

STUDY OF TOPOGRAPHIC MAPS

34.1 INTRODUCTION

Maps are indispensable tools in the study of geography. Various types of maps are used for different purposes. Some of these maps are drawn on a small scale and some on large scale. The main purpose of drawing maps on a very large scale is to study natural and cultural features of an area in much details. As you know, the surface of the earth is made up of a large number of relief features such as mountains, plateaus, plains, rivers, lakes, oceans etc. These relief features are best represented by models which are three dimensional but they are very costly, heavy and cumbersome to handle. However, these difficulties are solved by representing the relief features through maps and diagrams. For representing these relief features on the maps, some specific symbols, signs and colours are used. In this lesson, we will study about these symbols, signs and colours used for representing the relief features on the maps. You will also study a topographical map with the help of all these signs and symbols. This will provide you basis for studying other topographical maps.

34.2 OBJECTIVES

After studying this lesson you will be able to:

- describe various methods of representing relief on a topographical map;
 - distinguish between bench mark and spot height;
 - draw a cross section/profile from a contour map choosing a suitable vertical scale;
 - calculate the area of the toposheet with the help of the map scale;
 - find out the contour interval of a given topographic sheet;
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- locate on a map of India, the area depicted on a given topographical sheet;
- identify various relief features shown in a toposheet;
- establish relationship between cultural features and relief features;
- identify various cultural and natural features with the help of symbols and conventional signs used in a map.

34.3 TOPOGRAPHICAL MAPS

Maps which represent a symbolic or conventional picture of the physical and cultural (man-made) landscape of small areas on a very large scale are known as topographical maps or topo-sheets. These maps are also described as scenery maps and are based on the actual survey of the area. The scale of the map is large enough to show the physical and cultural features in detail

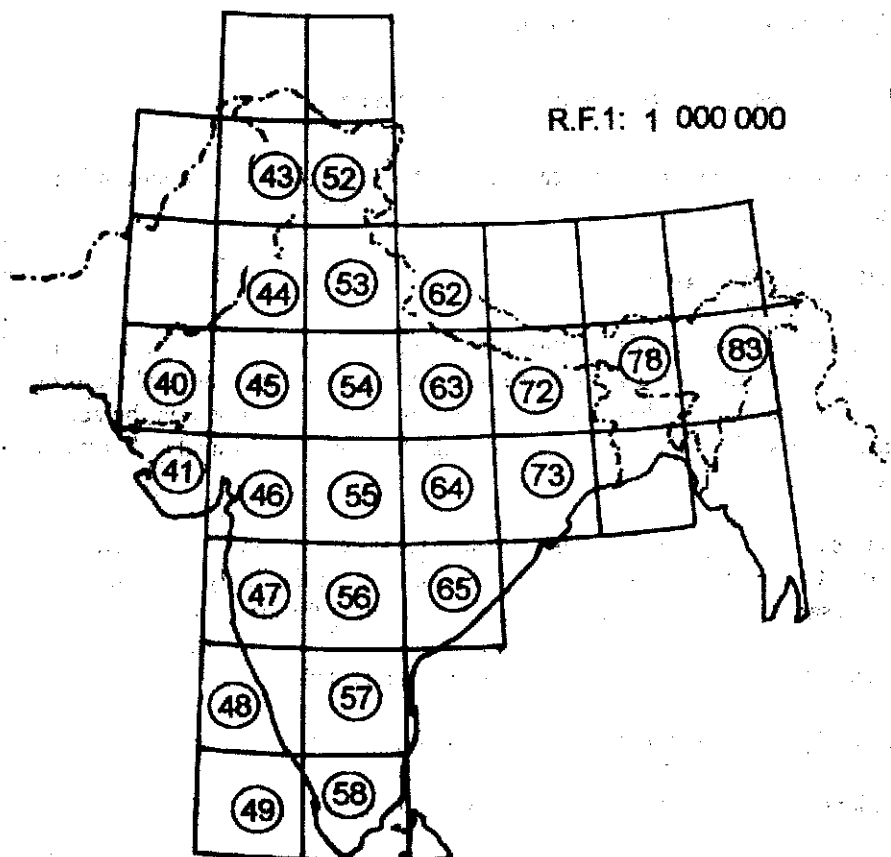
The main objective of drawing these maps is to present accurately the physical and cultural features in details. One gets the knowledge of the area through the study of these maps more or less in the same way as he would have got it by visiting the area.

The topographical maps are used by various people for different purposes.

- (i) A student of geography studies physical and cultural landscape of an area
- (ii) A traveller or a tourist tries to find out locations and plans his tour accordingly.
- (iii) A planner studies natural and cultural resources before planning for its economic development.
- (iv) A military general may require it to chalk out his strategy of defence or aggression.

34.4 USE OF CONVENTIONAL SIGNS

A map is a representation of an area of the earth's surface. It is expected to give a detailed picture. It must show all the features found within the area whether they are natural or man-made. But it will be impossible to write all the details of the area on to a map. In order to fulfill this end, various symbols and signs are used to depict physical features such as relief, drainage and vegetation etc. and cultural features such as human settlements, rail and road routes, temples, churches, mosques, villages, cities and bridges etc. on the map. The main purpose of using these signs and symbols and letters is to make a toposheet informative as well as legible for easy study. These signs are called conventional signs because these have been in use for quite sometime throughout the world. So before venturing to study a toposheet, it is imperative on your part to be familiar with the signs (see fig.34.1)



R. F. 1: 50 000

(A)	(E)	(I)	(M)
(B)	(F)	(J)	(N)
(C)	(G)	(K)	(O)
(D)	(H)	(L)	(P)

R. F. 1: 2 50 000

1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

Fig. 34.1 Arrangement of Sheets

It is also imperative on your part to know the different colours by which various features are shown. These conventional colours represent the following features:

The colour	The features Represented
Yellow	Area Sown
Dark Green	Area under Forest
Light Green	Grass lands
Brown	Contours
Blue	Water bodies
Black	Railway & Power lines
Red	Roads & Human Settlements

Methods of representing relief on map

Relief is the representation of the general surface variations of the ground. Relief features on a map may be represented through contours, spot heights, benchmarks, etc. Following are some techniques through which the relief features may be shown on toposheets.

1. Contouring is a technique in which all points having equal height are joined with the smooth curve. Contours are drawn at certain intervals called contour interval. It is fixed in a given map. A contour map provides information regarding the nature of slope. Steep slopes are indicated by close contours. In the case of gentle slopes contours are placed far apart.
2. Spot-heights are exact heights of places above the mean sea level marked by dots on a map. This technique becomes more effective when it is used along with other techniques of relief representation.
3. Benchmark is a reference point which is marked on a wall of prominent buildings. On a map it is indicated by the letters B. M.

34.5 IDENTIFICATION OF RELIEF FEATURES ON A MAP THROUGH CONTOURS

The arrangements of contours into various shapes on a map represent a number of relief features. They may be hill, valley, escarpments etc.

The representation of some of these relief features through contours is given below.

1. **Conical hill:** A conical hill on a map is represented by a number of concentric contours at regular intervals.

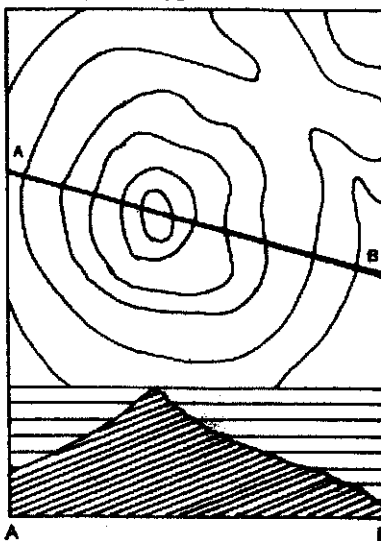


Fig. 34.2 A conical hills

The value of contours increases towards the centre (Fig.34.2).

2. Plateau: It is an upland area with steep slopes at the edge and a relatively wide flat top surface in the middle. On a map, contours are closely spaced on marginal slopes and they are absent or widely spaced on the plateau surface. The value of contours increases towards the top surface. (Fig. 34.3)

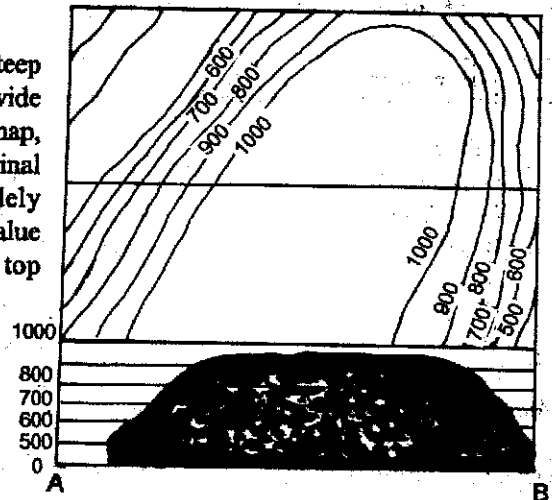


Fig. 34.3 A Plateau

3. Ridge: It is an elongated hill usually with a narrow width and steep sides. A ridge generally connects two and more peaks of a hill. Ridge is represented through elliptical contours on map. (Fig.34.4). The value of the contours decreases outwards.

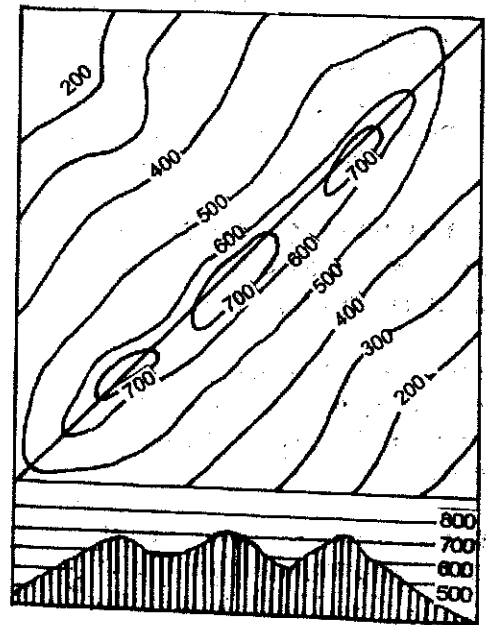


Fig. 34.4 A Ridge

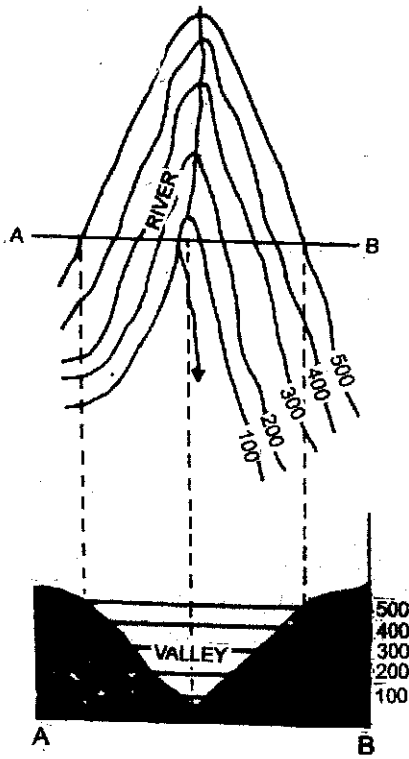


Fig. 34.5 A 'V' shaped valley

4. V-shaped valley: It is formed by a river in its youthful stage. The shape of such valley resembles the English alphabet 'V'. Therefore, it is called V-shaped valley. On a map, it is represented by V-shaped contours with the lowest values in the inner most contour. (Fig.34.5).

5. Cliff: It is an upward relief commonly seen with a sudden fall towards the sea. On a map, it is represented by contours running along the sea coast and generally merging with one another to form the face of the cliff. (Fig.34.6).

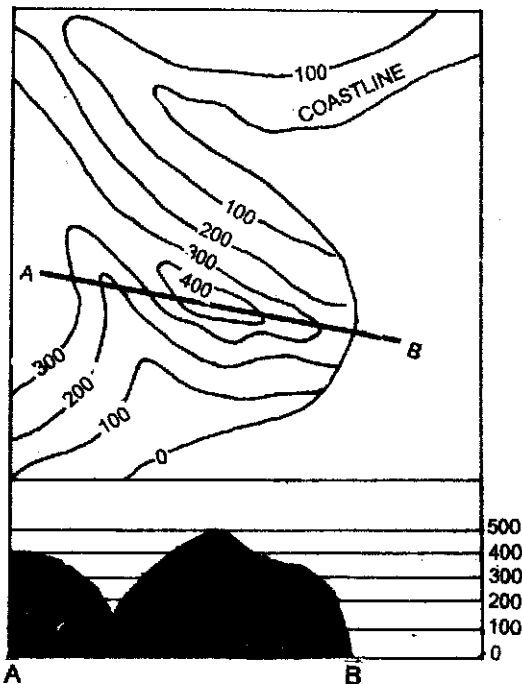


Fig. 34.6 A cliff

6. **Waterfall:** Sudden fall of a stream along a vertical slope is called a waterfall. Waterfall is represented by contours running closer to one another across the river channel (Fig.34.7).

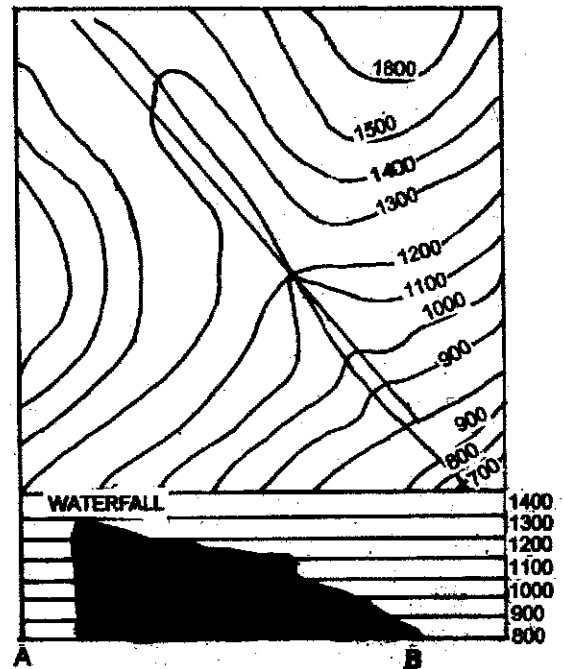


Fig. 34.7 A Waterfall

8. Slopes and their types.

(a) **Uniform slope:** regular slope in which uniformity exists from top to bottom is known as uniform slope. On a map, it is represented by evenly spaced contours. (fig. 34.8)

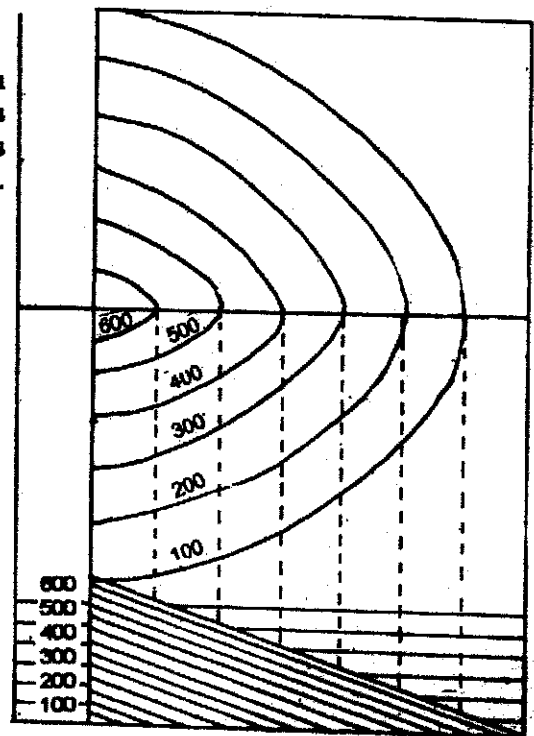


Fig. 34.8 A Uniform slope

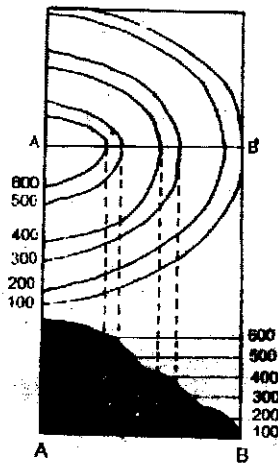


Fig. 34.9 A Undulating slope

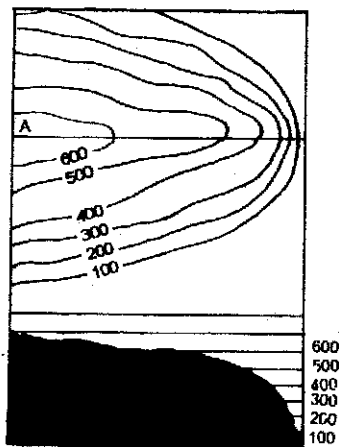


Fig. 34.10 A Cove slope

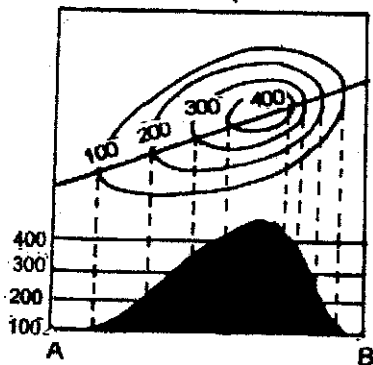


Fig. 34.11 A Gentle & Steep slope

(b) **Undulating slope:** irregular slope in which uniformity does not exist. On a map, it is shown by irregular and spaced contours. (fig. 34.9)

(c) **Convex slope:** It is a type of bulging slope in which the contours at the bottom are closely spaced while at the top they are widely spaced. (fig 34.10)

(d) **Gentle and steep slopes:** Gentle slope is represented by wider spaced contours while steep slopes are represented by closely spaced contours. (fig. 34.11).

(e) **Concave slope:** It is just opposite of convex slope in which the degree of slope is lesser at the bottom than at the top. The contours at the top are closer to one another and wider apart in lower parts. (Fig.34.12).

34.6 DRAWING OF A CROSS-SECTION OR A PROFILE FROM A CONTOUR MAP.

Profile is an outline of relief obtained through the cross-section of a contour map. It is considered to be the easier way of showing various landforms on maps along a certain chosen line.

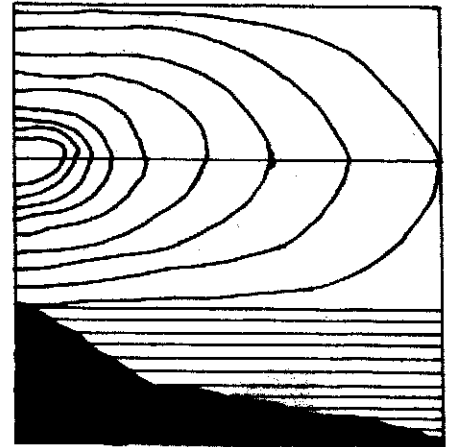


Fig. 34.12 A Concave slope

Following steps are needed in drawing the cross-section.

- (i) take a paper and put it on the line along which the profile is to be drawn;
- (ii) mark all the contour inter-sections along with their values.
- (iii) draw a base line equal to the line along which profile is to be drawn;
- (iv) erect a vertical line at one end of the base line and mark the chosen vertical scale on it
- (v) transfer the contour intersecting points on the base line, erect perpendiculars and join their top with the help of a curve.

34.7 INTERPRETATION OF TOPOGRAPHICAL MAPS OR TOPO-SHEETS

(a) **Introduction:** sheet number, region, extent, scale, contour interval, date of publication etc are included under this head.

(b) **Physiographic Informations:** Some basic and important physiographic informations should be studied under the

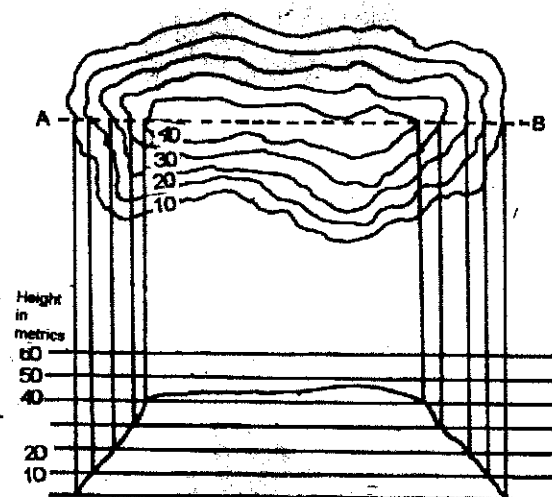


Fig. 34.13 A cross section profile

following heads:

- (i) Relief—nature and types of landforms (mountain, plain, plateau etc), average height and general slope, important hills, valleys etc.
- (ii) Drainage—important rivers and their tributaries, drainage patterns.
- (iii) Vegetation— areas covered by vegetation, types of forest (protected or reserved) and other types of trees and their distribution.

(c) Cultural Information:

Topographical maps bear a sufficient information pertaining to cultural aspects, These include:

- (i) landuse— cultivable land, wasteland and other uses of land, means of irrigation (canal, wells, tanks) etc. occupation (fishing, forestry, cultivation),
- (ii) Means of communication – railway, roadway, cart-track, etc post and telegraph offices, airport, seaport etc.
- (iii) Settlement – urban centres, their sites and sizes, rural settlements, their types and patterns, etc.

34.8. INFORMATION ON TOPOGRAPHICAL MAPS

We have already learnt that the topographical maps are large scale maps prepared to show minute details of the ground. The variations in relief, vegetation, landuse, forms of settlement, location of urban centres, drainage patterns, transport network and communication lines, etc. are some of the important information given on the topographical maps. These maps are usually prepared and published by the official organizations of national government. For example, the topographical sheets of India are prepared and published by the Survey of India.

(a) MARGINAL INFORMATIONS

Every topographical map or topo sheet has some basic information mentioned on the margin of the sheet. Therefore, this information is called marginal information. Marginal information includes:

1. Name of the states and districts to which the toposheet belongs and sheet reference number.
 2. Location and extent- in terms of the parallels of latitude and meridians of longitude and grid reference system.
 3. Scale, contour intervals and magnetic declination etc.
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4. Conventional signs
5. The date of issue and revision of toposheet etc.

(b) CONVENTIONAL SIGNS/SYMBOLS

A map or toposheet may correctly be interpreted only when one is thoroughly familiar with the symbols used on the map. These symbols have a direct relationship with the objects of the real world which they represent. Various type of symbols are used to represent features on the ground (Fig.34.14). These symbols are called conventional signs because, for the sake of uniformity the same symbols are used on different maps in the series.

Road, metalled: according to importance: milestone.....	
Road, unmetalled: according to importance: milestone.....	
Cart-truck, Pack - track and pass...Foot-path with bridge.....	
Bridges with piers without. Causeway, Ford or Ferry.....	
Streams:withtrack in bed: undefined, Canal.....	
Dams: masonry or Rockfilled earthwork. Weir/Anicut in Madras.....	
River banks. shelving: steep.10 to 19ft.: over19ft.....	
River dry with water channel with island & rocks. Tidel river.....	
Submerged rocks. Shoal. Swamp. Reeds.....	
Wells: lined, unlined Spring, Tanks:perenniel dry.....	
Embankments: road or rail, tank Broken ground.....	
Railways. Broad gauge: Double/Single with station: under constr.....	
Railways. other gauges: Double/Single with milestone: under constr.....	
Light Railway or tramway. Telegraph line. Cutting with Tunnel.....	
Contours, Formlines, Rocky slopes Cliffs.....	
Sand features:(1) flat (2)sand-hills(permanent)(3) dunes, (shifting).....	
Towns or villages: inhabited: deserted Fort.....	
Huts, permanent, temporary. Tower, Antiquities.....	
Temple. Chhatri Church. Mosque, Idgah, Tomb. Graves.....	
Light house, Lightship, Bouys: lighted, unlighted, anchorage.....	
Mine, Vine on trellis. Grass, Scrub.....	
Palms, palmyra,other Plantain. Conifer. Bamboo Other trees.....	
Boundary pillars surveyed. unlocated. village trijunction.....	
Heights. triangulated: station: point Approximate.....	
Bench = mark geodetic: tertiary. canal. other.....	
Post office, Combined office. Police Station.....	
Bungalows:dak or travellers: inspection. Rest house.....	
Circuit House. Camping ground. Forest: reserved: protected.....	
Space names: administrative :locality or tribal.....	

Fig. 34.14 Conventional Signs and Symbols used in the Topographical Sheet

34.9 INTERPRETATION OF THE TOPOSHEET 63 K/12

1. Marginal Information

Unfold the toposheet sent to you with this lesson and see inset map given on the left hand corner, between the scale and right box of symbols at the bottom of the map. You will find that the sheet No. 63K/12 includes large part of Mirzapur district and small parts of Varanasi district of Uttar Pradesh, that is why it is popularly known as Mirzapur sheet. Also, locate the number of this sheet in the map of India. This will give you an idea, where this area is located. Note the other marginal information. Read the scale and find out the area of the whole region mapped in the toposheet. It is roughly about 700 square kilometres. This region lies between 25° N to $25^{\circ}15'$ E longitudes and $82^{\circ}30'E$ to $82^{\circ}45'$ N longitudes. So, the introduction of your interpretation should read as follows.

The sheet No 63K/12 represents a large part of Mirzapur district and some part of Varanasi district of Uttar Pradesh. The region depicted on sheet covers an area of about 700 square kilometres. This region lies between 25° N to $25^{\circ}15'$ N longitude and $82^{\circ}30'E$ to $82^{\circ}45'E$ longitude.

2. Relief Features

The following two outstanding relief features are observed:

(i) Ganga Plain

The plain lies more or less to the north of $25^{\circ}5'$ North latitude and covers about two third of the region. The presence of few knolls mainly to the south of Northern Railway line makes it quite clear that the plain is flat. The average height of some of the knolls to the south of Mirzapur town is about 100 metres above sea level. The average height of the plain region is less than 100 metres above sea level, which is quite clear from the Bench Marks (BM) shown at different places. The Bench Mark near Mirzapur Railway Station is 85.6 m, near Chilh town across the Ganga, 79.3 m. Locate the Bench Marks along N.R. Railway line and other places and find out the height of different places of this region.

(ii) The Plateau Region

This plateau lies to the south of $25^{\circ}5'$ North latitude. It is more pronounced to the south west and south central part of the toposheet as compared to south eastern part. It covers about one third of the area shown in the map. Due to erosive action of various rivers, the plateau is dissected and has undulating surface. The dividing line between the Ganga Plain and the plateau region is 100 m contour. The average height of this plateau region is 105 m. Note the isolated flat topped and residual hills in this region.

The Dephulwa, in the extreme South Central part of the sheet with a height of 208 m. above sea level, is the highest hill. Note the height of other hills shown in this area. The contours are closely spaced. It is because of the steep slope of the plateau region toward the northern plain.

3. The Drainage

The Ganga is the main river which drains major parts of this region. It flows from west east direction and forms two loops. Many tributaries join it from south in the form of nalas. These tributaries are known as rivers as long as they flow in the plateau region and become nalas in the plain region. Note the Harrai river that flows through the southwestern part of this region. The famous Tanda Falls lie on this river. This river becomes Jhala Nala in the Ganga plain. Note the height of Tanda Falls. The Harrai river supply water to Tanda Dari Tal.

The Khajuri is another tributary of the Ganga. This is known as Kuardari Nala in its upper course, Madho Nala in the middle and Khajuri Nala in the lower course. Note the lower Khajuri dam and the tank in the north central part of the plateau region.

The Chatar Nadi is the third tributary of the Ganga. The Pahiti, Joglehari and Jamthiwa are tributaries of the Chatar river which is known as Belwan river in its lower course. Other minor nalas (drains) also join the Ganga from north and south. The drainage pattern of this region will give you some idea about the direction of slope in this region.

The Ganga makes two parallel loops while flowing in a meandering course. The northern bank of the western loop is gently sloping but the southern bank is steep. The main current of the Ganga leaves the southern bank and carves out another wider north eastern loop. The river bed widens at some places upto two kilometres. It is due to the deposition on the banks of the river bed.

4. The Vegetation Cover

If you observe the green patches and other symbols depicting natural vegetation, you will arrive at the conclusion that the Ganga Plain is completely devoid of natural vegetation. This is because it has been cleared off for cultivation. Only uncultivable ravines along Chatar and Harrai river have some patches of natural vegetation. The other areas under forest cover include a continuous belt of Bar Kachha and Danti Reserved Forests which cover the large parts of the plateau region. These are mixed deciduous forest of scrubs, bushes, ber and khair trees. The western part of the plateau has some clearings. This may be due to land put under cultivation or it is covered by grass. The villages are surrounded by planted trees.

5. Land Use

From the spacing of contours and gently slope, it is obvious that northern plain region is under intensive cultivation. It is also clear from the yellow colour and absence of natural vegetation in this region. Moreover, the presence of numerous villages scattered throughout this region also support this view. Some cleared patches in the southern plateau region are also cultivated. Note the distribution of villages in these patches. However, the major part of the southern plateau region is under bushy forests. Some parts are under human settlement, transport network and canals. Some land is under quarrying in the plateau region. Note the fallow land patches mainly along Nalas.

6. Distribution of Population

A glance at the toposheet will help you to realize that the distribution of population is even in the Ganga Plain. However, the plateau region is sparsely populated. The areas under reserved forest and hills of the plateau region and the ravines of some of the rivers are very thinly populated.

7. Human Settlements

The population is mainly settled in villages and a small portion lives in four urban centres namely-Mirzapur, Vindhyachal, Khamaria and Kachhwa. The rural settlements are scattered, compact and linear in shape. Mirzapur is the most important town of this region. It is situated on the southern bank of the Ganga on its western loop. Here the river is the narrowest. If you closely examine the map, you will understand the following facts of the site of this town.

- (i) It is situated at a place along the river where it can easily be crossed because the river channel is the narrowest here and there are number of ferries on the river in the neighbourhood.
- (ii) There is no danger of river flooding the town because the bank is steepest and highest towards the city.
- (iii) Good navigation facilities are ensured throughout the year because the main current of the Ganga washes the southern bank.
- (iv) A bridge links Mirzapur with a small town Chilh situated on the northern bank.
- (v) The city is connected with other surrounding towns and cities by roads and railways network.
- (vi) It is close to the southern plateau region. Thus, it is in a better position to communicate with this part also.
- (vii) The town is extending in east-west direction along railway line and road running along it.
- (viii) There is no possibility of settlement on the opposite bank side due to silting of river bank and absence of permanent flow of main stream of the river. The small town Chilh has developed as the terminal point of Mirzapur-Jaunpur road and North Eastern Railways. However, it has since been extended to Mirzapur Ghat railway station.
- (ix) It serves as a major collecting and distributing centre of this region.

The other town Vindhyachal is situated to the west of Mirzapur at the southern bank of the Ganga. The presence of several temples here shows that the city is a religious centre. A metalled road links this town with Mirzapur. There is a facility of ferry for crossing the Ganga towards Malepur village.

Khamaria and Kachhwa are two market towns situated north of the Ganga. Khamaria is situated in the north west corner of the map. A minor metalled road links it with Jaunpur and

Mirzapur towns. This town has small carpet factory. Kachhwa is situated in the north eastern part of the toposheet. It lies about two kilometers east of the Ganga. This town is linked with roads to villages and smaller towns scattered towards west, north and east.

8. Means of Transport and Communication

Note the two railways that serve this region. You will find out that North Eastern Railways (metre gauge) and Northern Railways (broad gauge) are two main lines. The former runs along the northern margin of the map from east to west. It is a part of the Varanasi Allahabad branch of N.E. Railways. Between Madho Singh and Mirzapur Ghat Railway Stations, a branch runs parallel to Jaunpur-Mirzapur road.

The Northern Railways passes through the heart of the region. It has four main railway stations namely Vindhyachal, Mirzapur, Jhingura and Pahara. The main line is electrified. Note that both these lines have been constructed at several places on embankment. What does it show? It shows that these railway lines pass through low lying areas experiencing floods.

You may observe all types of roads in the toposheet. The roads in the western part of the region are generally metalled. These roads radiate in all direction from Mirzapur town. Mirzapur is the focal point for all types of traffic. The following metalled roads are worth noticing-

(i) **The Great Deccan Road:** It runs toward south west from Mirzapur and connects Lal Gunj Town. It is also known as National Highway No. 7.

(ii) **Mirzapur-Robertsgunj Road:** It runs toward South and is the only road crossing the plateau region of this map.

(iii) **Mirzapur-Allahabad Road:** This road runs parallel to Northern Railways. It connects Allahabad via Vidhyachal town.

(iv) **Mirzapur-Bhatauli Ghat Road:** This road links Bhatauli Ghat- a town in making along the southern bank of the Ganga towards north east. It connects Kachhwa town. Note a ferry of six boats at Bhatauli Ghat.

(v) **Mirzapur-Varanasi Road:** This road runs parallel to N.E. Railway line and is a part of National Highway No.7.

(vi) **Mirzapur-Jaunpur Road:** It runs parallel to N.E. Railway line and turns towards north east from Durgapur village.

(vii) **Chilh-Gopigunj Road:** It lies in the north western part of the toposheet. Now, read the map carefully and you will find some unmetalled roads. The road that connects Mirzapur with Tanda Falls on Harrai River is worth mentioning. Note that few roads are motorable only in dry season. Find out other such roads and their connection stations. You will also see cart tracks, connecting villages and roads. Note the black dotted telegraph and telephone lines and their connecting stations.

9. Means of Irrigation and Water Supply

You have already noted down the names of important tanks. The wells and the tanks are the important means of irrigation and water supply for domestic use. The wells are scattered over plain and the tanks over the plateau areas. The Tandadari Tal near Tanda Falls supplies water to Mirzapur town through a pipeline. It is the biggest tank of the region and has been constructed by an embankment across a tributary of Harrai river. The tanks located within the Barkachha R.F. area and formed by lower Khajuri dam and other important tanks. Note the network of canals that originate from tanks. A canal, to the east of Mirzapur runs parallel to the Ganga in north south direction. This is called left lower Khajuri Canal. Other important canals include right lower Khajuri, Harrai, Amai Minor, right upper Khajuri and left upper Khajuri canals. lift irrigation facilities are also available in the central and eastern plain, south of the Ganga. Note the Kanaura Ghat and Sakhaura pump canals.

10. Human Occupations

Since the rural settlements are scattered predominantly throughout the region, the main human occupation is agriculture. The Ganga plain provides extensive fertile cultivable lands. In the plateau region, such cultivated lands are in patches. The other occupations of plateau region are lumbering, cattle and sheep rearing and quarrying. Note the important quarries of the plateau region. Some people are also engaged in manufacturing industries such as cotton textile at Mirzapur and carpet factory at Khamaria. Tertiary occupations of this region include business, transport and communication, health, education and administration.

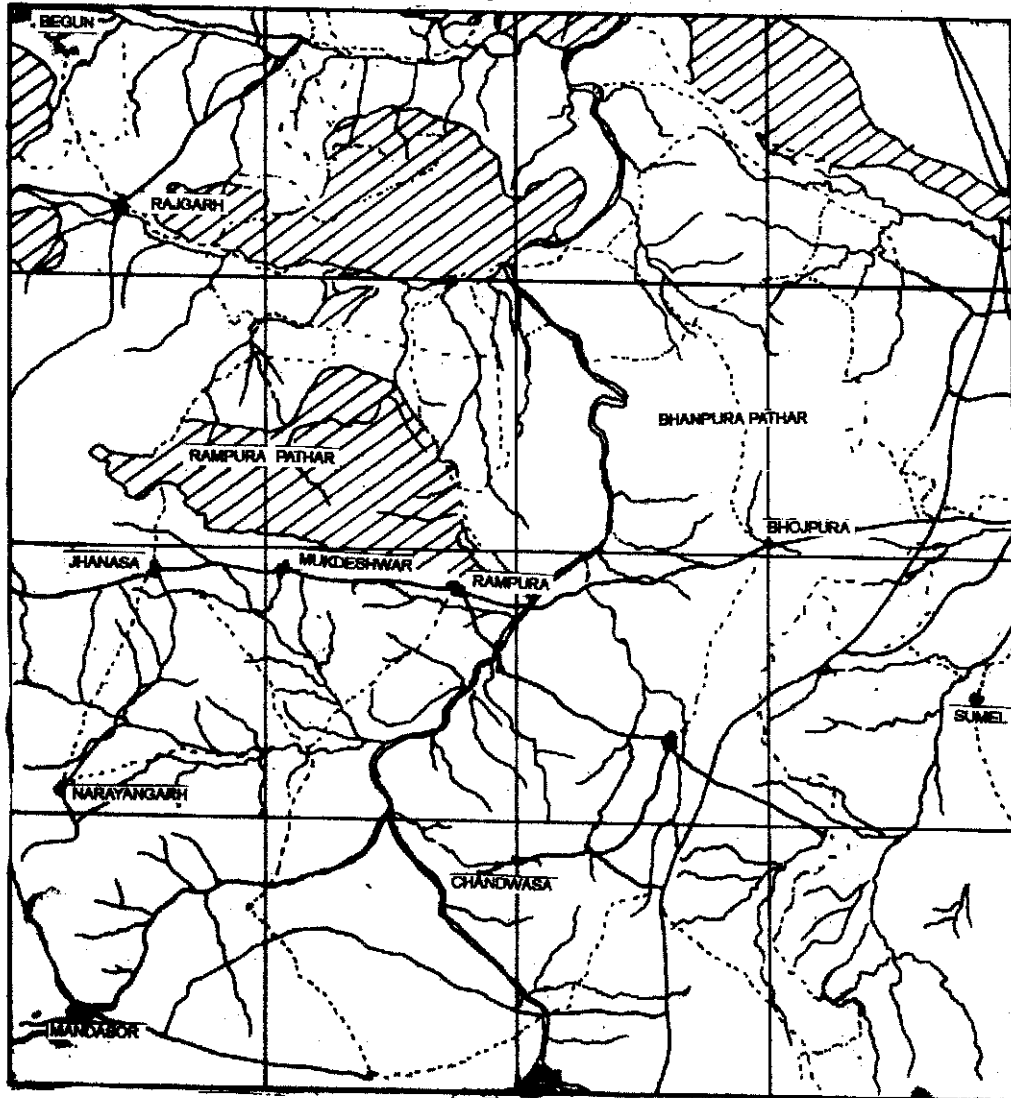
EXERCISE FOR PRACTICAL RECORD BOOK

1: Interpret the given part of a topographical map under the following heads:

- (a) landforms (b) line of communications (c) Settlements

Mandlaore & Shejapur Districts
Bunol, Chhorigarh, Jhalawar
and Kota Districts

Madhya Pradesh
Rajasthan



(ii) Draw a profile from the given contour map along line A-B and identify the important relief features.

