

7

Introduction to Maps

The universal media of expression in which, the geographical information of the earth is represented to a scale on a flat surface is known as a map. Maps occupy a prominent place among the methods and techniques used to present geographical data and information. Hence, it is important to be aware of map reading, construction of maps and uses of maps.

The main objective of this chapter is to create an understanding about,

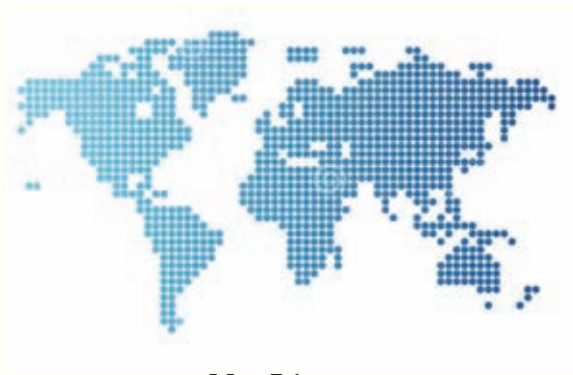
- Introduction to a map.
- Types of maps and their uses
- Basic features of the 1: 50 000 Topographic maps used in Sri Lanka.

Using maps for various purposes has taken place since ancient times. A map drawn on a clay tablet by a Mesopotamian to show the location of the region where he lived over 5000 years ago is considered as the oldest map discovered so far. Even in such eras, man was enthusiastic to map some features found in his surroundings. Cartography which began in that manner, has evolved up to the present, to become a developed science.



Figure 7.1

The oldest map drawn on a clay tablet



Map 7.1

A world map prepared using computers

At present, the following techniques are used for the purpose of mapping various types of geographical information accurately.

- Global Positioning System (GPS)
- Geographic Information System (GIS)
- Remote Sensing (RS)

The physical and cultural information on the earth's surface, information about the interior of the earth, the information about the planets and stars, as well as man made features on the earth's surface like administrative boundaries, latitudes and longitudes etc. are represented on maps.

The main features of a Topographic map

- Contracting the landscape to a scale.
- Indicating location and direction accurately.
- Presenting much spatial information.
- Presentation of accurate relationship among the various kinds of spatial information. for example - Distance between two places, pattern of distribution, extent. etc.
- Use of colours and symbols to represent information.
- Generalization of the earth's surface.

A map presents physical and cultural features on the land on a flat surface to a scale.

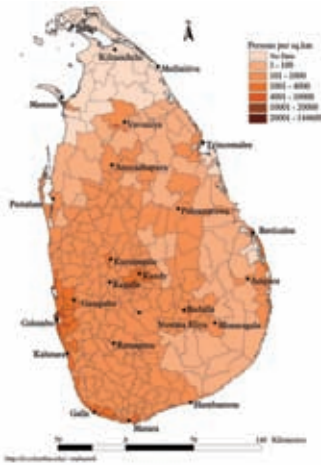
Types of Maps and their uses

There are two types of maps.

1. Thematic Maps
2. Topographic Maps

Thematic Maps

A thematic map is constructed to present the information under one specific field only. The heading of the map is given according to the information represented on the map. Several such thematic maps are given under Maps 7.2.



Distribution of population in Sri Lanka



Relief map of Africa



Rubber cultivation in Sri Lanka



Road map of Sri Lanka

Thematic Maps



Tourist regions in Sri Lanka



Map of Political Divisions in Australia

Population density in Asia



Maps 7.2
Several Thematic Maps

Uses of Thematic Maps

- Since the information represented on the map is not complex, it can be easily understood.
- Ability to compare various thematic maps with each other.
Examples - Climatic maps with natural vegetation maps
- The importance of each thematic map related to education, tourism, and development activities.
- Use of thematic maps in planning.
- Ability to have a good understanding of regional, spatial or field pattern.

Topographic Maps



Map 7.3
An extract from 1:50 000 Topographic map

A Topographic map is constructed including physical and cultural features.

Accordingly, on a topographic map, diverse features such as relief, drainage, natural vegetation, settlements, agricultural crop cultivations, cities, roads, railway lines, administrative boundaries, latitudes and longitudes etc are included.

Characteristics of Topographic Maps	Uses of Topographic Maps
<ul style="list-style-type: none"> ● Representation of various topographical features of a certain area. ● Showing relief features using contour lines. (mountains, valleys, spurs, plateaus etc). ● Use of conventional symbols and colours to represent cultural features and physical features. 	<ul style="list-style-type: none"> ● Ability to understand the physical features and their inter-relationships. ● Ability to understand the relationship between drainage patterns and relief . ● Clarification of the relationship between physical features and human activities. ● Ability to form an idea about land use patterns. ● Ability to identify the administrative boundaries separately. ● Ability to have an overall understanding about the region. ● Ability to utilize in development activities.

Activities

1. Define what a map is.
2. With reference to an atlas, name five thematic maps of Sri Lanka and five thematic maps of the world separately.
3. List out separately physical and cultural features found in Topographic map 7.3.

Identifying the Peripheral Information with reference to 1: 50 000 Topographic maps of Sri Lanka

Among the maps of different scales, the 1:50000 Topographical map occupies a prominent place. It is accepted as a medium scale map. At the beginning of the 1980 decade, the Survey Department of Sri Lanka began to construct a map of Sri Lanka using metric measurements. The scale of this map is 1:50 000 and contour interval is set 20 metres. The distance of 1km on land is represented on this map by 2cm. The longest distance of Sri Lanka

from Point Pedro to Dondra Head is 432km. The maximum breadth from Colombo to Sangamankanda Point is 224km. (Refer Map 7.4) According to 1:50 000 scale, the length of this map is $(432\text{km} \times 2)$ 864cm (8.64m) and width of this map is $(224\text{km} \times 2)$ 448cm (4.48m). Since it is difficult to handle such a large map, it has been printed in 92 map sheets for the convenience of use (Refer Map 7.6).



Map 7.4
Extent of Sri Lanka

The land area covered by such a map sheet is

Length - 40km

Width - 25km

Area of the region $-40 \times 25 = 1000\text{km}^2$

According to 1:50 000 scale the extent of the mapped area

Length - $40\text{km} \times 2 = 80\text{cm}$

Width - $25\text{km} \times 2 = 50\text{cm}$

Area,

$80\text{cm} \times 50\text{cm} = 4000\text{cm}^2$

The Model of a 1:50000 Topographic Map

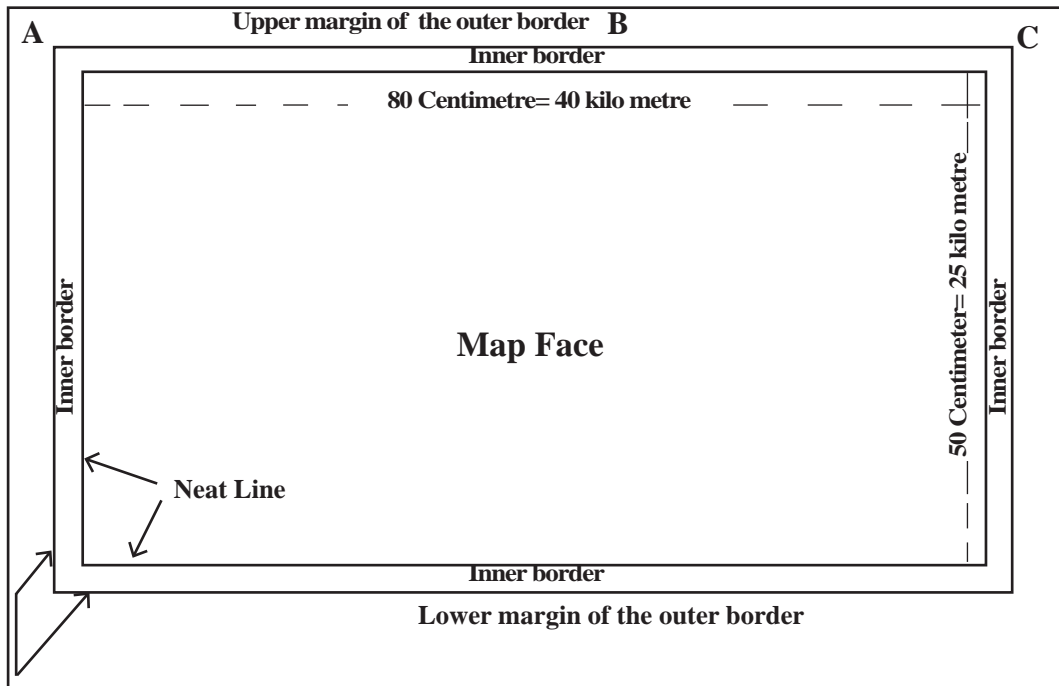
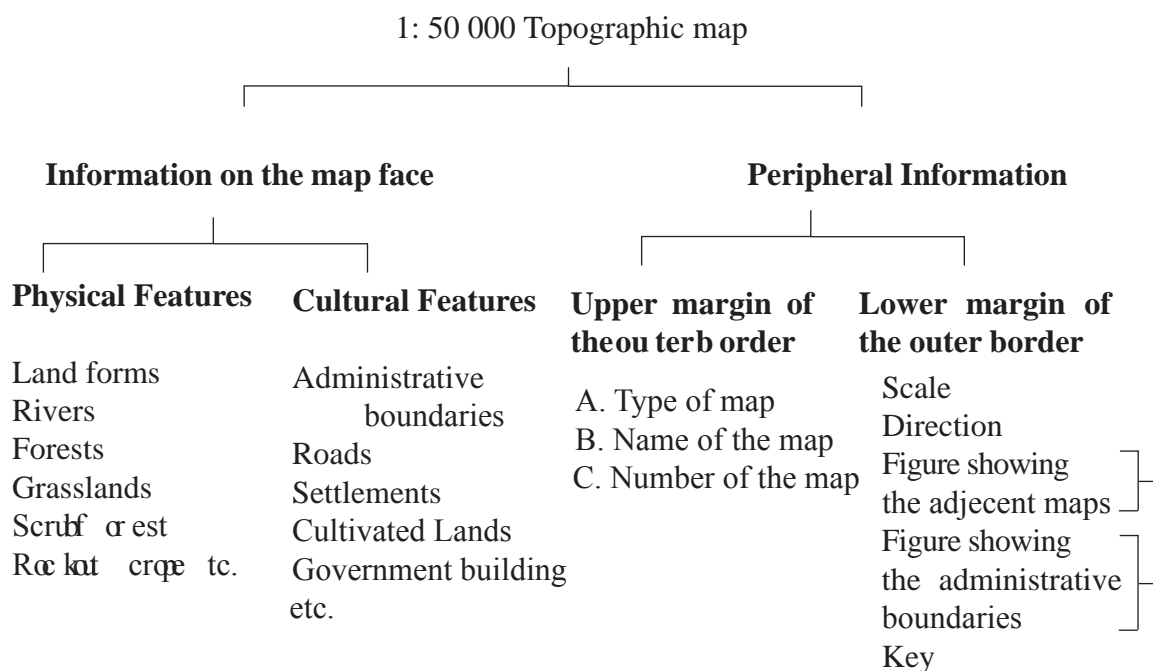


Figure 7.2
The model of a 1:50 000 Topographic map

Physical and cultural features of the relevant area have been mapped on the map face. Peripheral information help to read and understand the contents of the map face. In the inner border of Topographic maps, values of latitudes and longitudes as international coordinates, values of coordinates of the national grid, terminus of roads and the distances to them from the border are mentioned.

The contents of a 1:50 000 Topographical map can be divided as follows.



Activity

Studying a 1:50 000 Topographic map, list out the information included in the upper margin and lower margin of the map.

Location - Location of any place on the 1:50 000 Topographic map of Sri Lanka can be identified in two ways.

1. According to latitudinal and longitudinal values.
2. According to national (metric) coordinates.

The absolute location of Sri Lanka (according to the latitudes and longitudes)

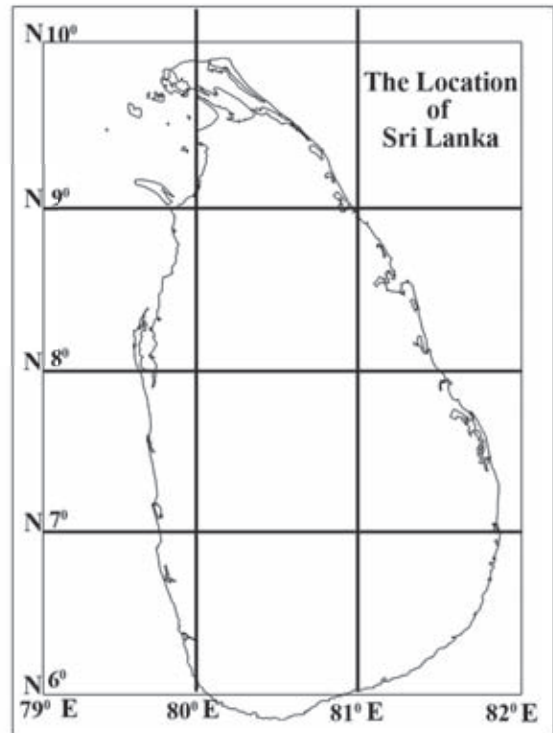
From North Latitudes $5^{\circ} 55'$ to $9^{\circ} 51'$

From East Longitudes $79^{\circ} .42'$ to $81^{\circ} .52'$

(Refer Map 7.5)

On the East and West borders of the neat line of a 1:50 000 Topographic map, the latitudinal values and on the north and south borders, the longitudinal values are marked.

1 degree (1°) = 60 minutes ($60'$)
1 minute ($1'$) = 60 seconds ($60''$)



Map 7.5
Absolute location of Sri Lanka

On the 1:50 000 Topographic maps values of latitudes and longitudes have been marked at 5 minute interval.

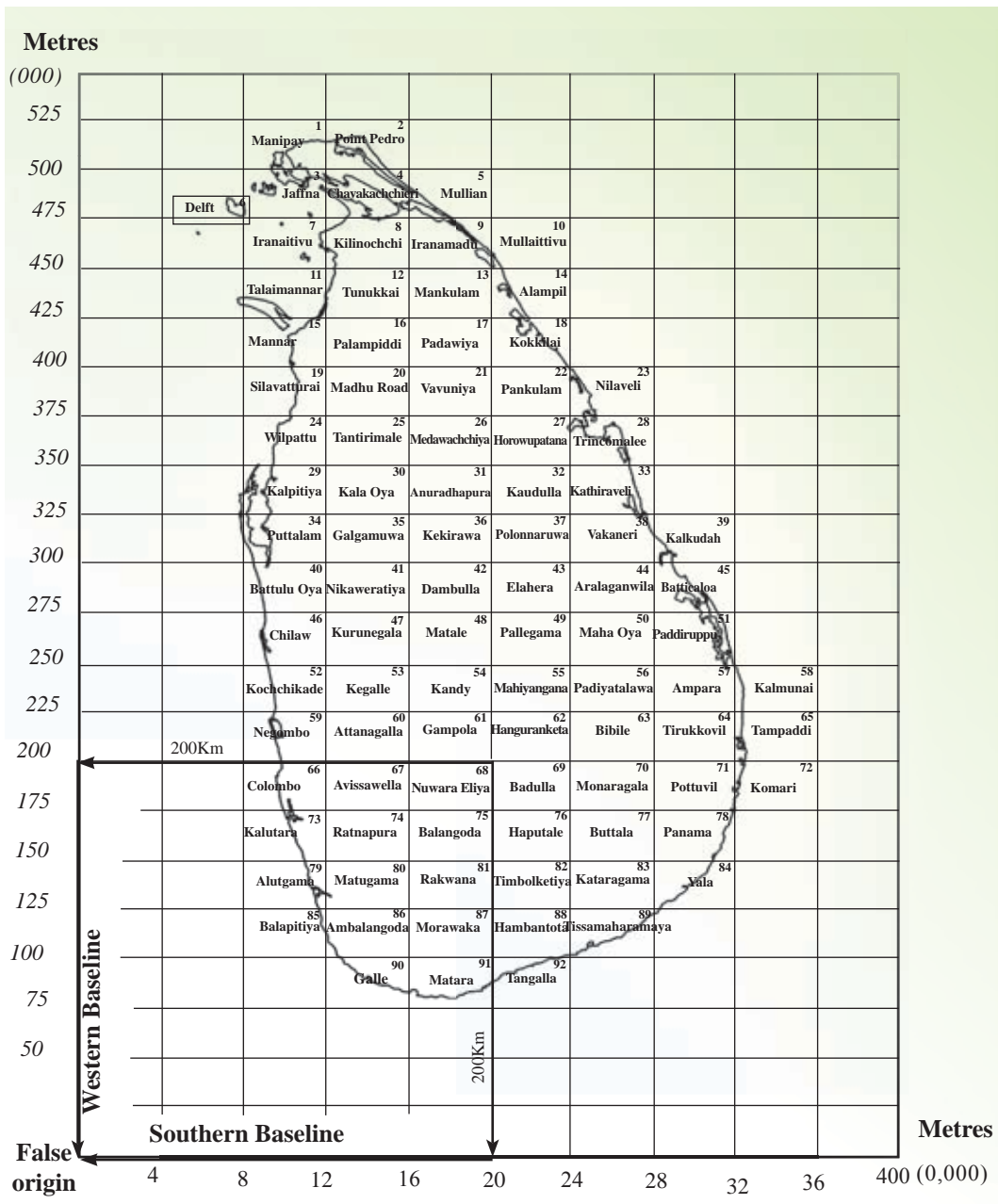
Example

In Vavuniya metric map, latitudes are marked as $8^{\circ} .35'$, $8^{\circ} .40'$, $8^{\circ} .45'$ and longitudes are $80^{\circ} .25'$, $80^{\circ} .30'$, $80^{\circ} .35'$, $80^{\circ} .40'$, and $80^{\circ} .45'$.

While values of latitudes and longitudes are marked along the border line, places where the latitudes and the longitudes intersect are marked by the symbol of \dagger on the map face. This information is useful to find the absolute location of any place in Sri Lanka. When the absolute location of a certain place in Sri Lanka is shown, it should be expressed in north latitudes and east longitudes.

Activities

1. Take 1:50 000 Topographic map and write down the values of the latitudes and longitudes found there.
2. Select two points where the latitudes and the longitudes intersect and write the absolute location of those points.



Map 7.6
The grid on which metric maps of Sri Lanka
have been constructed

National (Metric) Coordinates

In constructing a map, a projection should be used. 1:50 000 Topographical map of Sri Lanka has been constructed based on Transverse Mercator projection. The Peak of Pidurutalagala mountain, the highest point located in the Central Hills of Sri Lanka has been selected as the base point to prepare this metric grid system. The point of origin of this grid system is located at a place where the vertical line that is drawn towards the south from a point, 200km west of the peak of Pidurutalagala intersects the horizontal line that is drawn towards the west from a point located 200km south of the peak of Pidurutalagala. This point is located in the Indian Ocean. This limit of 200km is at present increased to the limit of 500km. A map reader can read the values in metres too.

From the point of origin, a grid network that spreads 25km to 25km towards north and 40km to 40km towards east has been constructed covering the whole land area of Sri Lanka. Out of it, choosing 92 grids (rectangles) that cover the whole land area of Sri Lanka, ninety two 1:50 000 map sheets have been constructed. On these map sheets national (metric) coordinates have been marked at 5km intervals. (on map 10cm intervals). The land area represented in one topographical map sheet is 1000km².

On 1:50 000 maps of Sri Lanka,

- A square grid has been created using national (metric) coordinates.
- Vertical and horizontal lines of this grid system are drawn in blue.
- Starting points of National metric coordinates that run towards the north and the east have been marked respectively as mN (metres to North) to north and to the east as mE (metres to East) from the points of origin.

For example, on the Vavuniya National (metric) coordinates grid, X is located 385 000m to the north and 185 000m to the east.

When National (metric) coordinates values are mentioned, on every map sheet the initial value is indicated as a whole number in metres at the south west corner and other values are marked omitting the last three digits.

Examples-

375 000 mN (metres to North)

160 000 mE (metres to East)

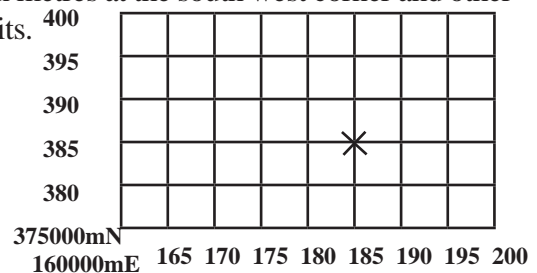


Figure 7.3
Model of national (metric) coordinate grid of Topographic map of Vavuniya

Activity

Refer to an 1:50 000 Topographic map available in your school and select two places where the coordinates intersect. Show the location of (national) coordinates of those places.

Indicating Directions

The direction is helpful to understand the information included in the map correctly. Generally, the north of a map is indicated by an arrow (Figure 7.4). Accordingly, other main directions and sub directions can be identified. On the 1: 50 000 Topographic maps a special figure is included to indicate the directions at the lower margin where the peripheral information of a map is included.



Figure 7.4

The figure showing the direction of a map

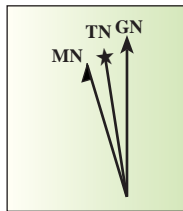


Figure 7.5

The figure showing the direction in 1: 50000 Topographical map

True North (TN)

Magnetic North (MN)

Grid North (GN)

True North

The true north is shown by a line that ends in a star. It is known as geographical north too. The direction where the North Pole in the globe is located is indicated by this.

Magnetic North

The north that is based on the magnetic field of the earth is called the magnetic north. It is shown by a line that ends with one half of an arrow point.

Grid North

The grid north that is indicated by a vertical line with a full arrow head is the north of the grid of the map. There is a small angular difference (3°) between the true north and the grid north. This angular difference between true north and grid north can be observed declined towards left on the map located east of Pidurutalagala mountain range and declined towards right to the grid north on the map showing west of Pidurutalagala mountain range.(Figure 7.7)

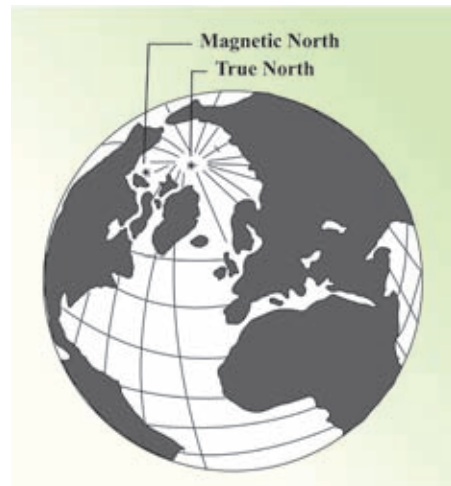


Figure 7.6

Location of true north and magnetic north

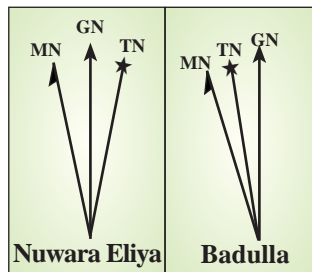


Figure 7.7

The variation of the figure indicating direction in maps with national coordinates based on Pidurutalagala

Activity

Observing several 1:50 000 maps available in your school, name five maps where the variation of the figure indicating direction is found.

Orienting

Orienting is very essential to read and understand a map accurately. Orienting a map means setting the direction of the map to the corresponding direction of the area shown on the map. A compass is required to do this accurately. When there is no compass, orienting the map can be done roughly identifying the direction according to the sun rise.

Scale

The ratio of the distance between two places on the map and the true distance between the corresponding places on the land is called the scale. In map reading the scale is very essential.

In 1: 50 000 Topographic maps, the scale is depicted in two ways

1. Linear scale
2. Representative fraction

Linear Scale

Construction of a scale on a horizontal line is linear scale. By the scale of 1: 50 000 Topographic maps, 1cm on the map represents 50 000cm (0.5km) on the land. Accordingly, 1km on land is represented by 2cm on map.



Figure 7.8

The figure showing the linear scale on a 1:50000 Topographic map

When constructing the linear scale

- Draw a horizontal line of 10cm in length and divide it into sections of 2cm (1km)
- Omit the first 2cm and number the others as 0, 1, 2, 3, 4
- To the left from the zero, mark 1. Divide that section into 10 sub divisions of 2mm to indicate the distance of 1/10 of a kilo metre. 100m on land is represented by one such part. (to show very short distance)
- Write km at the two ends of the line.

Representative Fraction

- To state scale as a ratio is the representative fraction.
- On topographic maps representative fraction is shown as 1:50 000.
- The special feature of showing this scale as a ratio is the ability for any person who uses any type of measuring unit in the world to measure the real distance between two places accordingly.
- According to the scale, the distance and area of the land can be calculated.
- In 1: 50 000 Topographic maps, the scale is shown in the lower margin of the outer border.

Calculation of Distance

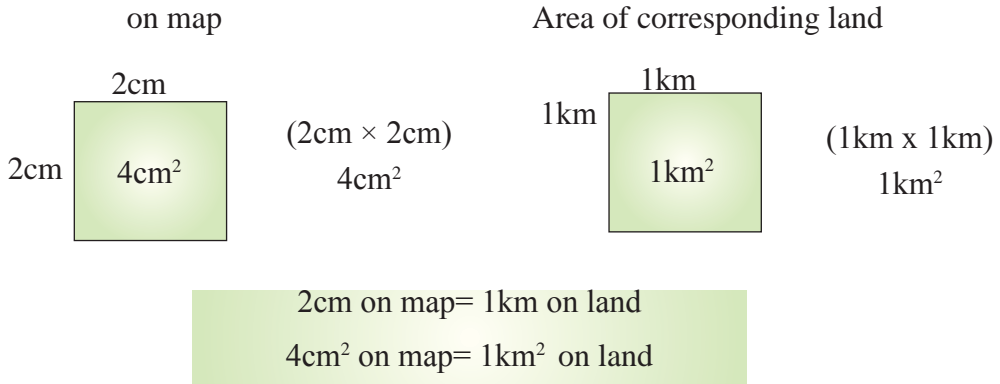
- 1 km on the land is represented by 2cm on the map. Accordingly, the actual distance of a road that runs over 10cm on the map is $(10\text{cm} \div 2)$ 5km.
- According to 1: 50 000 scale when a 7 km long road is mapped the length of it on the map is 14cm $(7\text{km} \times 2)$.

Activities

1. Select a segment from a Topographical map. Measure the length of a selected road or part of it and calculate the true distance in kilometres.
2. State the following in centimetres according to the scale of 1: 50 000.
A grade road of 3km long.
An irrigation canal 4km long.

Area (Extent)

According to the 1:50 000 scale, the area of 2 cm \times 2cm square is 4cm². True area represented by 4cm² on the map is 1km length and 1km in width. The area of this land is 1km².



Accordingly, a simple method can be followed to convert the area of a part of a map into the area of the corresponding land. According to the above example, the area of 2cm × 2cm part in a map that is constructed to the scale of 1:50 000 is 4cm². When it is divided by 4 the answer is 1. Hence, this value should be considered as 1km² and not as 1cm². In the same manner, when the area on the land is multiplied by 4, the area on the map of the corresponding land can be obtained. It must be considered as cm², but not as km².

On land, length of a side of square shape paddy field is 2km. The area of paddy field is 2km×2km= 4 km².

When this paddy field is represented on the map the length of one side is 4cm. The area of it on the map 4cm × 4 cm= 16cm².



Activities

1. Show the following areas in cm² according to 1:50 000 scale.
1km², 3km².
2. Show the following areas in km² according to 1:50 000 scale.
8cm², 16cm²

The Key

The physical and cultural features of the relevant area are included on a map. A key is needed to read and understand the information on the map. The symbols which are used to represent such information are included in the key. On 1:50 000 topographic maps, the key is organized under eight main headings. (Figure 7.9)

1. Boundaries.
2. Tourist Information.
3. Roads and associated features.
4. Railways and associated features.
5. Drainage.
6. Relief.
7. Vegetation.
8. Other features.

The symbols and colours relevant to the above information is depicted in the lower margin of the outer border of 1: 50 000 Topographical maps. Different colours are used for different symbols. Several examples are shown below.

Blue	- Rivers, tanks, canals, seas, and features linked to water.
Yellow	- To all home gardens.
Green on yellow	- the symbols relevant to different crop cultivations
Dark Yellow	- Minor roads.
Green	- Paddy cultivation.
Red	- Main roads, Administrative boundaries, Railway stations, schools, courts and some cultural features.
Black	- Railway lines, rock outcrops, boundaries of forest Reserves, Settlements.
Brown	- Tank bunds, contour lines.

Conventional Signs (Legend)



Sri Lanka Survey Department

Figure 7.9 Figure showing the conventional signs in the 1:50 000 topographical map

Activity

Draw and name the conventional symbols shown under the eight headings on 1: 50 000 Topographic maps using relevant colours.

Other Peripheral Information

Sheet Number, Heading, Year of Print, adjoining maps

Sheet Number

The Topographic maps constructed for Sri Lanka are serially numbered from 1 to 92. The relevant number of the map is printed at the top right corner and at bottom left corner respectively.

Name of the Map (Heading)

Each 1:50 000 Topographical map has a name. It is printed in the centre of upper border. The name of a town or region in the mapped area has been used as the name of the map.

Example - Sheet no 21 –Vavuniya

Year of Print

The year of print and the years the map was revised are printed in lower margin of a Topographic map.

Adjoining Maps

On the topographic maps you study, a figure showing the location of adjacent maps is included in the lower margin under peripheral information.

Example- Showing adjoining maps of Vavuniya metric map

Palampiddi 16	Padaviya 17	Kokilai 18
Madu Road 20	Vavuniya 21	Pankulam 22
Tantrimalai 25	Medawachchiya 25	Horowpatana 27

Activity

Take a topographical map and show the location of adjacent map with sheet numbers in a grid diagram.

According to above information, the peripheral information of 1:50 000 Topographical maps is shown in the upper margin and the lower margin. When you study a Topographic map representing any part of Sri Lanka, you will get a correct understanding of that region through the peripheral information. Hence, the map has become an essential tool for diverse activities.

Activities

1. State the two methods of showing the scale of a map.
2. Present the scale of 1:50000 Topographic maps by these two methods.
3. Explain why the first part of a linear scale is divided into sub parts.
4. State the scale of the map as a ratio.
5. What is the area in km^2 represented by each sheet according to the scale of 1:50 000.
6. Draw the followings using conventional colours and symbols to 1:50 000 scale.
 1. Main road (A) of 4km in length.
 2. An irrigation canal of 3km in length.
 3. A large paddy field of 2km^2 .
 4. Built up area over 1km^2 .

Assignment

Group the Students and select one metric map for each group, construct a plan including all peripheral information you have studied.

Bibliography and Sources

- නවීන ගුණசේන - ෆිලිප්ස් ලෝක සිතියම් පොත (2003), සීමාසහිත ඇම්. ඩී. ගුණසේන සහ සමාගම, කොළඹ.
- ප්‍රායෝගික භූගෝල විද්‍යාව, අ.පො.ස උසස් පෙළ (2009), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.

Glossary

Geographical data	- භූගෝල විද්‍යාත්මක දත්ත	- පுவිච්චියල් තරඟුකුණ
Cartography	- සිතියම් විද්‍යාව	- පටවරෙකලෙච්චියල්
Spatial information	- අවකාශීය තොරතුරු	- ඉඳුණුසාර් තකවල්කුණ
Global Positioning System	- ගෝලීය ස්ථානගත කිරීමේ පද්ධති	- පුකුණුආල නිලෙච්චිආරුආරුආරු (මුණෙච්චිය)
Geographical Information Systems	- භූගෝල විද්‍යාත්මක තොරතුරු පද්ධතිය	- පුවිච්චියල් තකවල් ඉඳුණු
Remote Sensing	- දුරස්ථ සංවේදය	- තුණෙච්චියල්
Latitudes	- අක්ෂාංශ	- අකලකුණුකුණු
Longitudes	- දේශාංශ	- තුණුකුණුකුණු
Thematic maps	- තේමා සිතියම්	- කුණුකුණුකුණු පටකුණු
Peripheral Information	- පර්යන්ත තොරතුරු	- ආලෙච්චියල් තකවල්කුණ
Information on the map face	- මුණුකුණු තොරතුරු	- පටකුණුකුණුකුණු තකවල්කුණ
Metric Coordinates	- මෙට්‍රික් ඛණ්ඩාංක	- තුණුකුණුකුණු
Topographical maps	- භූ ලක්ෂණ සිතියම්	- ඉඳුණුකුණුකුණුකුණු පටකුණු
Climatic zones	- දේශගුණික කලාප	- කාලනිලෙච්චියල් වලකුණු
Population Density	- ජන ඝනත්වය	- ජනතුණුකුණුකුණුකුණු
Physical features	- භෞතික ලක්ෂණ	- තුණුකුණුකුණුකුණු
Cultural features	- සංස්කෘතික ලක්ෂණ	- තුණුකුණුකුණුකුණු
Drainage pattern	- ජලවහන රටා	- වකුණුකුණුකුණුකුණු
Contour lines	- සමෝච්චි රේඛා	- ජනකුණුකුණුකුණු

● Mountain ranges	- கஜவரீ	- மலைத்தொடர்கள்
● Valley	- நிலைய	- பள்ளத்தாக்கு
● Spur	- நெரூல	- சுவடு
● Key	- ஐலகய	- குறியீட்டு விளக்கம்
● Scale	- பரிமான்ய	- அளவுத்திட்டம்
● Administrative borders	- பரிபாலன மூடீ	- நிர்வாக எல்லைகள்
● Absolute location	- தீரபேகீய பீதிபீ	- முழுமை அமைவிடம்
● Relative location	- ஑ாபேகீய பீதிபீ	- சார்பு அமைவிடம்
● Projection	- ப்ரகீயபீய	- எறியம்
● False origin	- லயாச லீலய	- போலியான தோற்றம்
● True North	- ஑ரூ஑ ஑கூர	- உண்மை வடக்கு
● Magnetic North	- ப்ரூபீகை ஑கூர	- காந்த வடக்கு
● Grid North	- சால ஑கூர	- பையாயரி வடக்கு
● Linear scale	- ஑ீலீய பரிமான்ய	- நேர்கோட்டு அளவுத்திட்டம்
● Representative fraction	- தீயேசீய பரிமான்ய	- வகைக்குறிப் பின்னம்