

INTERPRETATION OF TOPOGRAPHICAL MAPS

STAGE 1 – TYPES OF MAPS

There are different types of maps. We will focus now on Topographical Maps.

1. Topographical maps

In order to do this, you must be able to:

- Interpret the shape of the ground from a map;
- Definition of relief; and
- Representation of height.

CONTOURS

• *A contour is a line on a map joining two points of equal height, and is the standard method of showing relief on a topographical map.*

Contours are shown at regular vertical intervals.

- On a 1:50,000 map the interval is 10 m.

INTERPRETATION OF CONTOURS

- The shape of the contours indicates the shape of the ground.

When contours are further apart, the slope is gentle and when contours are close together the greater the drop.

When contours are equal distance apart the slope is uniform:

a. Contours are continuous. No matter how far they travel, they always return to where they started. Except for a cliff.

b. When spacing of contours down a slope gets close together at the bottom, the slope is convex.

c. When spacing is further apart, the slope is concave.

STAGE 3 – PLOTTING GRID REFERENCES

• *A grid is a rectangular square system of lines superimposed on a map, within which any point can be located.*

Maps are normally printed so that north is on top.

• North / South lines are called Eastings because the numbers increase as they go East.

• East / West lines are called Northings because the numbers increase as they go North.

What are the 3 points in determining height?

1. bench marks;
2. trig points; and
3. spot height.

What are Eastings and Northings?

- 1. Eastings run – move left to right; and*
- 2. Northings run – bottom to top.*

What are the two most important things to remember when giving a grid?

- 1. Easting value first; and*
- 2. never round up.*

*What is the purpose of a contour line?
Joins points of equal heights.*

• A topographic map is a type of map characterized by large-scale detail and quantitative representation of relief, usually using contour lines in modern mapping, but historically using a variety of methods. Traditional definitions require a topographic map to show both natural and man-made features .

• The Centre for Topographic Information provides this definition of a topographic map: "A topographic map is a detailed and accurate graphic representation of cultural and natural features on the ground."

- According to Cartographer's Kraak and Ormeling, "Traditionally, the main division of maps is into topographic and thematic maps. Topographic maps supply a general image of the earth's surface: roads, rivers, buildings, often the nature of the vegetation, the relief and the names of the various mapped objects."

- The study or discipline of topography, while interested in relief, is actually a much broader field of study which takes into account all natural and man made features of terrain.

Uses

- Topographic maps have multiple uses in the present day: any type of geographic planning or large-scale architecture; earth sciences and many other geographic disciplines; mining and other earth-based endeavours; and recreational uses such as hiking or, in

particular, orienteering, which uses highly detailed maps in its standard requirements.

Map conventions

- The various features shown on the map are represented by conventional signs or symbols. For example, colors can be used to indicate a classification of roads. These signs are usually explained in the margin of the map, or on a separately published characteristic sheet]
- Topographic maps are also commonly called contour maps or topo maps. In the United States, where the primary national series is organized by a strict 7.5 minute grid, they are often called topo quads or quadrangles.
- Topographic maps conventionally show topography, or land contours, by means of contour lines. Contour lines are curves that connect contiguous points of the same altitude (isohypse). In other

words, every point on the marked line of 100 m elevation is 100 m above mean sea level.

There are several rules to note when viewing topographic maps:

- *The rule of V's*: sharp-pointed vees usually are in stream valleys, with the drainage channel passing through the point of the vee, with the vee pointing upstream. This is a consequence of erosion.

- *The rule of O's*: closed loops are normally uphill on the inside and downhill on the outside, and the innermost loop is the highest area. If a loop instead represents a depression, some maps note this by short lines radiating from the inside of the loop, called "hachures".

- *Spacing of contours*: close contours indicate a steep slope; distant contours a shallow slope. Two or more contour lines merging indicates a cliff.

- Of course, to determine differences in

elevation between two points, the contour interval, or distance in altitude between two adjacent contour lines, must be known, and this is given at the bottom of the map.

- These maps usually show not only the contours, but also any significant streams or other bodies of water, forest cover, built-up areas or individual buildings (depending on scale), and other features and points of interest.
- Today, topographic maps are prepared using photogrammetric interpretation of aerial photography. Older topographic maps were prepared using traditional surveying instruments.
- In most cases, contour intervals are consistent throughout a map. Sometimes dashed contour lines are present; these represent half the noted contour interval.

Understanding Topographical Maps

Understanding of surface depends on the ability to interpret topo maps. They-

- Are based on accurate surveys.
- Show a variety of landforms with carefully chosen symbols & signs.
- Shows natural features like hills, valleys, waterfalls,
- Also show man made features like roads, railways, buildings, bridges and canals.

TOPOSHEETS ARE:-

- Are prepared on a number of sheets since they are large scale maps.
- Each sheet gives the details of a part of the whole area.
- When these joined together, they form a map of the whole area.

INTERPRETATION OF TOPO MAPS AND SURVEY MAPS

IT involves ability to follow the symbols portrayed in the map.

- Understand the information given in

pictorial and written form

- Visualize the topography of the original area by interpreting the contour
- Spot heights skillfully
- Map reading is a practical skill.
- Can be developed only by reading topo map very minutely and mentally analyzing the details with the help of conventional signs & symbols given in their conventional colours'
- As the conventional symbols cannot cover all the graphical details, each topographical map sheet provides the necessary information in the margin for the users.

1. Identification of topographical maps

2. Reading the Grid reference

3. Scale (R.F.)

4. Representation of Relief by contours

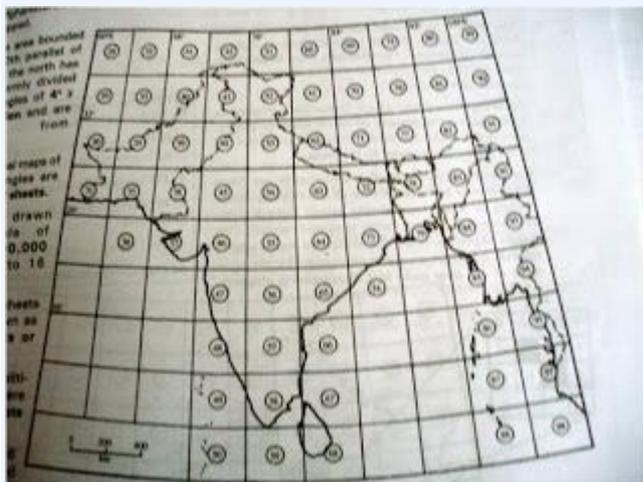
5. Directions

6. Measuring distances and calculating distances

7. Drainage

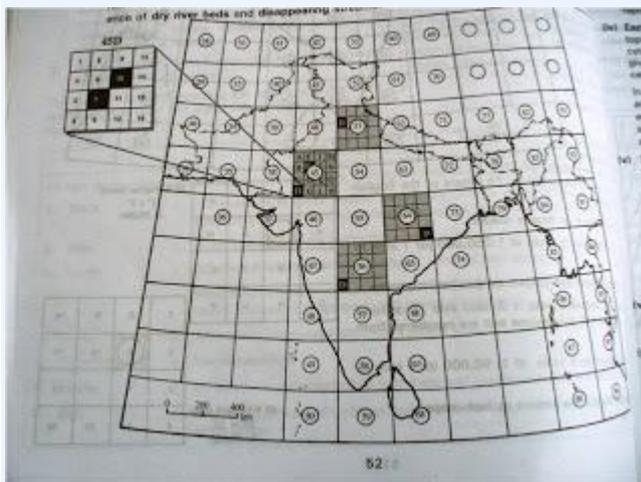
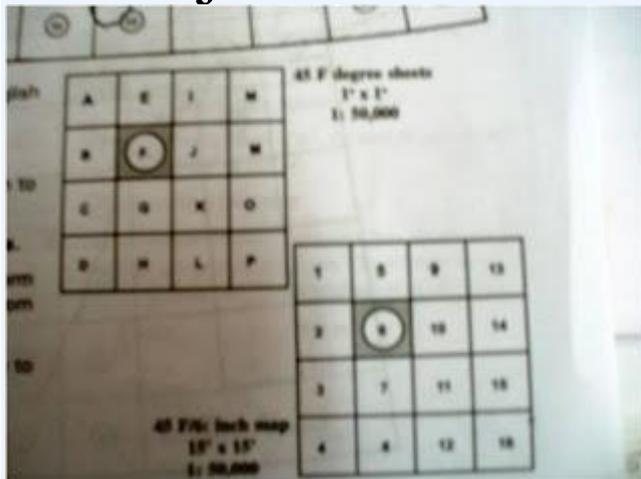
8. Man-made and natural features
9. Means of transport in relation to relief
10. Land use and irrigation
11. Settlements
12. Inferring occupations
13. Importance of colours and tints in topographical survey sheets
14. Legend
15. Glossary of conventional signs and symbols used in survey maps

INFORMATION IN THE MARGINS



i) The number of the topo sheets: Topo sheets numbers can give an idea as to which part of India is shown on the map. For example, topo sheet numbers 45D/7, 45D/10 and 45 F/3 show parts of Gujarat

and Rajasthan.



- Knowing the number of toposheet can give us a clue about the general physical relief of the region and its climate which

can be confirmed by other information



given in the map.

- Eg- since all toposheets are from India, it may be inferred that all the regions represented by those topo sheets would have a tropical monsoon climate, with seasonal rainfall.
- Western Rajasthan – u may expect scanty rainfall- a fact which could be verified by the presence of dry river beds and disappearing streams.

- 45D/7 shows a region of northern Guj, closer to the border of Rajasthan
- 45D/10 lies in the southern part of Rajasthan close to the border of Gujarat region
- 45F/3 lies in the western Rajasthan, near Jodhpur
- 53B/7 shows a region in Punjab, close to the border of Haryana.
- 56D/11 shows a region in north-east Karnataka.
- 64P/13 shows a region in north-east Orissa.

ii) Latitudinal and Longitudinal extent:
These indicate in which part of the Earth the area is located.

- On a 4 degree topographical map, at least 4 lines of latitude and longitude can be

seen. But as the scale of the topo map increases, the number of latitudes seen on the map decreases.

GRID REFERENCE

- A Grid is a set of lines used to find the exact location of places on a map.
- The National Grid Reference is a system of rectangular co-ordinate.
- The origin of the grid reference lies at a point in the south-west corner of the map.
- Thus any place on the map can be located by starting its distance east or north of the origin of the grid reference.
- Topo maps bear the national grid of squares drawn to the scale of 2 cm=1km with each square having a side measuring 1 km.
- These are sheets most commonly used for various purposes and are of vital practical importance.

- Vertical lines=Eastings since they are numbered from west to East
- Horizontal lines = Northings - they are numbered from South to North
- Net work of horizontal and vertical lines or the Eastings and Northings , is called the Grid.

READING THE GRID REFERENCE

- i) Origin is the South –West (SW) corner of the map. The reading on the map is always taken with reference to this origin.
 - ii) Eastings are always read to the East of the origin.
 - iii) Northings are always read to the North of the origin.
- It is also identified as the Grid Reference

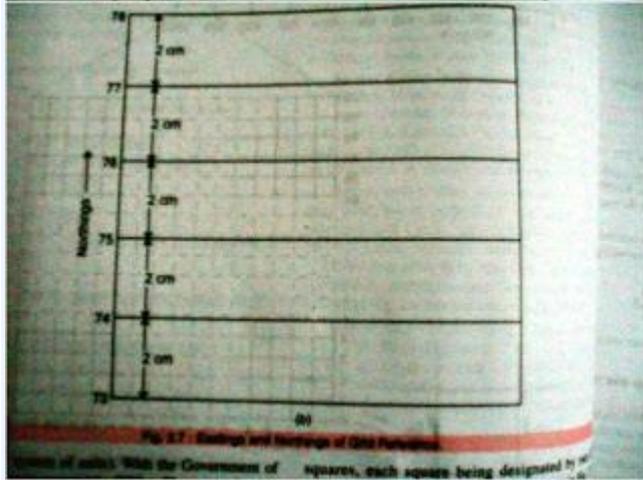
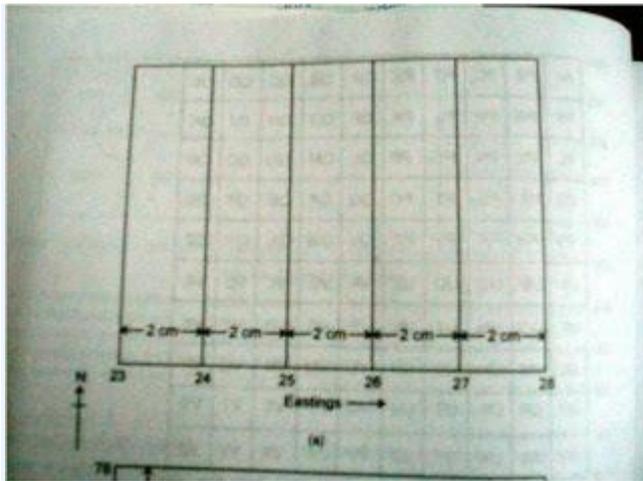
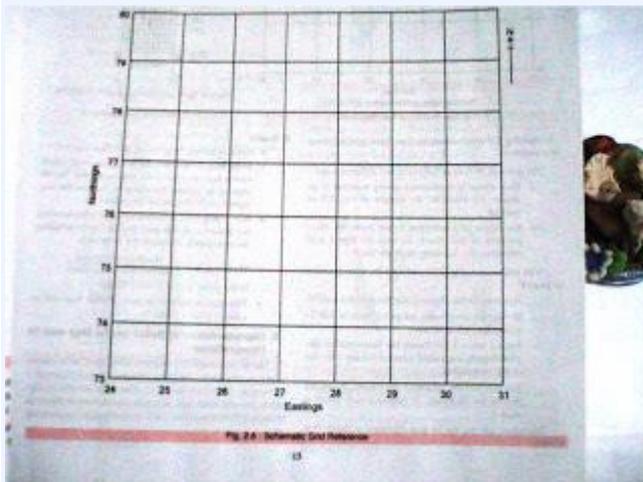


Fig. 2.7: Eastings and Northings of QRS Punched squares, each square being designated by the

- i) The readings are always taken to the right of the Eastings and to the North of the Northings.
- ii) While giving a grid reference, Eastings are always stated first, followed by Northings



Grid Reference of this picture is 2676

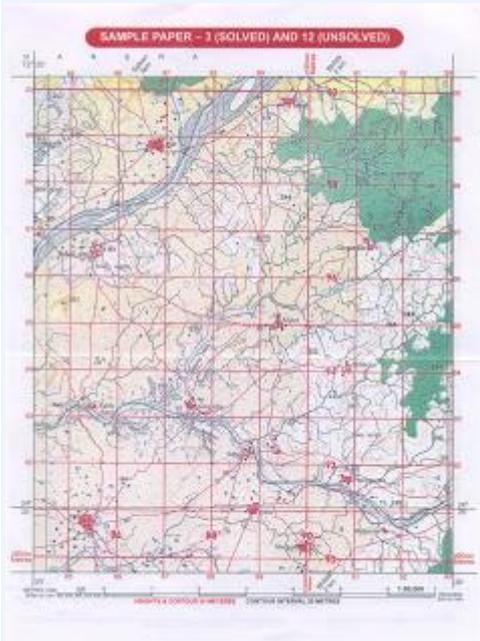
Four Figure Grid Reference:-•In four-figure grid reference, the first two figures are the eastings and the last two are the northings.

Six Figure Grid Reference:•For greater accuracy, a third figure may be added to two-figure eastings and northings.

- i) Obtain the four figure reference by using first two digits of eastings and northings.
- ii) Then divide each kilometre into ten parts visually, both vertically & horizontally.
- iii) Mark the division of eastings and the division of the northing corresponding to the location.
- iv) The crossing point is the location of the reference point.

SCALE

- Refer to Survey Map No. 45D/7
- In the map, 1:50,000 is the R.F. of the map, which means that one unit on the map represents 50,000 units on the ground.
- For example, 1 cm on the map represents 50,000 cm on the ground.



(Scale of this toposheet is)
Scale-2cm:1 km or 1:50,000

- R.F. or Representative Fraction is the ratio between the distance on the map and the corresponding distance on the ground in the same unit.*
- Therefore, R.F.

Distance on the map

Distance on the ground

In the above map, R.F. = 1:50,000

This map is referred to as 1:50,000 map and its scale is 2 cm=1km.

Representation of Relief on the Map and its Interpretation

- Earth's surface – uneven – made up of hills, plains, plateaus, lowland which are varying in their elevation or heights from sea level.
- The total terrain is also called physical landscape.
- It can be represented on the maps through different methods, such as spot heights, contouring, etc.
- Surveying is considered a part of science of map making.
- Topographical maps are large-scale maps,

they show a great deal of details about the relief.

•In Topographical survey, actual survey is carried out and different methods are used to represent relief on the map as follows.

i)Hachuring

ii)Hill shading

iii)Form lines

iv)Spot heights

v)Triangulation points

vi)Bench markscontours

i)Hachuring: are short lines representing directions of a slope.

- For steep slopes , they are drawn closer together than for the gentle slopes.

- on flat grounds they can not be used at all.

DISADVANTAGE: it gives no indication of the actual height and that both high plateau region and low plain are unshaded
The close hachuring of the high mountain regions tends to obscure other details of the map.

II) HILL SHADING: A method of representing relief on a map by depicting the shadows that would be cast by high ground if light were shining from a certain direction.

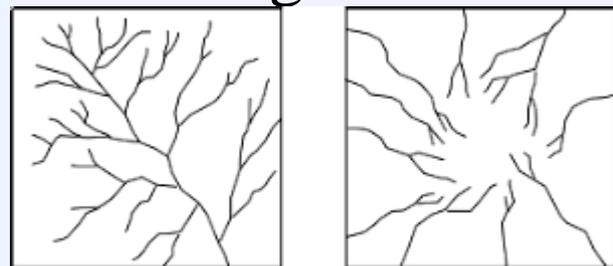
It can be defined as the addition of shadows to give the optical illusion of a third dimension, making hills stand out in relief. The shadows can be regarded as those which would be cast on an imaginary relief model of the ground when illuminated by parallel rays of light from a selected direction or directions.

In this map, it is assumed to be from north west at an angle of 45 degree with the horizon.

This method too gives a general idea of relief of the country by it does not give the actual height and that it is difficult to know whether a piece of land is sloping uphill or downhill.

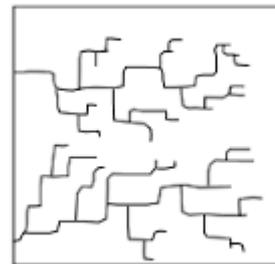
THE DRAINAGE

- The term drainage basin describes an area drained collectively by the network of a river along with its tributaries and sub-tributaries of various dimensions.
- An area drained by a single river is called its Catchment Area.
- A drainage system as seen in the topographical sheets usually develops a pattern which is related to the general



Dendritic Drainage

Radial Drainage

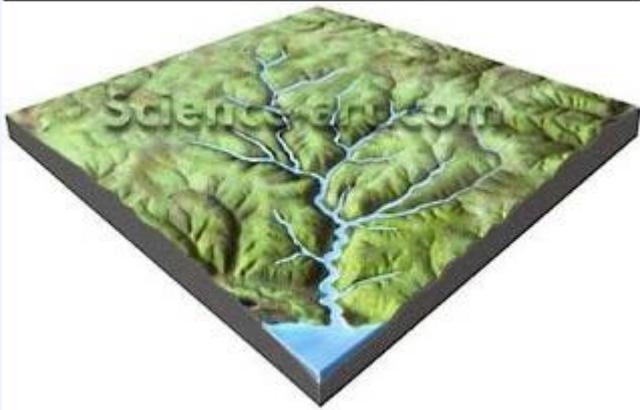


Rectangular Drainage

structure of its basin.

3 distinct patterns can be recognized

1)Dendritic:



Dendritic drainage patterns are most common. They develop on a land surface

where the underlying rock is of u



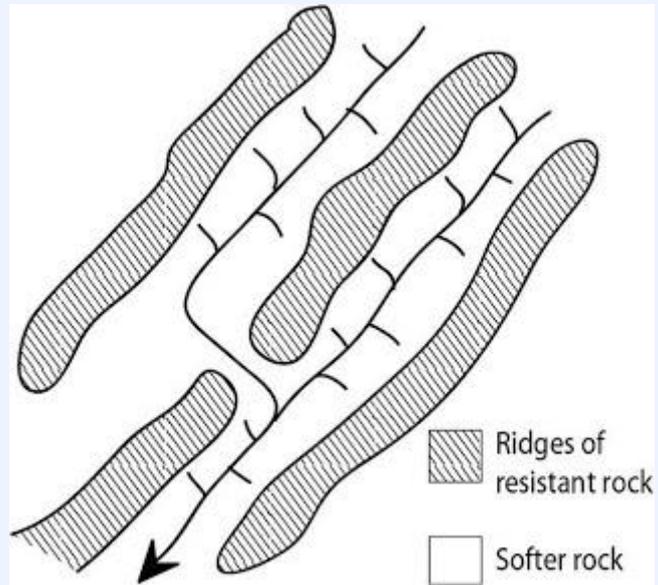
niform resistance to

erosion.

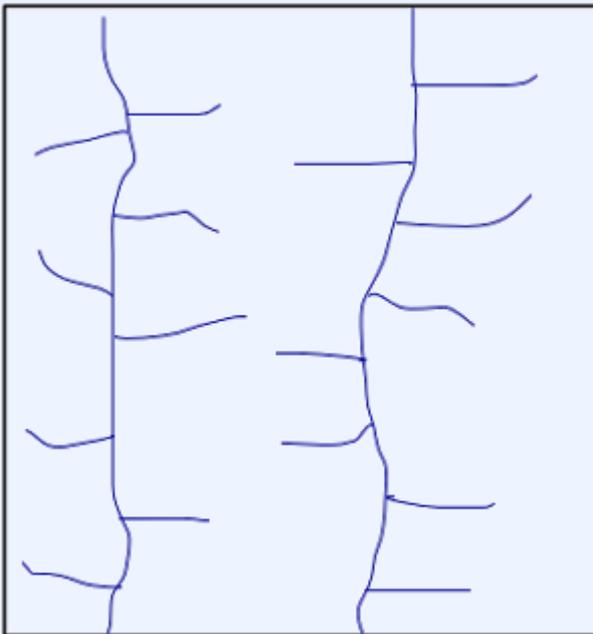
- Dendritic drainage systems are the most common form of drainage system. The term dendritic comes from the Greek word "dendron", meaning tree, due to the resemblance of the system to a tree.

- In a dendritic system there is one main river (like the trunk of a tree), which was joined and formed by many smaller tributary rivers. They develop where the river channel follows the slope of the terrain.

- Dendritic systems form in V-shaped valleys; as a result, the rock types must be impervious and non-porous



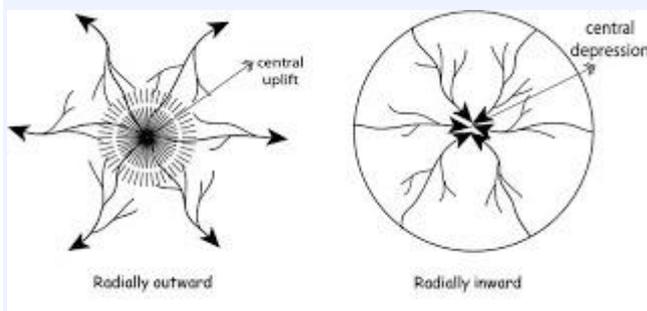
2. TRELLIS



Rectangular drainage patterns develop where linear zones of weakness, such as joints or faults cause the streams to cut down along the weak areas in the rock.

- Trellis systems form in areas of alternating geology, particularly chalk and clay. The main river (the consequent) flows straight down hill.
- Subsequent streams develop perpendicular to the consequent along softer rock and erode it away, forming vales.
- The consequent river then cuts through the escarpments of harder rock.
- Obsequent streams flow down the dip slope of the escarpments to join the subsequent streams.

3. *RADIAL*



- Radial drainage patterns develop surrounding areas of high topography where elevation drops from a central high area to surrounding low areas.

SIGNIFICANCE OF COLOURS IN TOPOSHEETS

On toposheets colours are used to show certain features. Each colour used on a map has significance.

1. BLACK – All names, river banks, broken ground, dry streams, surveyed trees, heights and their numbering, railway lines, telephone and telegraph lines, lines of latitude and longitude.
2. BLUE – Water features or water bodies that contain water.
3. GREEN – All wooded and forested areas, orchards, scattered trees and scrubs.

Note:- Prominent surveyed trees are shown in black. Surveyed trees have numbers on their trunks. They serve as landmarks and are not allowed to be cut.

4. YELLOW – All cultivated areas are shown with a yellow wash.

5. WHITE PATCHES – Uncultivable land

6. BROWN – Contour lines, their numbering, form lines, and sand features such as sand hills and dunes.

7. RED – Grid lines (eastings and northings) and their numbering, roads, cart tracks, settlements, huts and buildings.

SETTLEMENTS

1. On a topo map, all settlements are shown by symbols in RED colour.

2. The size of the symbol and size and style of letters used give an idea of the size of the settlement.

3. In the case of large cities, major roads are marked and named.

4. Deserted village cities, temporarily occupied huts are also shown.

5. Places of worship, forts, water towers, burial grounds, police stations, post office, dak bungalow, circuit houses, etc. are indicated by suitable symbols.

NOTE – Site is the land on which the settlement (village or town) is built.

Dense settlements : Fertile plains and wide river valleys.

· Sparse Settlements : forests, deserts, mountain slopes, plateaus and hill tops with poor vegetation.

Absence of Settlements: Swamps, marsh land, sandy deserts, thick impenetrable forests, flood-prone areas, steep mountain slopes.

OCCUPATION AND MAP FEATURES

AGRICULTURE – Level land with yellow wash; many wells

LUMBERING: Forests

CATTLE REARING – Pastures, meadows, grasslands, presence of road in highland region (sheep)

FISHING – Plenty of rivers

MINING –Stony wastes, quarries, limestone beds

TRADE – Dense settlements near road

INDUSTRY – Large settlements near roads and railways, presence of raw materials, (like making, cement industry near limestone beds)

TOURISM – hotels and inns

APPROXIMATE OR RELATIVE

HEIGHT-is height is not taken from sea level but with respect to the surrounding area. It may be the height of a dam, bridge, sand dune or it can be the depth of a well, tank, hill or river canal, for example , 3r, 5r, 8r, etc.

EXAMPLE:3r - the relative depth of perennial lined well in 3 metres

●5r – the relative height of dry tank is 5 metres

NOTE: CHECK THE SYMBOL – if it is tank, dam, bridge, embankment, etc then write the answer this way - the relative height of ismeters.