larger than the original.

A reduction gives the same map that is proportionally smaller than the original.

The above image or map has been reduced by ½ .The amount that an original image has been enlarged or reduced is called a **scale factor,** or an **enlargement** or **reduction factor**. It is the constant factor by which all dimensions of an object are enlarged or reduced in a map. If shapes have been reduced by half, the scale factor is ½.

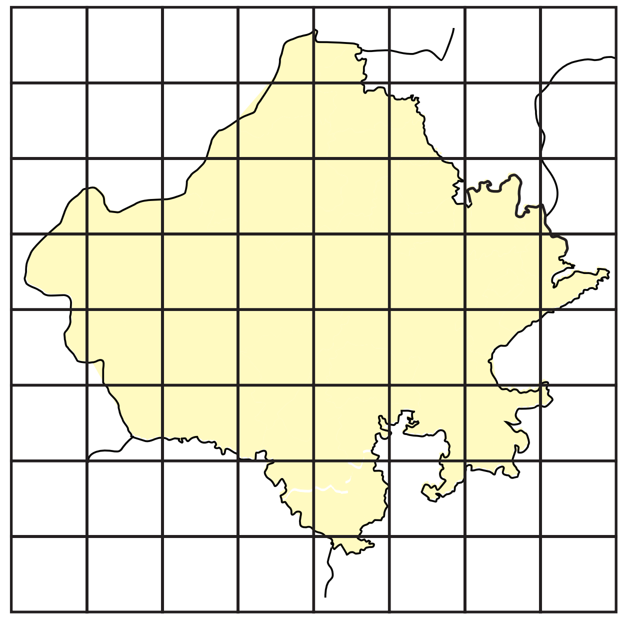
The ratio between the area of a map on one scale and its area to another scale is equal to the square of the ratios between the scales of the original and enlarged or reduced maps.

Graphical Method

Graphically maps can be enlarged or reduced with the help of similar squares.

The square method is the most common and simplest method for enlargement and reduction of maps. In order to enlarge a map, cover the original map with a set of squares of equal sides. The side of the squares has to be enlarged proportionally to that the original map. The side of the square of the new map has to be determined using the formula.

Step 1: Draw a network of squares on the original map, each side being 1 cm. in length.



Rajasthan R.F=1:16,000,000

Scale of the new map $= \dfrac{\text{New scale}}{\text{old scale}} \times$ Side of the square of the original map.

Example: 2

This is a map of Rajasthan drawn on a scale of 1/16,000,000 and is to be enlarged on the scale of 1/8,000,000.

To enlarge the given map on the scale of 1/8,000,000:

Step 2: Calculation

When the scale is 1/16,000,000 the side of the small square is one cm.

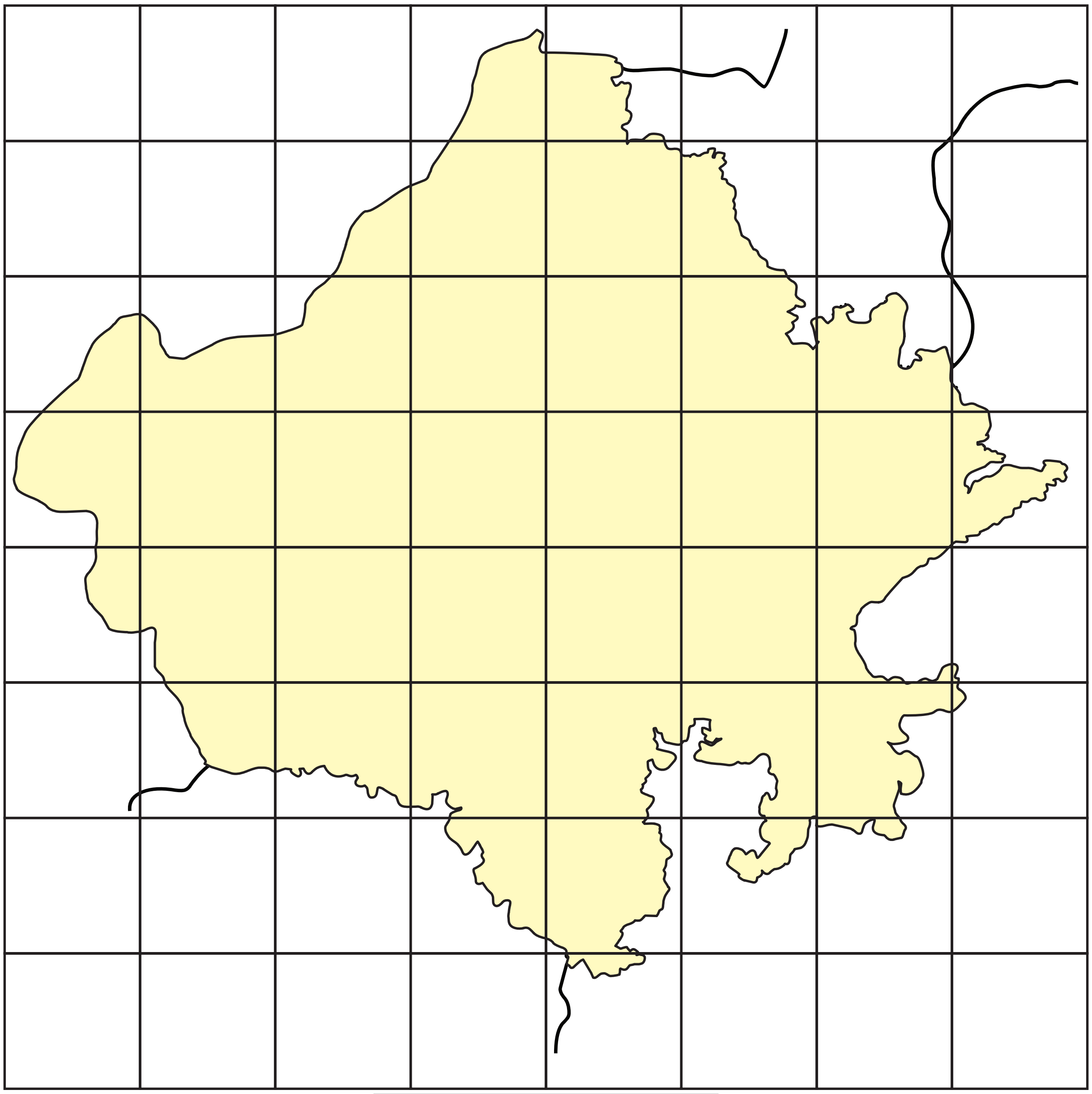
For Scale of the map 1/16,000,000 side of the small square =1 cm

Therefore, If scale is to be 1/8,000,000 side of the small square of new map = x

$$X = \frac{1/8{,}000{,}000}{1/16{,}000{,}000} \text{ x } 1 \text{ cm}$$

$$X = \frac{1 \text{ x } 16{,}000{,}000}{1 \text{ x } 8{,}000{,}000} = 2\text{cm}$$

When the scale is 1/8,000,000 the side of the small square will be 2cmNow draw a network of squares, each side measuring 2 cm. The number of squares will be the same as on the original map. Now transfer the outline of original map on the enlarged map square by square.



R.F= 1:8,000,000

Example: 3

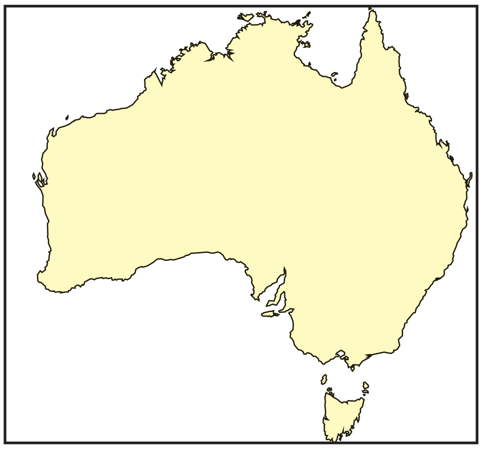
This is a map of Australia drawn on the scale of 1/32,000,000 and is to be enlarged on the scale of 1/16,000,000. The side of each square is ½ cm.

Calculation

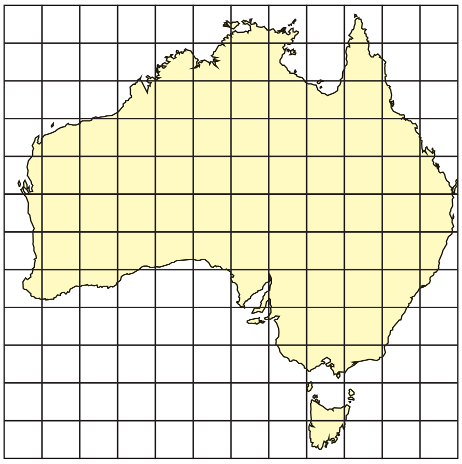
To enlarged the given map on the scale of 1/16,000,000:

In the given map, when the scale is 1/32,000,000 the side of the small square is 0.5 cm.

Australia

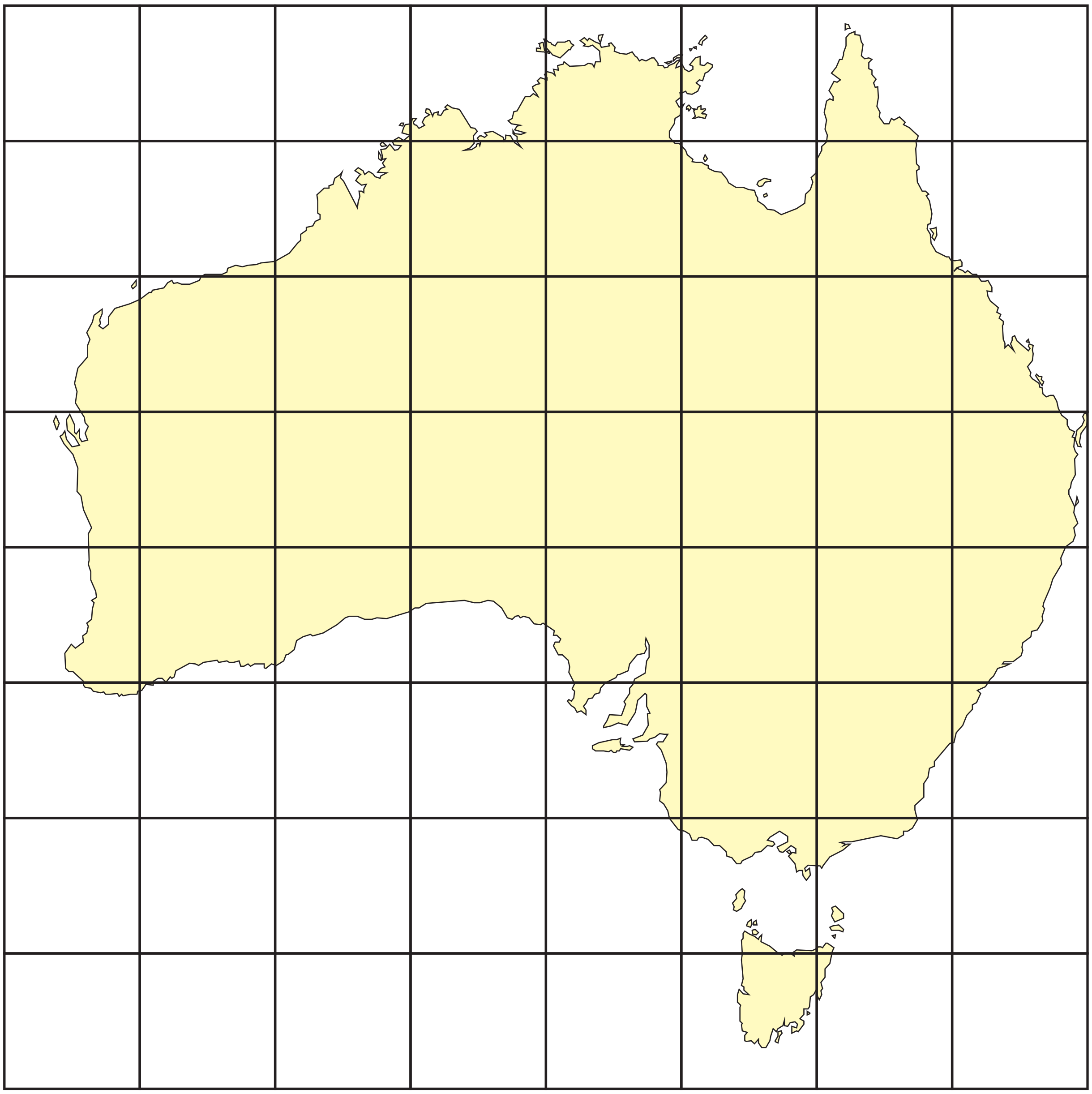


R.F= 1:32,000,000



Australia

R.F= 1:32,000,000



Australia

R.F= 1:16,000,000

Therefore, If scale is to be 1/16,000,000 side of the small square = x

$$X = \frac{1/16,000,000}{1/32,000,000} \times 0.5 \text{ cm}$$

$$X = \frac{32,000,000}{16,000,000} = 2 \text{ cm}$$

When the scale is 1/16,000,000 the side of the small square will be 2 cm. Now draw a network of squares, each side measuring 2 cm. The number of squares will be the same as on the original map. Now transfer the outline of original map on the enlarged map.

Exercise:

Trace the outline of any two districts of Tamil Nadu from your atlas and enlarge and reduce the same.

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References

1. Singh R.L. and R. Singh (2001) Map Work and Practical Geography, Central Book Depot, Allahabad.
2. Singh L.R. (2013) Fundamentals of Practical Geography, ShardaPustakBhavan, Allahabad.