

CALCULATION OF GRADIENTS AND VERTICAL EXAGGERATION

1. Gradient: The gradient of an area is the slope of the ground expressed as a ratio between the height and the length of the ground. Slope are of various steepness.

Example.

Using the diagram below calculate the gradient between point A and B.

Procedures For Calculating Gradient

1. Located the height of the two points or places requested e.g A and B.
2. Find out the difference between the two points by subtracting the lower height from the highest point to get the vertical interval (VI) which is $800 - 200 = 600\text{m}$
3. Measure the horizontal distance between the two points on the map and relate it to the scale to give the horizontal equivalent. (HE)
4. Calculate the gradient in the same unit.

Solution

Formula for calculating gradient.

$$\text{Gradient} = \frac{\text{Difference in height (meters)}}{\text{Horizontal distance (meters)}}$$

Or
$$\frac{\text{Vertical interval (VI)}}{\text{Horizontal equivalent (HE)}}$$

$$\text{VI} = \text{B} - \text{A} = (800\text{m} - 200\text{m}) = 600\text{m}$$

$$\text{HE} = \text{Distance on map which is } 6\text{cm}$$

Relate 6cm to the map scale (1:100,000)

$$6\text{cm} \times 100,000/100,000 = 6\text{km}$$

$$\text{Average Gradient} = 600\text{m}/6\text{km}$$

Recall that $1000\text{m} = 1\text{km}$

$$= 600/6000 = 1/10 \text{ or } 1 \text{ in } 10$$

The gradient between point A and B is 1 in 10.

Note: The numerator must always be one (1) the smaller the denominator, the steeper the slope.

Vertical Exaggeration

Vertical exaggeration is defined as the number of times vertical heights are exaggerated or enlarged in relation to the horizontal distance.

It is well known that a relief section has a horizontal scale (which is that of the map) and a vertical scale. The vertical scale is generally larger than the horizontal scale. i.e. the vertical is usually exaggerated or enlarged so as to provide a better view of the relief section.

Procedure For Calculating Exaggeration

1. Convert the vertical scale into a representative fraction (R.F) or a ratio
2. Write down the horizontal scale of the map also as ratio
3. Divide the horizontal scale by the vertical scale to get the vertical exaggeration.

$$\text{Vertical exaggeration} = \frac{\text{Horizontal Scale}}{\text{Vertical Scale}}$$

Example

If the vertical scale of a map is 1cm to 100m (i.e. 1mm to 10m) while the map scale is 1:50,000. Calculate the vertical exaggeration.

Solution

The ratio of vertical scale = 1:10,000

Horizontal scale = 1:50,000

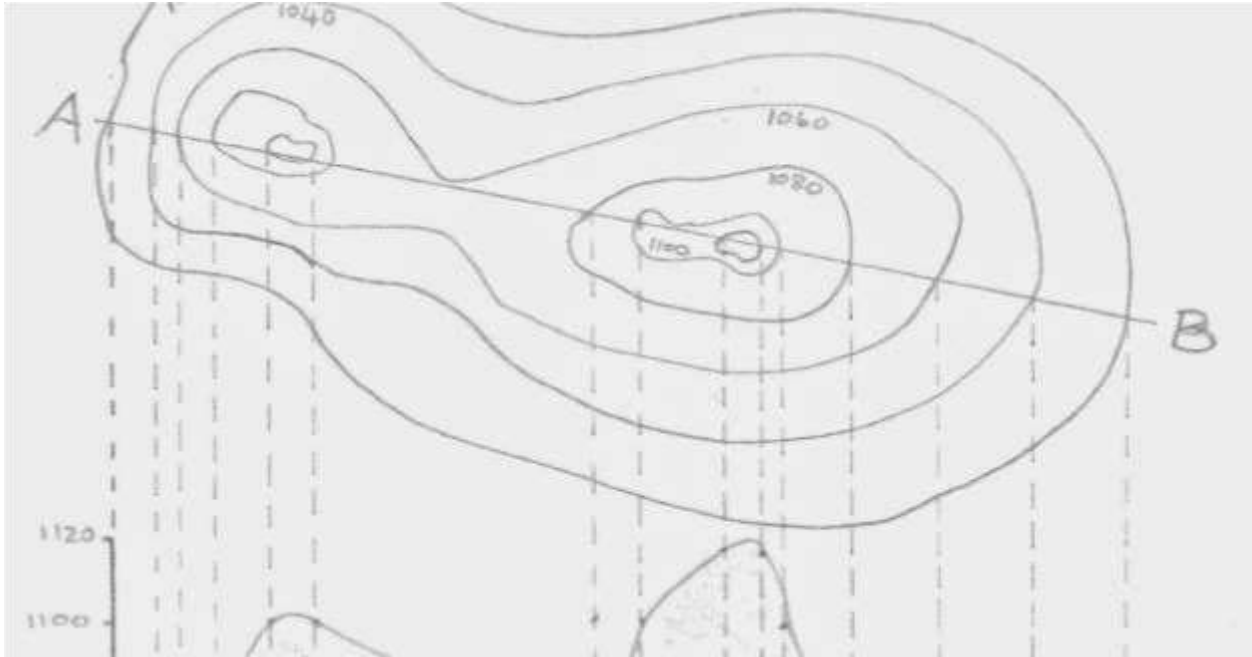
Vertical exaggeration = $50,000/10,000 = 5.0$

The vertical exaggeration = 5.0

CROSS SECTION DRAWING AND INTERVISIBILITY

Cross-section or relief profile is defined as the practice whereby relief shown by contours on map are drawn to bring out the real appearance of such relief as it is on the ground. In other word, cross-section shows the nature of the relief that is represented by contour lines at a glance.

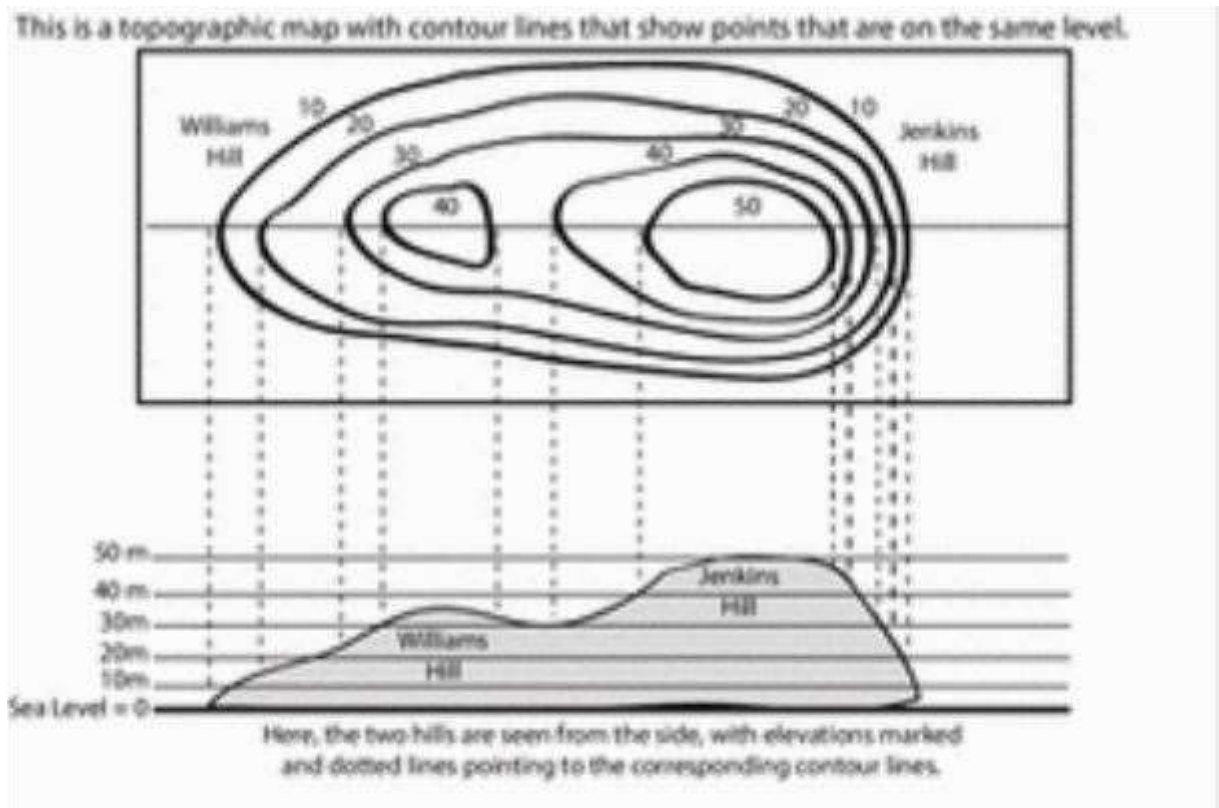
Example: Draw the cross-section between A and B in the contour line below



Procedure For Cross-Section Drawing

1. Draw a straight line to join the two points A and B on a map.
2. Get a sheet of paper, preferably a graph paper
3. Place the straight edge of the piece of graph paper on the map along the line of section. (A – B)
4. Mark points A and B on the paper
5. Make a mark on the paper where each contour line is crossed and note the height of the contour. Some other features on the map like rivers, lakes, roads, valleys etc. may also be required on the section drawing. Hence such cross-section drawing becomes a labelled.
6. Choose suitable vertical scale e.g. 2mm to represent 50m or 100m as shown on the contour interval. Graduate your graph paper accordingly starting from zero (0) on the vertical axis.
7. From point zero (0) on the paper draw a horizontal line equal in length of the line between the two points A and B on the map.

8. Place the straight edge of the paper with the marking from the map along the base line on the graph paper. On the graph paper, mark out the corresponding heights from the map at the exact vertical distance from the base line.
9. Finally, draw a line from A to B to join up the various heights between the two points and the cross section is completed.



Cross Section Drawing of a Relief Features

INTERVISIBILITY

Inter-visibility is defined as a way of knowing whether one point or place on the map can be seen from another point or place on the same map within the limit of physical sign.

Cross section drawing can help us to know if two points on a map are inter-visible or not.

The most important factors to know whether two points are inter-visible is to look whether high contour lines exist between the two points. The presence of higher contour line simply shows that the two points are not visible to each other. E.g. contour A is 300m, contour B 400m and contour C is 200m. point A cannot see point C because, higher contour line B (i.e. 400m) exist between them.

DRAINAGE AND SETTLEMENT

Drainage refers to the distribution of water feature such as rivers, streams, oceans, natural or man-made lakes etc.

Important Points To Note When Describing Drainage System Of Any Map

1. Compass points (direction of flow of rivers):. Point out in which direction the river is flowing e.g. river A is flowing from North east of the area to South west, with the aid of an arrow. Remember that rivers flow from higher (i.e. higher contour lines) towards lowland (i.e. lower contour lines).
2. Relief of the land drained and nature of the river course:. Point out water shed, if any and where the river started from (name the contour lines) e.g. 800m and flow in the south west direction
3. Other water bodies:.. Point out other water bodies such as lake, ocean, bore holes, etc. and state their location on the map e.g. lake Kusa is on the South Western part of the map and it receives water from river Cano and Suno.
4. Drainage pattern of the river:.. Point out the pattern of drainage of a particular river either in certain part or the wole map.

TYPES OF DRAINAGE PATTERN

There are five types of drainage pattern, namely dendritic, radial, trellis, annular and centripetal drainage pattern.

1. Dendritic drainage pattern:. In this pattern, there is irregular branching of the tributaries or streams in many directions like the branches of a tree.



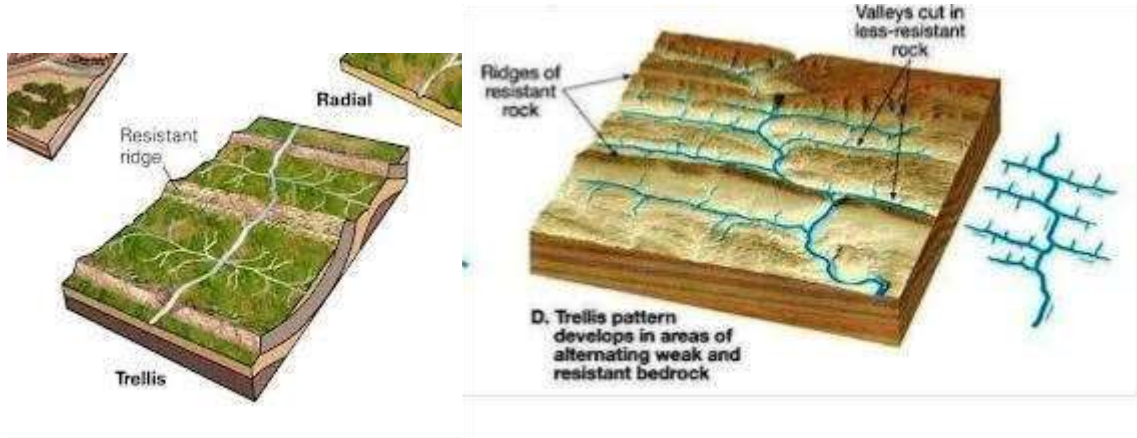
Dendritic Drainage Pattern.

2. Radial Drainage Pattern:. The many rivers, streams or their tributaries diverge from a central elevated highlands and flow away to different directions.



Radial Drainage Pattern.

3. Trellis Drainage Pattern:. The streams or tributaries flow almost parallel to each other in line with the nature of the rock materials of the soil.



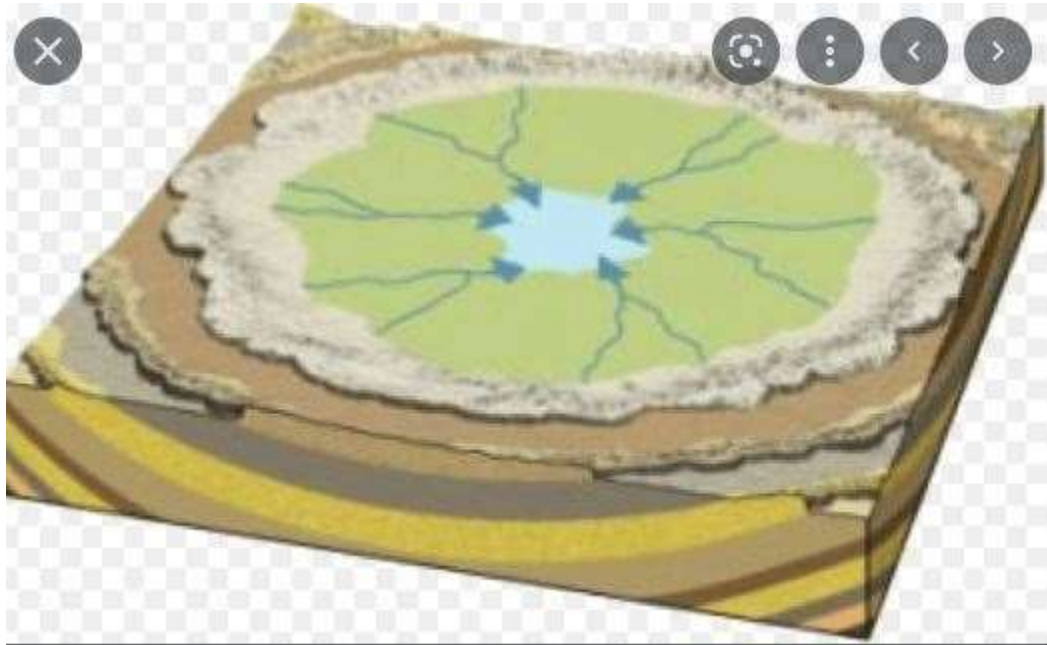
Trellis Drainage Pattern.

4. Annular Drainage Pattern:. The tributaries or the main river almost form a concentric ring around a highland. In other words, the main stream almost flows round or encircles a hill.



Annular Drainage Pattern.

5. Centripetal Drainage Pattern:. Many rivers or streams flow from different direction into a lake.



Centripetal Drainage Pattern.

SETTLEMENT

A settlement is defined as a place having one or more building with people living in them.

Factors That Favours Settlement

- i. Availability of drinkable water ii. Presence of communication routes e.g. roads, railways etc.
- iii. Presence of economic resources like minerals iv. Presence of fertile soil for farming purposes
- v. Presence of commercial activities e.g. Market.

TYPES OF SETTLEMENT

There are three main types of settlement and these are

1. Nucleated or dense settlement:. In this type of settlement, the building are very close to each other or are concentrated in a small area with many social amenities.



Nucleated Settlement.

2. Dispersed or Scattered Settlement:. The buildings are scattered or far from each other with few social amenities.



Dispersed or Scattered Settlement.

3. Linear Settlement:. In this type of settlement, buildings are located along the roads, railway or even rivers in a linear form.



Linear Settlement.

Other types includes.

4. Nodal Settlement:. This is the settlement around the meeting point of roads or railways.



Nodal Settlement.

Confluence Settlement:. This is the settlement around the meeting point of two rivers e.g. Lokoja in Nigeria.



Confluence Settlement.

INTERPRETATION OF TOPOGRAPHICAL MAPS.

The importance features that need interpretation include relief, drainage, settlement, communication and land use.

Procedures For Interpreting Relief

1. Use contour lines, spot height or trigonometrical station to note the highest point and the lowest points is found in the highest contour lines.
2. Note the proportion of the land occupied by highland and lowland.
3. Note the specific land form or relief whether a ridge, hill, plateau, knoll plain,.
4. Note the location or direction of these relief etc. on the map.
5. Note the heights of the lowlands above the sea level and whether they are flat plains or undulating.
6. Note if the hills and plateau are dissected or not.
7. Do the river have delta or estuary.

Procedure For Interpreting Drainage.

1. Find out the important rivers on the map area
2. Note the direction of flow of the rivers
3. Find out the pattern of drainage either on the whole or part of the map. i.e. whether dendritic, trellis, radial etc.
4. Look out for water sheds which separate drainage system
5. Note if there are marshy areas which are usually poorly drained and are liable to flooding.
6. Note if there are other water bodies like lakes, oceans, bore-holes and identify their locations on the map.
7. Do the river have delta or estuary.

Procedure For Interpreting Settlement

1. Find out if the type of settlement is rural or urban. Urban settlement that are found in the cities or towns with compacted buildings, presence of good roads and basic infrastructures. If it is rural, the people live in villages or scattered farmsteads.
2. Note the pattern of settlement whether linear, nucleated or dispersed.
3. Relate settlement to relief:. That is, are settlement located on highlands, plateau, ridge or on lowlands and give reasons for such settlement.
4. Relate settlement to drainage:. That is the settlement along the river course, far from rivers, near a lake, ocean or far from marshy areas and gives reasons for such settlement.
5. Relate settlement to communication:. Is the settlement linear i.e. along the road, railway, far from airport or along a navigable river or lake?
6. Describe also areas which are not settled and give reason why they are uninhabited.

Communication.

Procedure For Interpreting Communication

1. Find out the means of communication that is, by road, railway, footpath, air (if there is any air ports) and rivers (if there are navigable river or lake).
2. Note from conventional signs if the roads are primary, secondary, or minor roads.
3. Relate communication to relief, do the roads, railways or footpath avoid steep slopes, passes through highlands, ridge or are they located on the lowlands? Are there passes etc.
4. Relate communication to settlement:. The presence of major road is an indication of commercial or industrial town while minor road and footpaths are common features of rural settlement.
5. Note important natural and man-made features like mountain, lakes, ridge, boreholes, factories which one may come across when travelling from one area to another.

LAND USE

Land use refers to the various ways in which man uses the land. The use of land or function of a particular settlement can best be determined from conventional signs, usually found below all topographical maps.

The table below provide a useful means for interpreting the land use, function or importance of a particular settlement.

	Features from conventional signs on map	Use of land or function in settlement
1.	Presence of building e.g. house, etc.	Residential
2.	Presence of mineral resources	Mining
3.	Presence of forest	Farming and lumbering
4.	Presence of grasses	Livestock and farming
5.	Presence of rivers	Fishing and canoe building.
6.	Presence of prison, court, police station	Administration
7	Presence of banks and market	commercial
8.	Presence of hotels	Social functions
9.	Presence of school	Education
10.	Presence of marshy area	Swamp rice cultivation
11.	Presence of hospital dispensary	Health function
12.	Presence of industries	Industrial function.