Vishwendu Vidya Prasarak Mandal's
(Regd. No: MAH 1906 / F-1614; Dt.5/3/1987)
Abhinav Vidyalay & Junior College
(Govt. Regd. No. Prim.Edu. 6-970,90-91 Dtd:16-8-90; Index No: Sec:16.17.019 / 020; H.Sec: J16.17.24)
Contact: +91(0)251 2472232 admin@abhinav.ac.in; www.abhinav.ac.in

G12 Cm_Contour mapping

Introduction to Topography

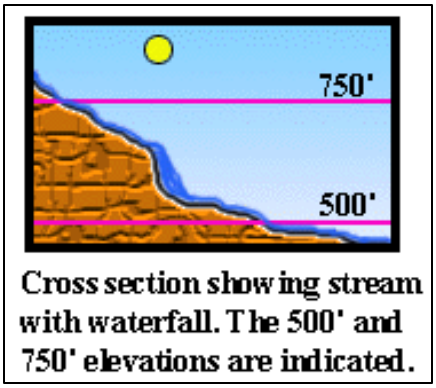
Topography is a general term in geography, derived from the Greek "topos" (place) and "graphein" (to draw), and refers to the lie of the land, or various other characteristics of Physical geography in a region; this is usually expressed in terms of the **elevation, slope**, and orientation of terrain features.

Maps are the most common communication tool for topographic information

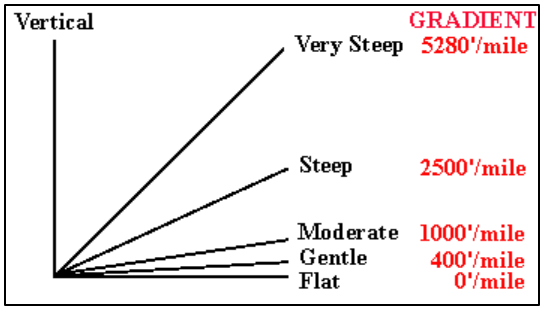
The **elevation** of a geographic location is its height above a fixed reference point, often the mean sea level. Elevation is mainly used when referring to points on the Earth's surface, while **altitude** is used for points in the air, such as an aircraft.

- The elevation of a mountain usually refers to its summit.
- The elevation of a hill also refers to the summit.
- A valley's elevation is *usually* taken from the lowest point but is often taken all over the valley.

A topographical map is the main type of map used to depict elevation



Cross section showing stream with waterfall. The 500' and 750' elevations are indicated.



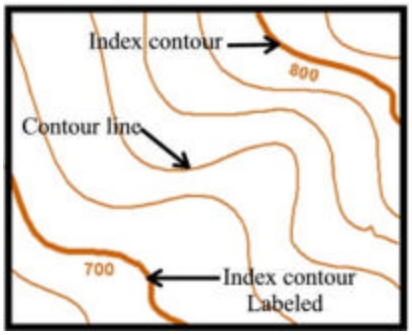
The understanding of topography is critical for a number of reasons.

- In terms of environmental quality, agriculture, and hydrology, understanding the topography of an area enables the understanding of drainage characteristics and water movement.
- Complex arrays of topographic data are used as input parameters to allow prediction of river water quality.
- Understanding topography also impinges on soil conservation, especially in agriculture. Contour plowing is an established practice of enabling sustainable agriculture on sloping land, and is the practice of plowing along topographic lines.
- Topography is critical militarily because it determines the ability of armed forces to take and hold areas, and to move troops and material into and through areas.
- Topography is important in determining weather patterns. Two areas in proximity to each other geographically may differ radically in characteristics such as precipitation because of elevation differences

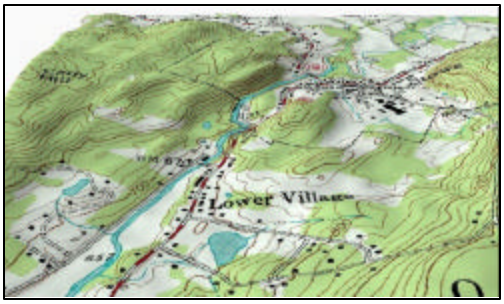
Tectonic processes and erosional processes are the determiners of topography. Tectonic processes cause land to be elevated, and erosional (and weathering) processes cause land to be worn away to lower elevations.

Topographic maps, also called **Contour maps**, are maps that show topography, or land contours, by means of contour lines

Contour lines are curves that connect contiguous points of the same elevation



- Every point on the marked line of 100 m elevation is 100 m above mean sea level.



A Topographic Map

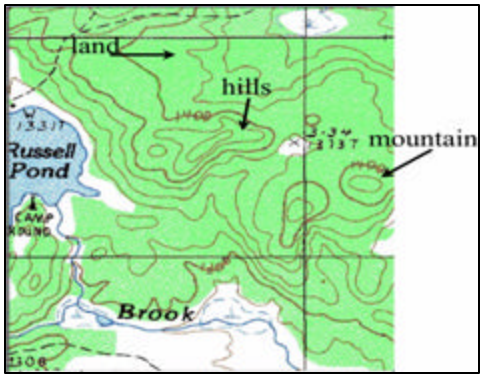
Contour Intervals

Contour lines can be drawn for any elevation, but to simplify things only lines for certain elevations are drawn on a topographic map. These elevations a chosen to be evenly spaced vertically. This vertical spacing is referred to as the contour interval (distance in altitude between two adjacent contour lines). . In most cases, contour intervals are consistent throughout a map

Index Contours

- Unlike the simple topographic map used above, real topographic maps have many contour lines. It is not possible to label the elevation of each contour line. To make the map easier to read every fifth contour line vertically is an index contour. Index contours are shown by darker brown lines on the map. These are the contour lines that are usually labeled

Read And Describe Topographic Maps



Theory:

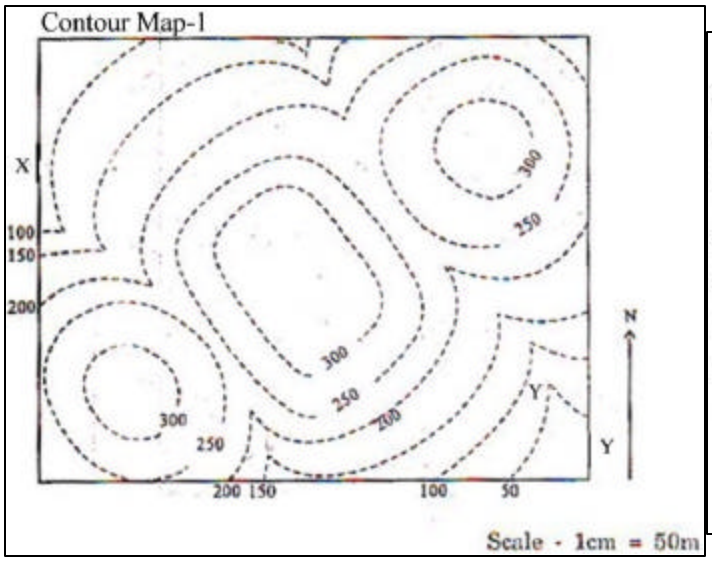
A topographical map represents the relief of a region projected on a horizontal or plane surface .It also shows the features like roads, railways, canals, water courses, towns, villages and so on .The term "relief" used while describing a topographical map, conveys the general effect produced as a result of the difference between the elevation of the highest and the lowest elevation of the region.

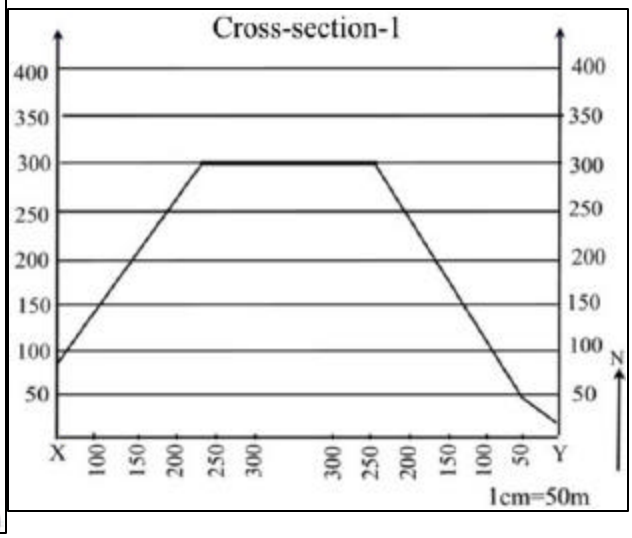
Section Diagram

Procedure:

(1) Join the points X and Y with the help of a scale on the contour map.
(2) Take a plane strip of paper and plot the points of intersection of the contour interval and the line drawn along X-Y, on the strip of paper.
(3) Transfer these points on a plane paper, forming a base line and write down the proper contour interval below the line drawn on the blank paper.
(4) Extent the points X & Y respectively in the perpendicular direction.
(5) Then, decide the scale for eg.1 cm= 100 cm, this means, 1 cm on the scale is equal to 100 cm on the ground.
(6)Then taking 1cm on the scale, plot the points on the perpendicular line from points X & Y respectively.
(7) Transfer the points from the base line to the respective points above with the help of set square and join all the points.
(8) Thus, a profile diagram is created which explains the relief of that particular contour map regarding the hill and the valley in that map.
(9) Draw a cross-section of the map along X-Y axis. Draw the **horizontal beds** along with the proper sequence of deposition of the beds.

To study topographical map with reference to the prominent physical features & drawing of cross-section with reference to horizontal series of beds.





Map No.	1			
Contour interval	**50 m**			
Minimum contour elevation	**100m**			
Maximum contour elevation	**300m**			
All Relief features seen in the contour map	Relief features such as two conicalsteep hills one on the north east & the other on the south west side of the map, along with a gently sloping domical hill. The valley is flowing from south west to north west & also from north east to south east.			
Relief features seen along the cross section	The map in the cross- section shows a very beautiful gently sloping, domical hill, i.e. (a hill with rather flat or gentle slopes on all sides) . It also shows a symmetry between the two sides and to certain extent it can be said to have a symmetrical slope also. The cross -section of this map does not any valley feature.			
Nature of the slope (from cross section and contour)	The hill has an even , a gentle & symmetrical slope which can be seen on the overall map.			
Hill	Elevation	Type and Slope	Spur	
	300m.	Domical hill & a gentle slope.	Absent	
Valley	Shape	Slope	Saddle **(from cross section and contour)**	Gorge
	Absent	Absent	Absent	Absent

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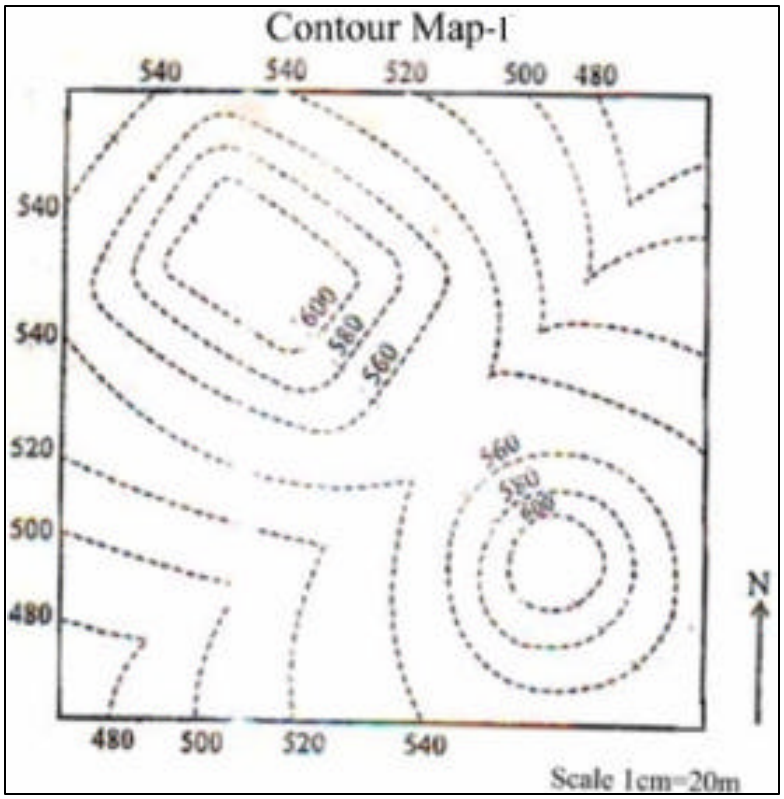
G12Cm1_Contour mapping



Study of map-1

Map No.	
Contour interval	
Minimum contour elevation	
Maximum contour elevation	
All relief features seen in the contour map	
Relief features seen along the cross section	
Nature of the slope (from cross section and contour)	

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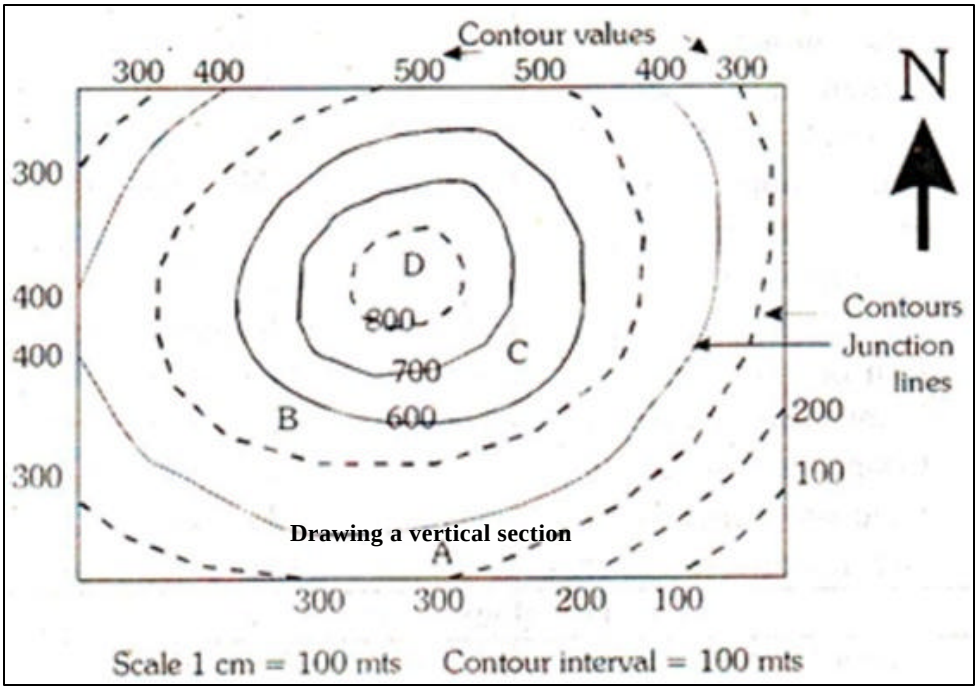
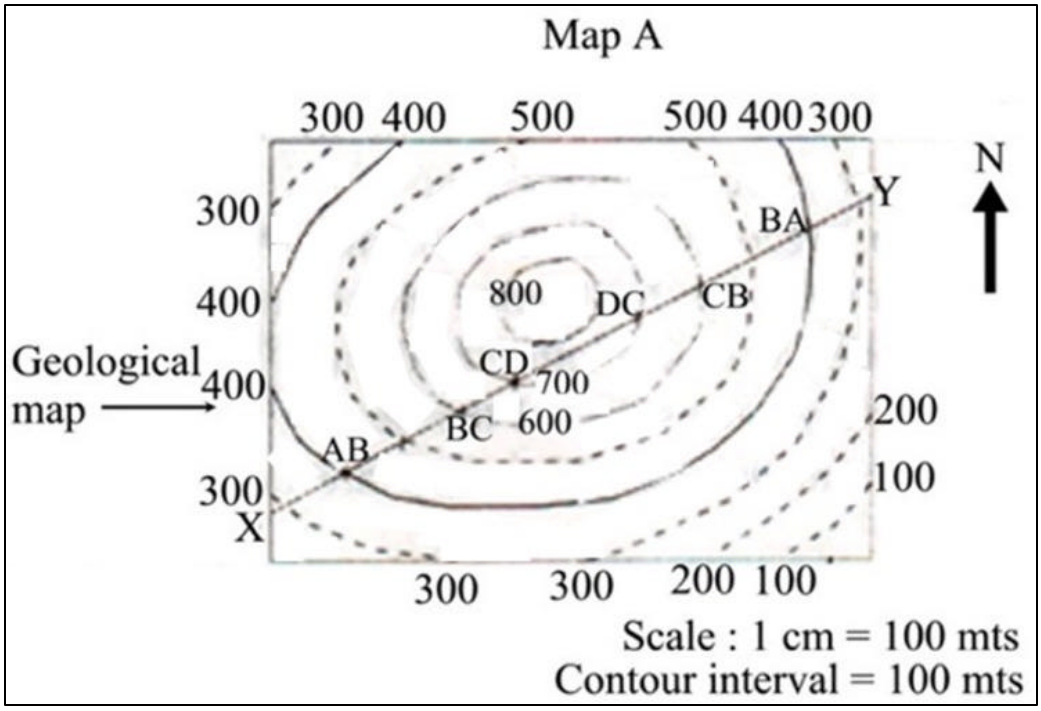
G12Cm2_Contour mapping with horizontal beds.

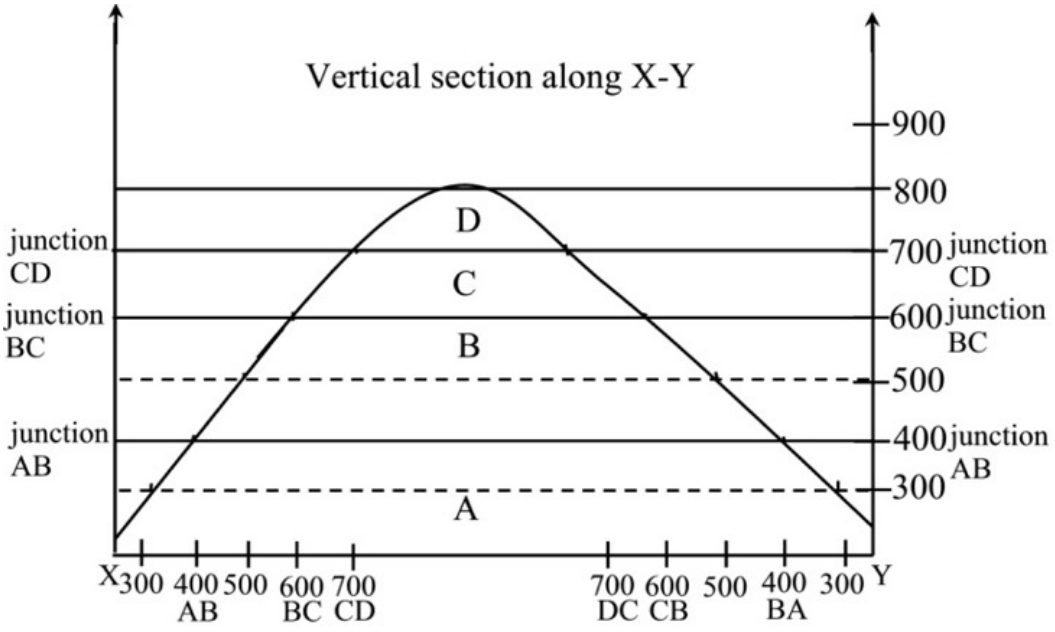
Aim: **A topographical map with horizontal beds.**

Topographic maps depict the various topographic features, such as relief, drainage, mountains & valleys with the help of contours.
Contours are the imaginary dotted lines which connect points of the same elevation on a map.
Bed or stratum: It is a single unit of a sedimentary stratified sequence, e.g., beds A, B, C & D.
Bedding plane: The plane of contact between 2 consecutive beds of a stratified sequence (continuous lines).
Junction lines: These are imaginary continuous lines which run along the plane of the contact or junctions of 2 consecutive beds of a geological sequence.
Shown below is a topographical map with horizontal beds.



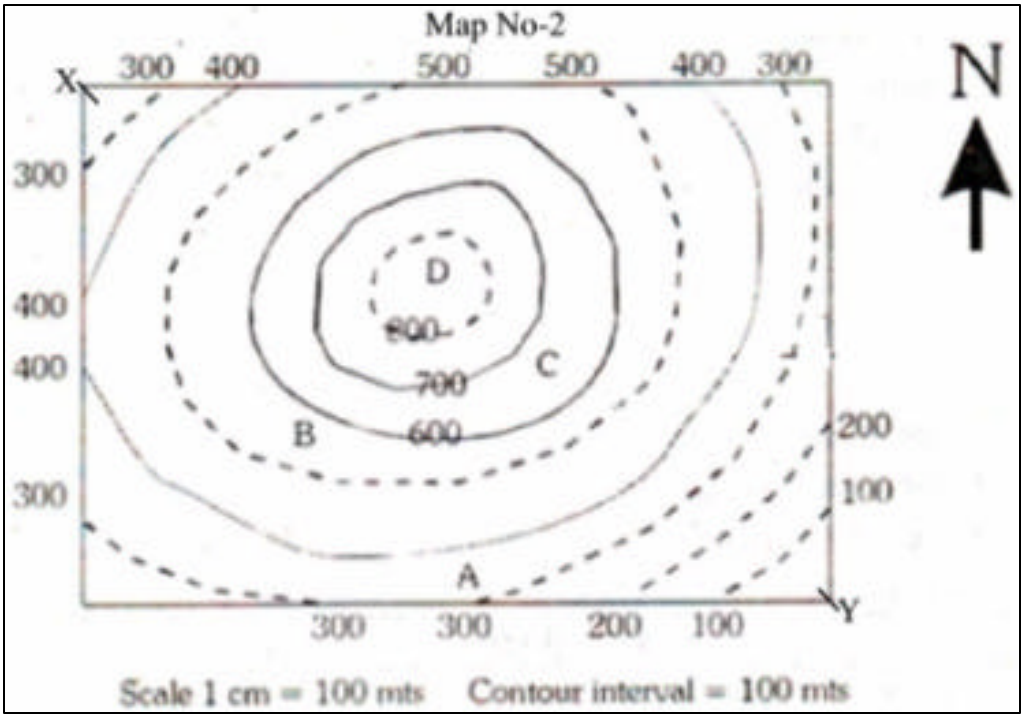


Section Map



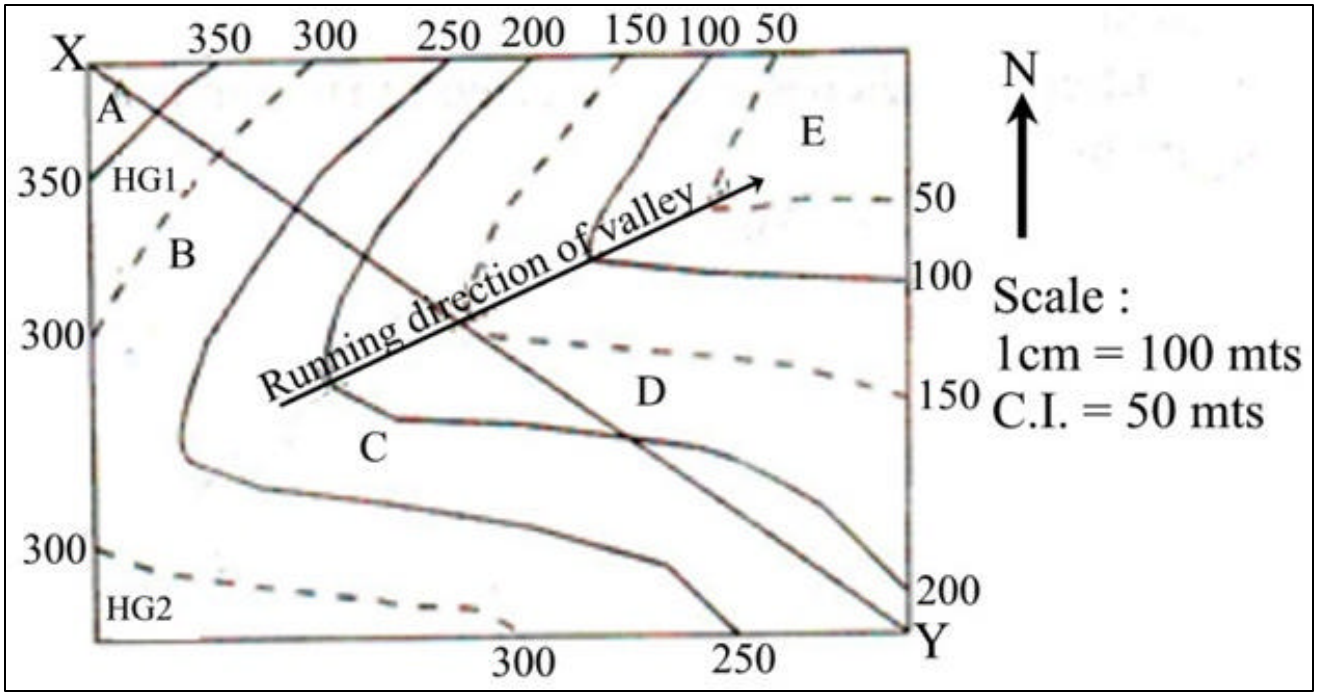
Map

Description of the map	The contour pattern of the map shows an isolated hill at the centre of the map. The concentric & dotted lines are the contours whose height increases towards the centre of the map. The height of the hill is indicated by such contours values & accordingly, the maximum height is 800 mts above the Mean Sea Level (MSL). The minimum elevation of 100 mts is shown by the contour along the outermost periphery of the map (in the Southeast corner of the map).
Geology of the area	There is one conformable series of 4 horizontal beds namely A, B, C & D.
Attitude of Beds	All the beds are horizontal (junction lines being parallel to the contours).
Order of superposition & thickness of beds	As the beds are horizontal, the highest elevation of the map has the youngest bed associated with it & the lowest elevation with the oldest bed. The difference between the heights of the 2 junction lines of a particular bed is used for determining the thickness of beds. **Ex. Bed B has its top junction at 600 mts while its bottom junction coincides with 400 mts contour. Hence the thickness of the bed is 200 mts.** Once the highest & the lowest beds are identified, the order of superposition & thickness of beds can be established. **Order of superposition & thickness of beds:** D — Youngest bed C — 100 mts B — 200 mts A — Oldest bed
Geology history of the area	Bed A was deposited first followed by B, C, & D successively. The beds were subjected to compaction & cementation to form a stratified sequence. Later, the area was uplifted due to earth movements & subjected to weathering & erosion to form the present topography.



Description of the map-2	
Geology of the area **Attitude of Beds**	
Order of superposition & thickness of beds	
Geology history of the area	

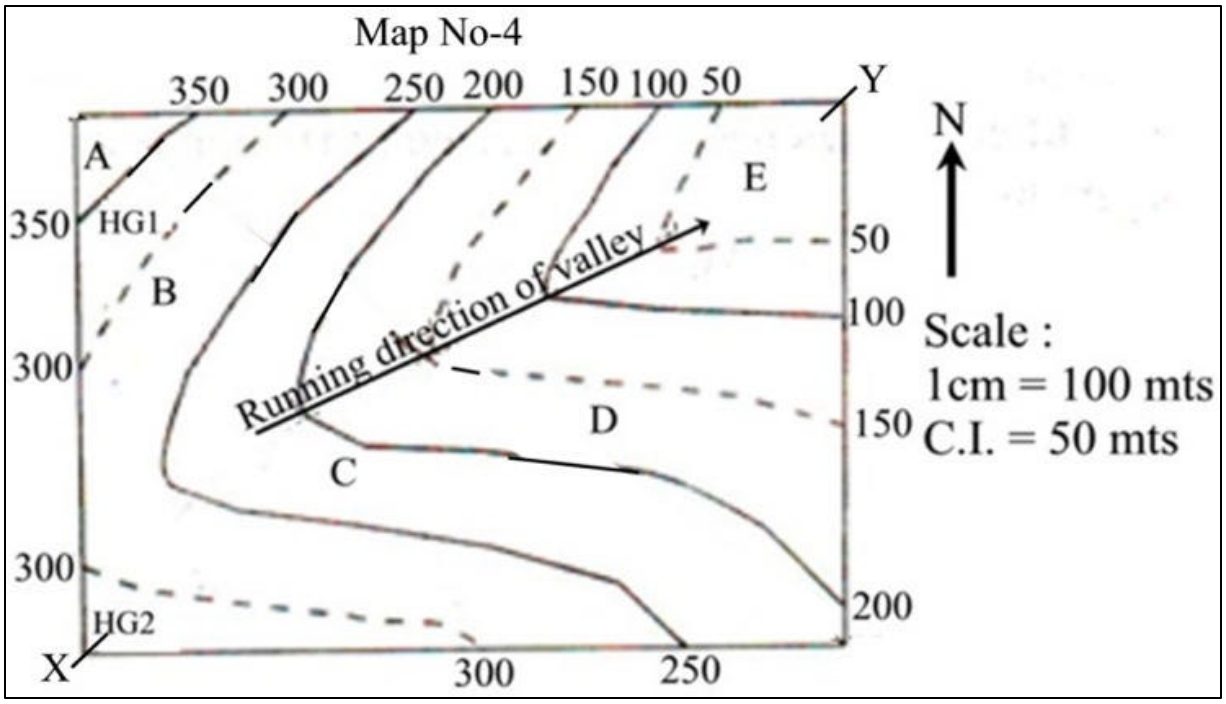
Map-3



Map-3

Description of the map-3	
Geology of the area	
Attitude of Beds	
Order of superposition & thickness of beds	
Geology history of the area	

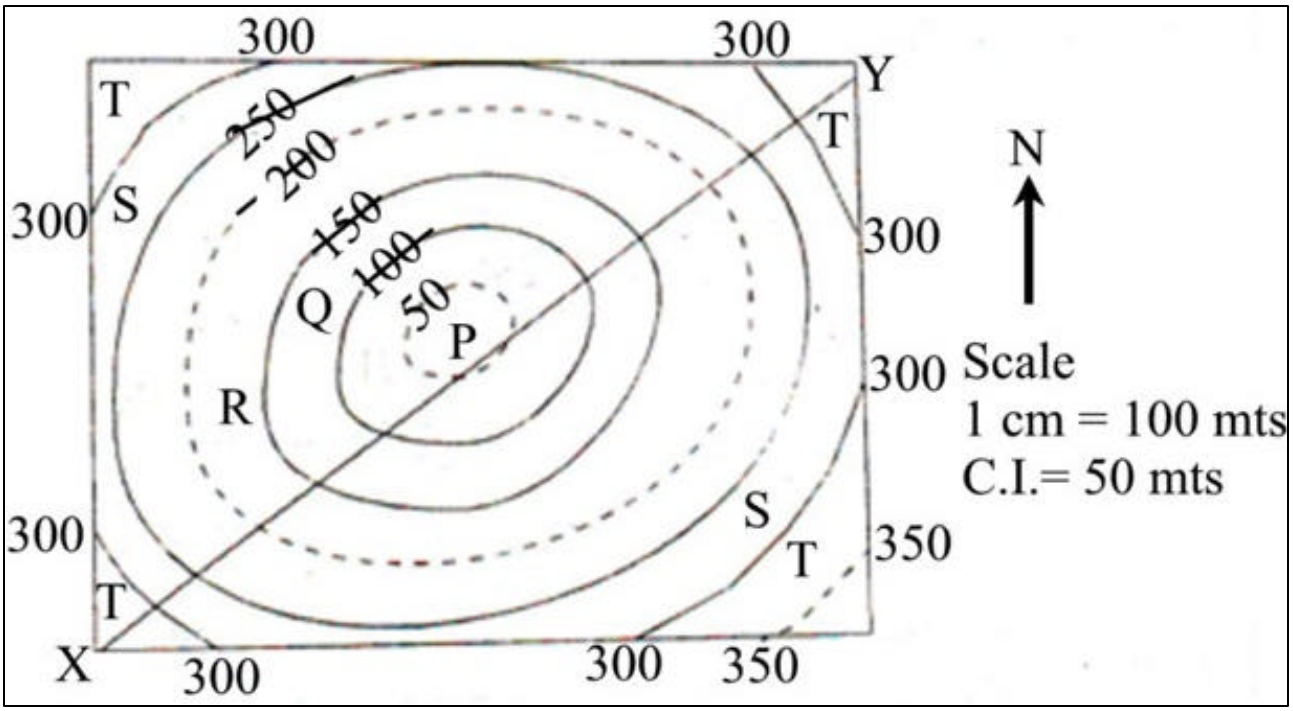
Map No-4



Map-4

Description of the map-4 **Geology of the area**	
Attitude of Beds	
Order of superposition & thickness of beds	
Geology history of the area	

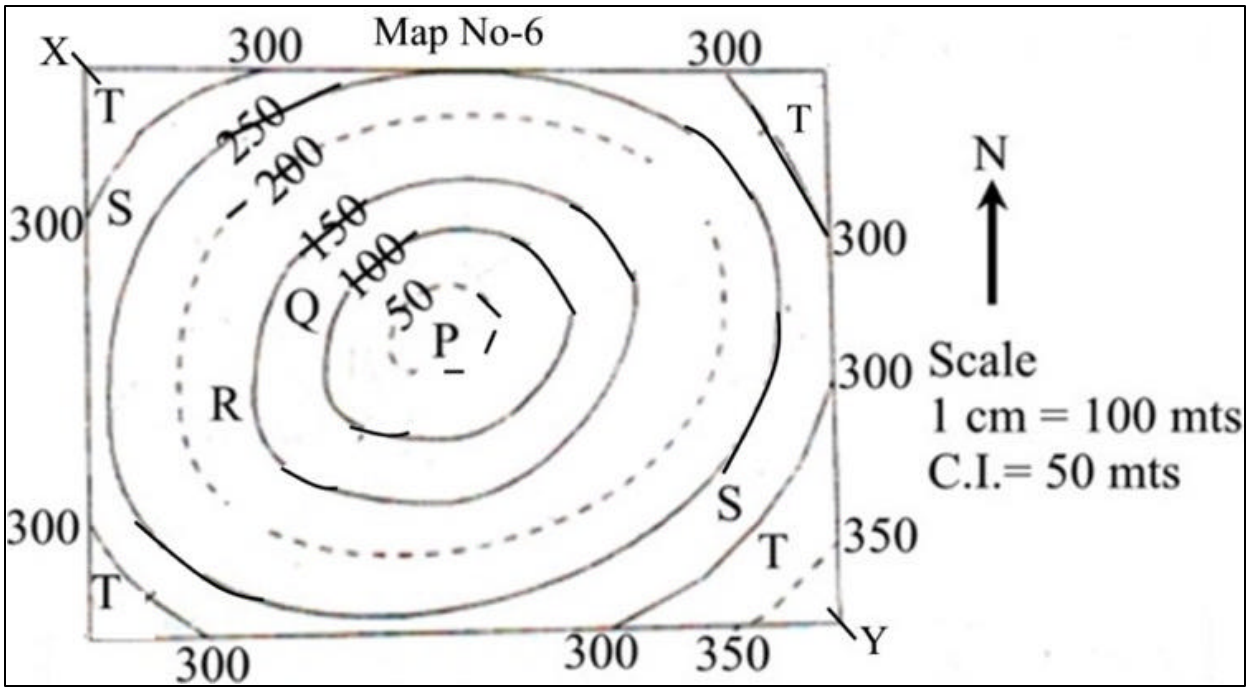
Map-5



Map-5

Description of the map-5 **Geology of the area**	
Attitude of Beds	
Order of superposition & thickness of beds	
Geology history of the area	

Map No-6



Map-6

Description of the map-6	
Geology of the area	
Attitude of Beds	
Order of superposition & thickness of beds	
Geology history of the area	

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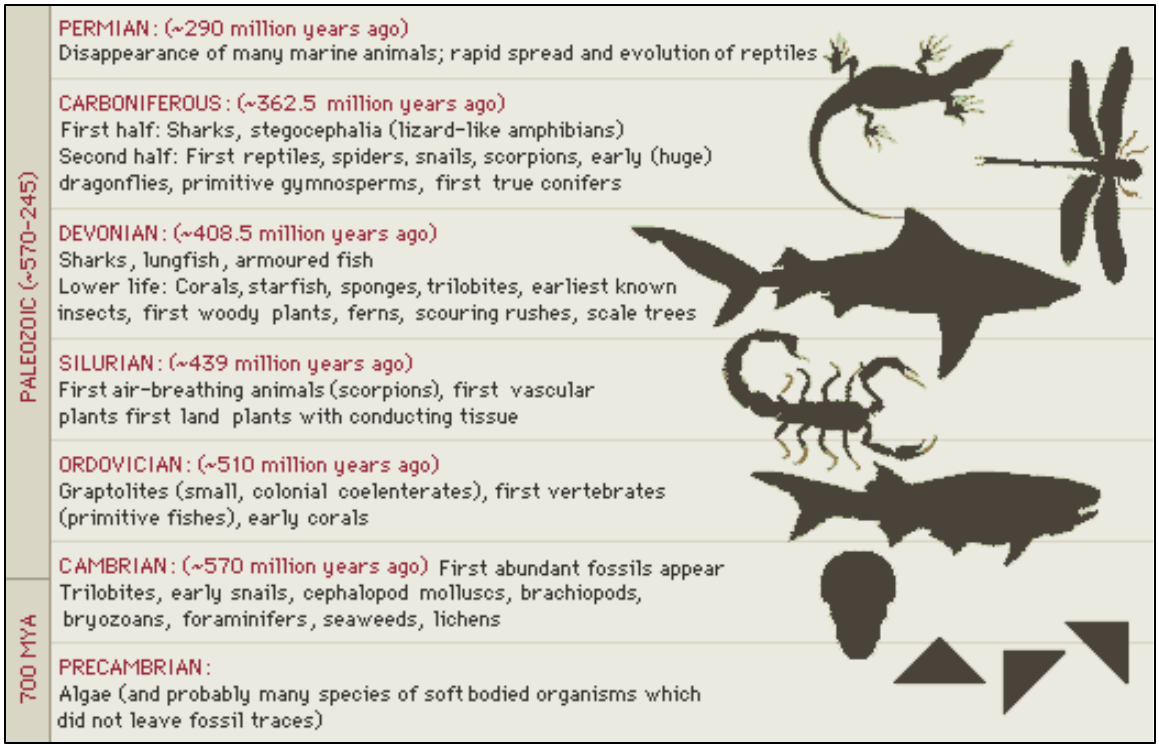
G12S_Geological Map of India

Aim: To show the stratigraphy of India on the given map.

Records of the Earth's geological history are obtained from four major types of rock, each produced by a different kind of crustal activity:
(1) Erosion and sedim entation produce successive layers of sedimentary rocks
(2) Molten rock, pushed upwards from deep-lying magma chambers, cools and forms surface rocks or the upper part of the Earth's crust, providing records of volcanic activity
(3) Geological structures developed from pre-existing rocks form records of past deformations
(4) Records of plutonism, or magmatic activity deep within the Earth, are supplied by studying the deep-lying metamorphic and granitic rocks.
A time chart of the Earth's geological events is developed by dating these past geological episodes by using various radiometric and relativistic methods.
The divisions of the resulting geological timescale are based primarily on changes in fossil forms found from one stratum to the next. The first five-sixths of the estimated 4 to 6 billion years of the Earth's history, however, is recorded in rocks

that contain almost no fossils; an adequate fossil record for stratigraphic correlation exists only for the past 600 million years, beginning at the time when Lower Cambrian deposits were laid. Scientists therefore conveniently separate the Earth's vast span of existence into two major time divisions: the Cryptozoic (hidden life), or Precambrian; and the Phanerozoic (obvious life), or Cambrian, and the more recent time divisions.

EON	ERA	PERIOD	EPOCH	APPROX. TIME BOUNDARY	LIFE FORMS ORIGINATING
PHANEROZOIC	CENOZOIC / QUATERNARY SUB-ERA	PLEISTOGENE	Holocene (Recent)	10,000	
			Pleistocene	1,800,000	Human beings
		NEOGENE	Pliocene	5,300,000	Human-like apes
			Miocene	23,800,000	
	TERTIARY SUB-ERA	PALAEOGENE	Oligocene	33,700,000	True primates
			Eocene	54,800,000	Marine and carnivorous mammals
			Palaeocene	65,000,000	Hoofed mammals
	MESOZOIC	CRETACEOUS		142,000,000	Flowering plants, placental mammals
		JURASSIC		205,700,000	Birds
		TRIASSIC		248,200,000	Small dinosaurs, small mammals
		PERMIAN		290,000,000	Conifers, mammal-like reptiles
	PALAEOZOIC	CARBONIFEROUS		354,500,000	True reptiles, fern forests
		DEVONIAN		417,500,000	Land vertebrates, air-breathing insects
		SILURIAN		443,000,000	Vascular land plants
		ORDOVICIAN		495,000,000	Vertebrates
		CAMBRIAN		545,000,000	Hard-bodied invertebrates
PROTEROZOIC	NEOPROTEROZOIC			1,000,000,000	Soft-bodied invertebrates
	MESOPROTEROZOIC			1,600,000,000	Cells with distinct nuclei
	PALAEOPROTEROZOIC			2,500,000,000	
ARCHAEAN	LATE			3,000,000,000	Primitive unicellular organisms
	MIDDLE			3,500,000,000	
	EARLY			4,000,000,000	
PRISCOAN (HADEAN)				4,650,000,000	



Fundamental differences in the fossil assemblages of early, middle, and late Phanerozoic rocks gave rise to the designation of three great eras: the Palaeozoic (ancient life), the Mesozoic (middle life), and the Cenozoic (recent life). The principal divisions of time in each of these eras constitute geological periods, during which rocks of corresponding systems were laid down throughout the world. The periods are generally named after the regions where rocks of the period in question are well exposed; **for example, the Permian period is named after the European province of Perm in Russia** Some periods are named instead after typical deposits, such as the Carboniferous period for its coal beds; or for ancient peoples, such as the Ordovician and Silurian periods, named after the Ordovices and Silures of ancient Britain and Wales. The Cenozoic's Tertiary and Quaternary periods are further divided into epochs and ages, from the Palaeocene to the Holocene, or most recent time. Besides these time periods, geologists also use time-rock divisions called systems; such systems are similarly divided into series and, sometimes, still smaller units called stages.The discovery of radioactivity enabled 20th-century geologists to devise new dating methods and thereby assign absolute ages, in millions of years, to the divisions of the timescale.
In the Cambrian period, the peninsula had been a land area which had river. They had been submerged beneath the sea temporarily and locally, so that no marine sediments of latter age than Cambrian were found in it .The extra peninsula had remained as a better part beneath the sea and land has been covered by thick marine deposits of all geological periods. The geological formations from the Archean (Dharwar) upto the Tertiary is given below, they are:-

1) The Archean (Dharwar):- The term Archean refers to very ancient gneisses, schists and granites which constitutes the platform on which all sedimentary formation.In India they are found in abundance and cover 2/3rd of the peninsula. They are very well developed in South-India, Rajasthan, M.P, Eastern-parts of India, in the Singhbhum and Gangapura district. In Bihar, Orissa and Eastern-ghats ranges.

2) Cuddapah Supergroup: - The name of these system has been derived from the cuddapah basin of Andhra Pradesh where it has been best developed .It includes shales and Quartzite in the alternate layers. It is found in Cuddapah district in Andhra Pradesh. It is also found in Vidharbha, South-Maharashrta, Orissa, M.P, and Rajasthan.

3) Vindhyan Supergroup: - The Vindhyan constitutes un-metamorphosed columns of Calcareous, Arenaceous, and Argillaceous sediments .The Vindhyan rocks are developed in 'Son-valley' and in certain parts of Rajasthan, M.P and A.P.

4) Gondwana Supergroup:- The name of this formation is derived from the Gond –kingdom of M.P. The Gondwana rocks, mainly fresh water sediments are found deposited in shallow, elongated basin brought about by block faulting. The Gondwana rocks are developed in peninsular region of India and they are along the:
i) Damodar and Son valley.
ii)Upper Narmada and along the Godavari valley.
iii) Along Mahanadi valley.

5) Deecan Trap:- The **Deccan Traps** is a large igneous province located on the Deccan Plateau of west-central India and is one of the largest volcanic features on Earth. It consists of multiple layers of solidified flood basalt that together are more than 2,000 m thick and cover an area of 500,000 km². The term 'traps' is derived from the Swedish word for stairs (*trappa*, or sometimes *trapp*), referring to the step-like hills forming the landscape of the region. The gases released in the process may have played a role in the extinction of the dinosaurs. W ithin the Deccan Traps at least 95% of the lavas are basalts

6) The Tertiary group: (65-1.64 million years ago). In the Tertiary, North America's land link to Europe was broken, but its ties to South America were forged towards the end of the period. During Cenozoic times, life forms both on land and in the sea became more like those of today. Grasses became more prominent, leading to marked changes in the dentition of plant-eating animals. With most of the dominant reptile forms having vanished at the end of the Cretaceous, the Cenozoic became the age of mammals. Thus, in the Eocene epoch, new mammal groups developed such as small, horse-like animals; rhinoceroses; tapirs; ruminants; whales; and the ancestors of elephants. Members of the cat and dog families appeared in the Oligocene epoch, as did species of monkeys. In Miocene times, marsupials were numerous, and anthropoid (human-like) apes first appeared. Placental mammals reached their zenith, in numbers and variety of species, in the Pliocene, extending into the Quaternary period.
In India these period has witnessed the igneous action on a very large scale. Tertiary rocks cover very large part of India . They are very well developed in Kathiavad in Gujarat, Orissa, and Midnapur.

Procedure: The map provided to the students is a blank map with the outline of the geological formations of peninsular India. The following task has to be performed by the students:The student has to go through the map & fill appropriate colours or signs to the given geological map of India & also the index given in the map with respect to their respective order of successions.