

# CONTOURING

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<http://www.gowaterfalling.com/waterfalls/images/full/mi/pr/pteroack15.jpg>

# Contour

- An imaginary line on the ground surface joining the points of equal elevation is known as contour.
- In other words, contour is a **line** in which the ground surface is intersected by a level surface obtained by joining points of **equal elevation**. This line on the map represents a contour and is called **contour line**.

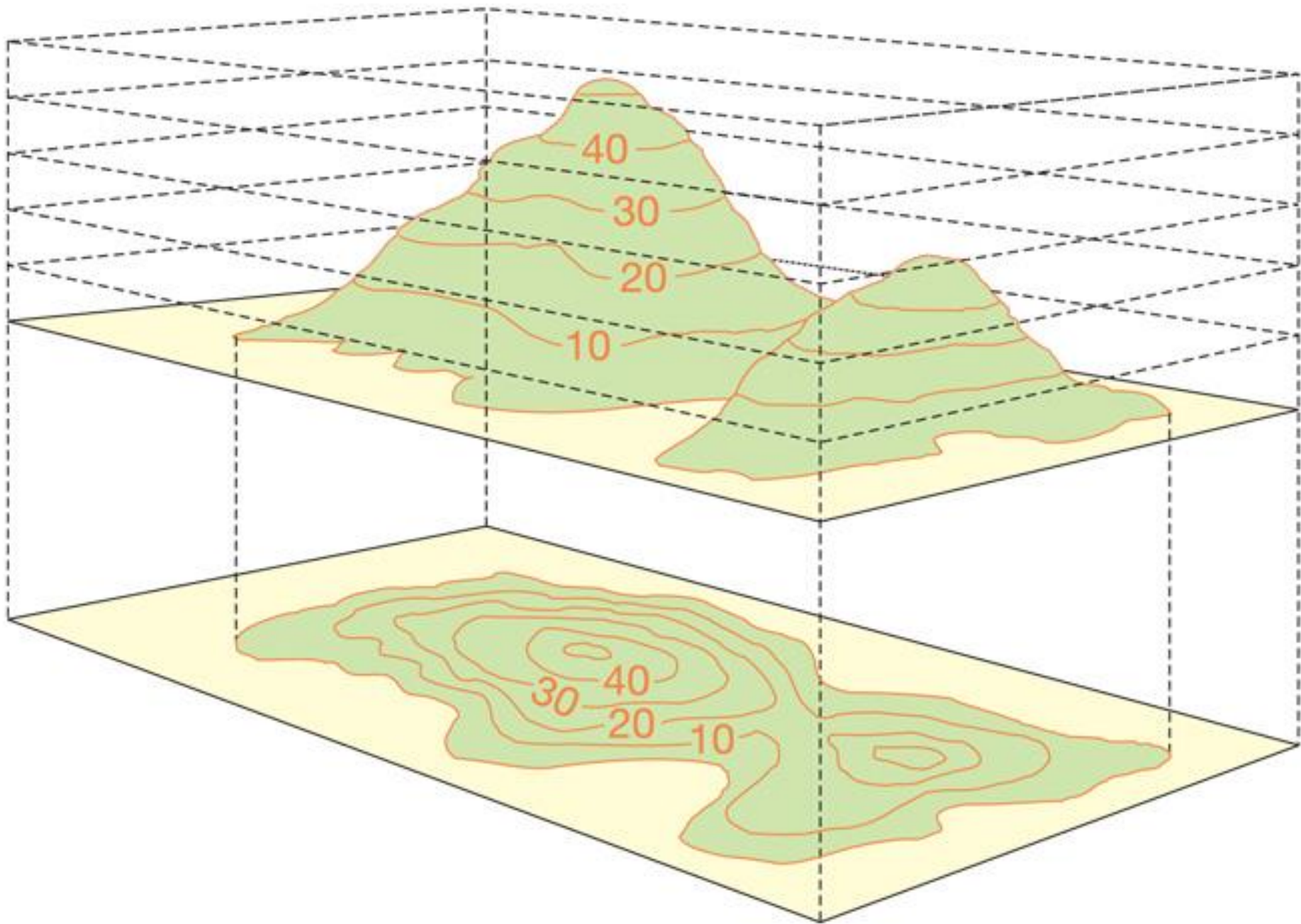
# Contour Map

- A map showing contour lines is known as Contour map.
- A contour map gives an idea of the altitudes of the surface features, as well as their relative positions in plan serves the purpose of both, a **plan** and a **section**.

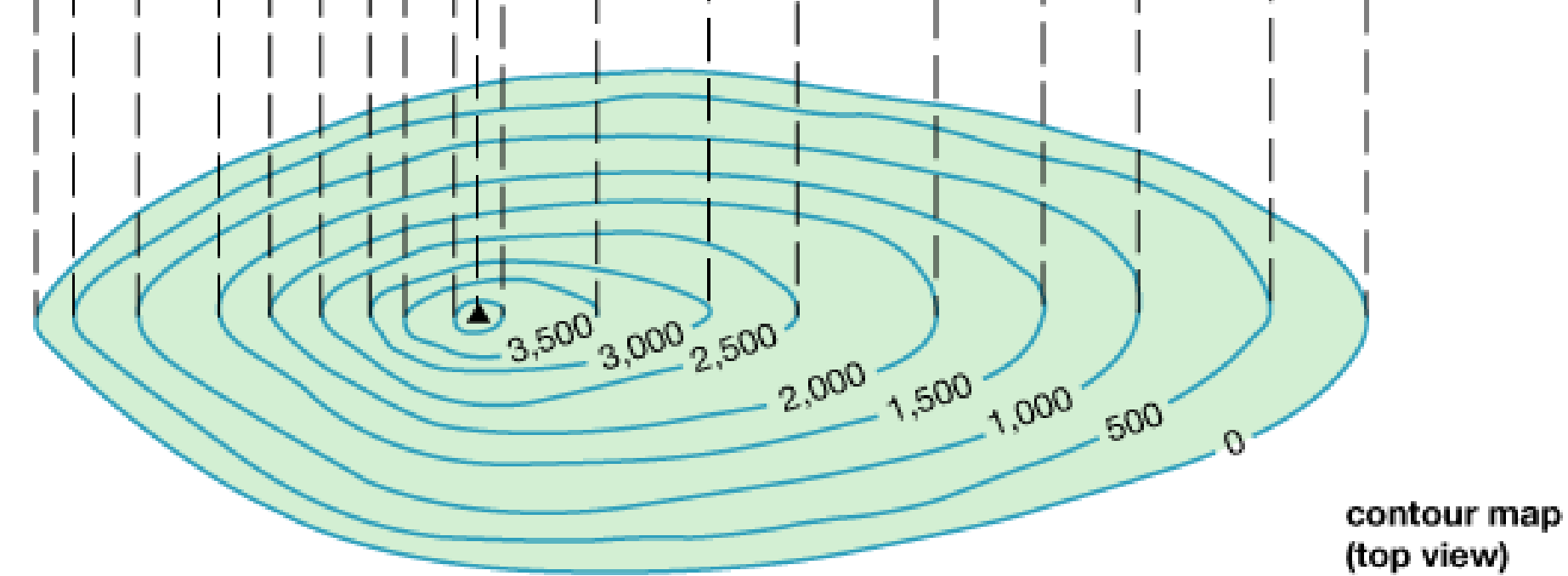
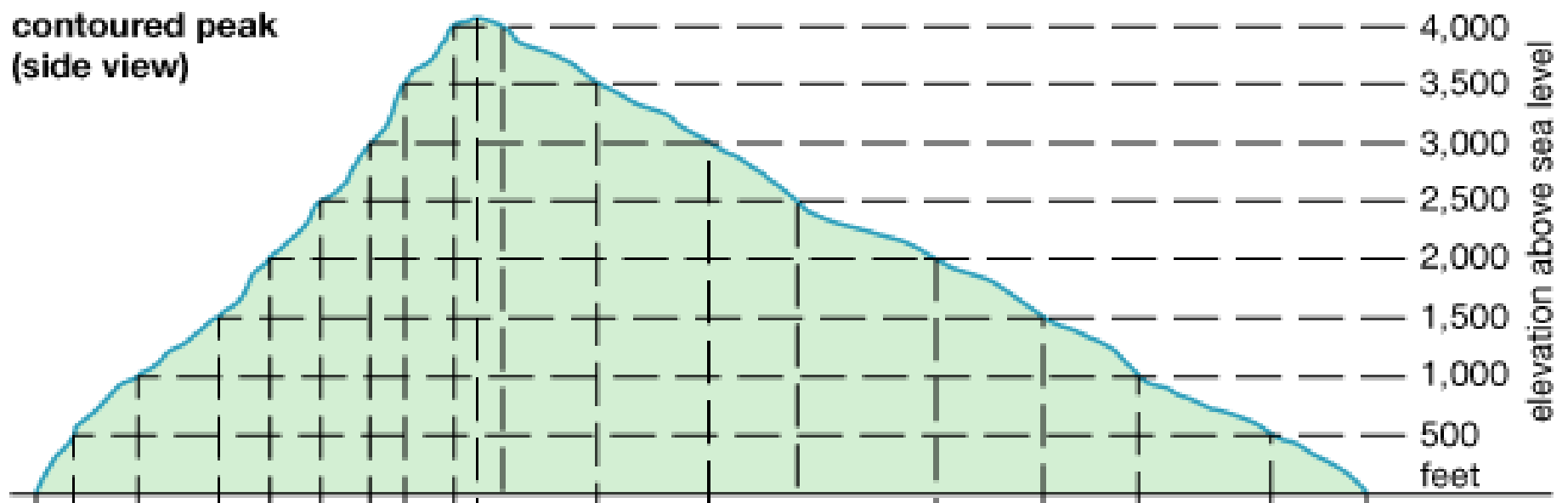
# Contouring

- The process of tracing contour lines on the surface of the earth is called **Contouring**.

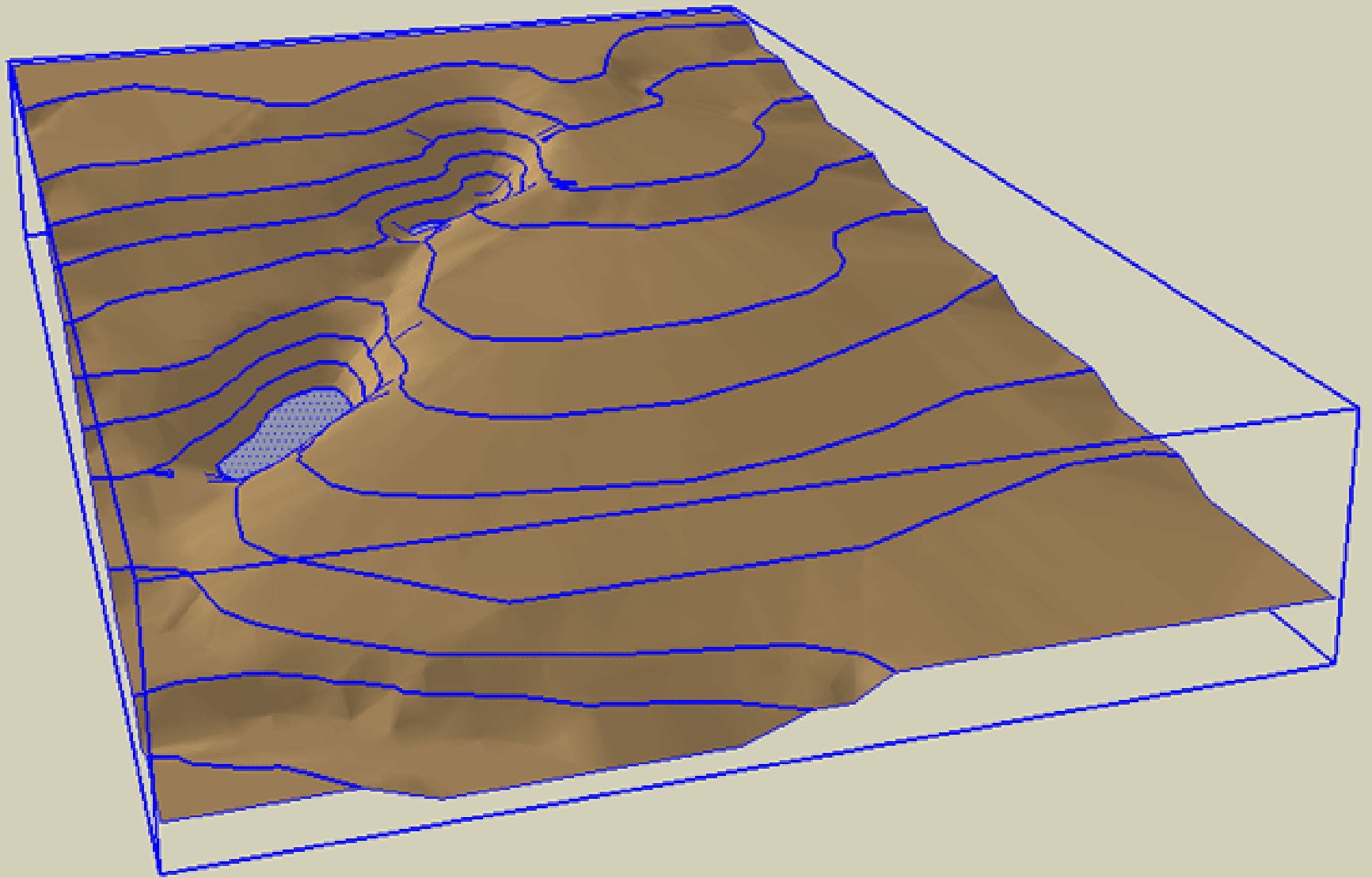




**contoured peak  
(side view)**



**contour map  
(top view)**



# Purpose of Contouring:

- Contour survey is carried out at the start of any engineering project such as a road, a railway, a canal, a dam, a building etc.
1. For preparing contour maps in order to select the most economical or suitable site.
  2. To locate the alignment of a canal so that it should follow a ridge line.
  3. To mark the alignment of roads and railways so that the quantity of earthwork both in cutting and filling should be minimum.



## Purpose of Contouring

4. For getting information about the ground whether it is flat or mountainous.
5. To find the capacity of a reservoir and volume of earthwork especially in a mountainous region.
6. To trace out the given grade of a particular route.
7. To locate the physical features of the ground such as a pond depression, hill, steep or small slopes.

# Contour Interval and Horizontal Equivalent

## CONTOUR INTERVAL

- The constant vertical distance between two consecutive contours is called the contour interval.

## HORIZONTAL EQUIVALENT

- The horizontal distance between any two adjacent contours is called as horizontal equivalent.
- The contour interval is constant between the consecutive contours while the horizontal equivalent is variable and depends upon the slope of the ground.

# Common Values of Contour Interval

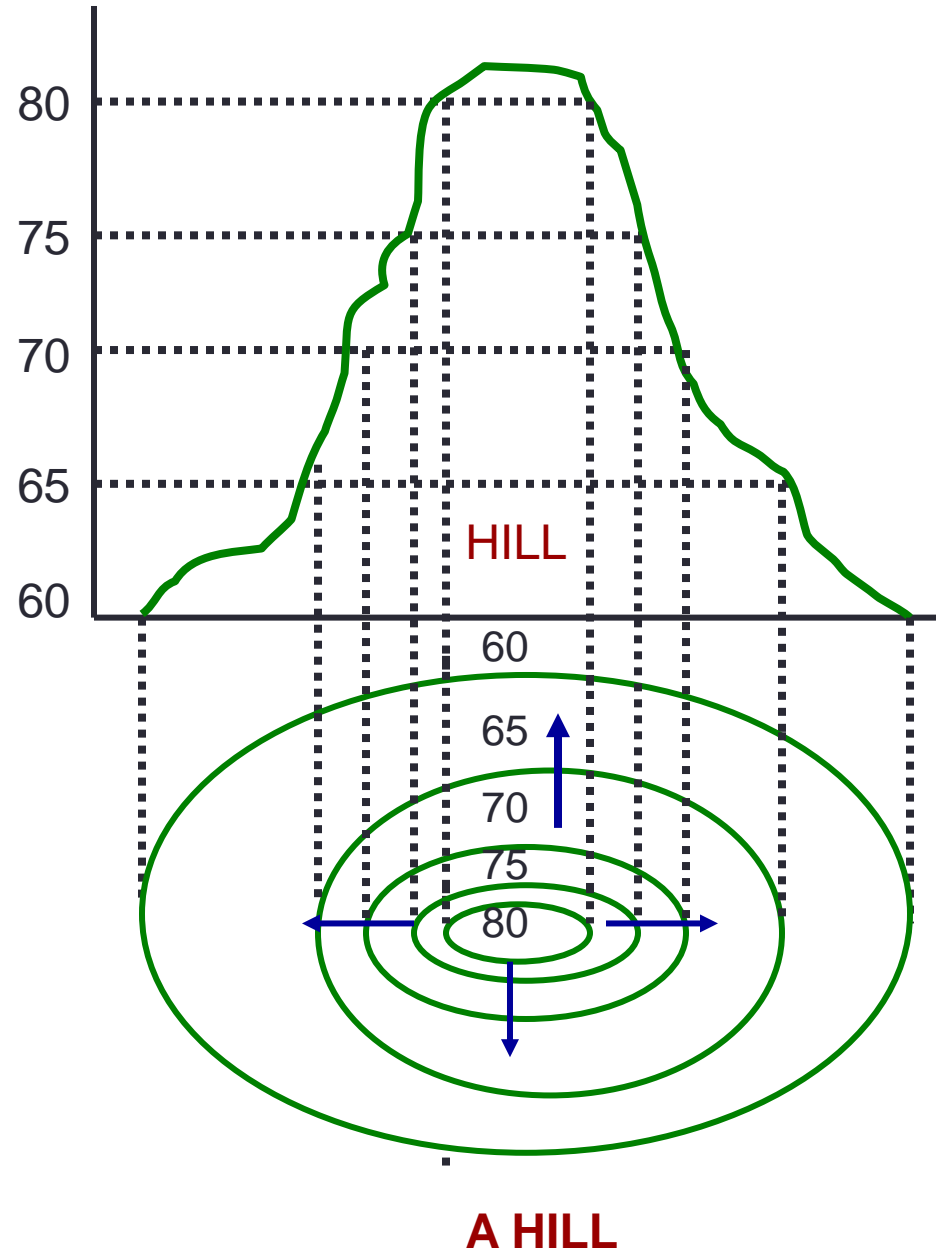
- The following are the common values of the contour interval adopted for various purposes:-
  1. For large scale maps of flat country, for building sites, for detailed design work and for calculation of quantities of earth work; **0.2 to 0.5 m.**
  2. For reservoirs and town planning schemes; **0.5 to 2m.**
  3. For location surveys. **2 to 3m.**
  4. For small scale maps of country and general topographic work;  
**3m,5m,10m,or 25m.**

# Characteristics

- All points in a contour line have the same elevation.
- Flat ground is indicated where the contours are widely separated and steep slope where they run close together.
- A uniform slope is indicated when the contour lines are uniformly spaced and
- A plane surface when they are straight, parallel and equally spaced.

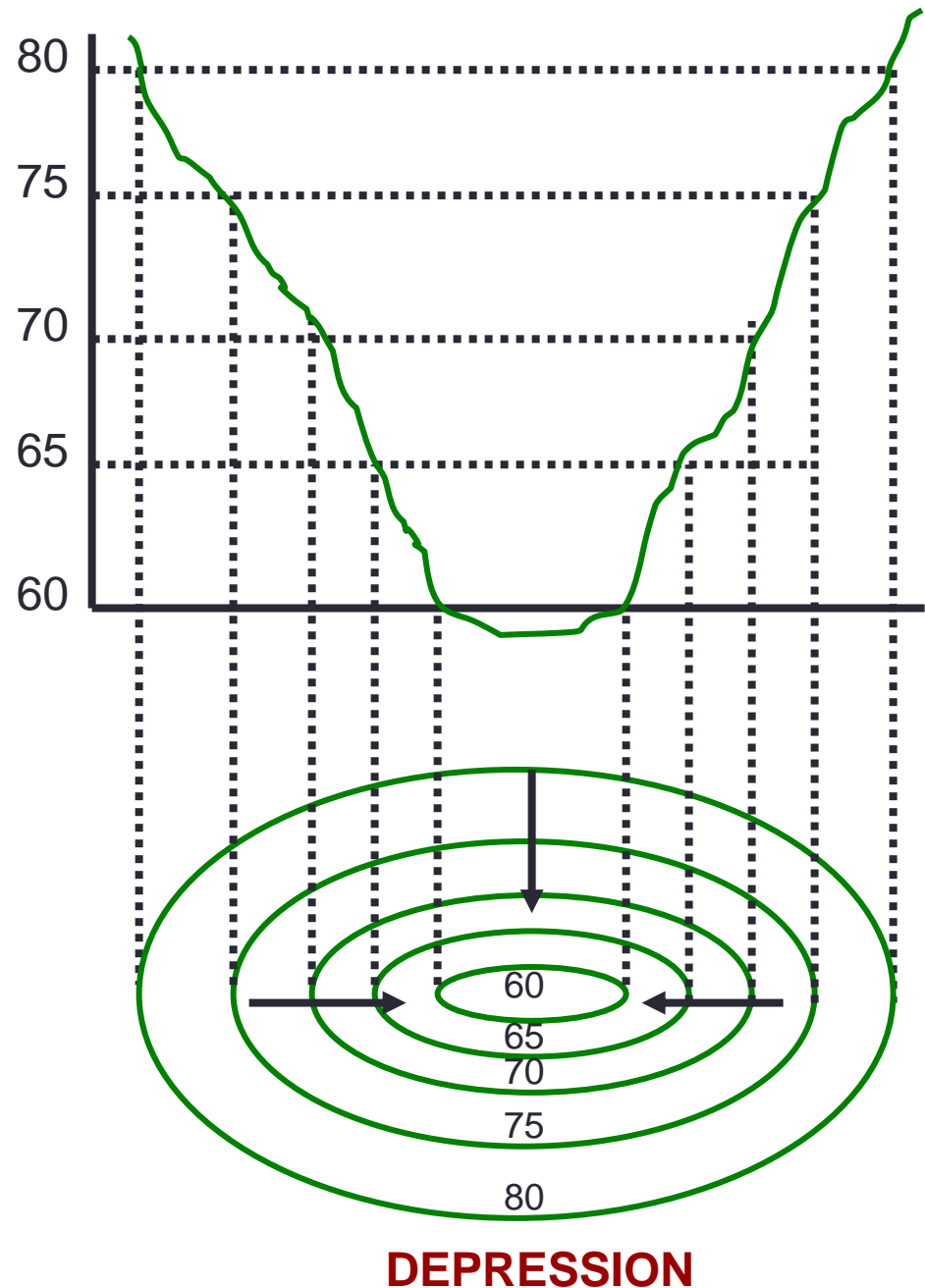
## Characteristics

- A series of closed contour lines on the map represent a hill, if the higher values are inside.



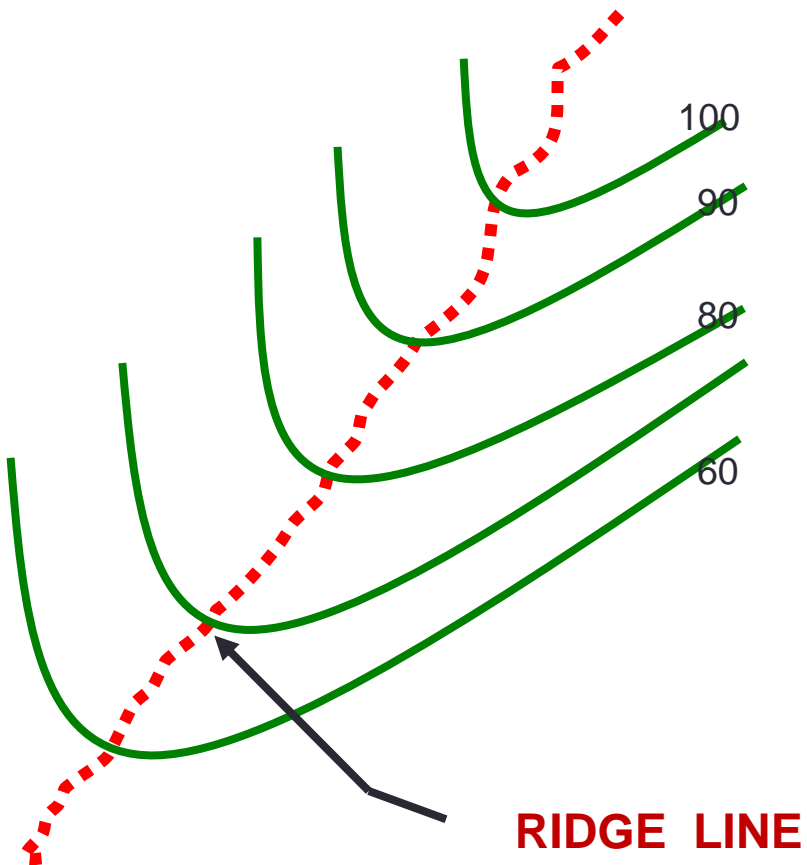
## Characteristics

- A series of closed contour lines on the map indicate a depression if the higher values are outside



## Characteristics

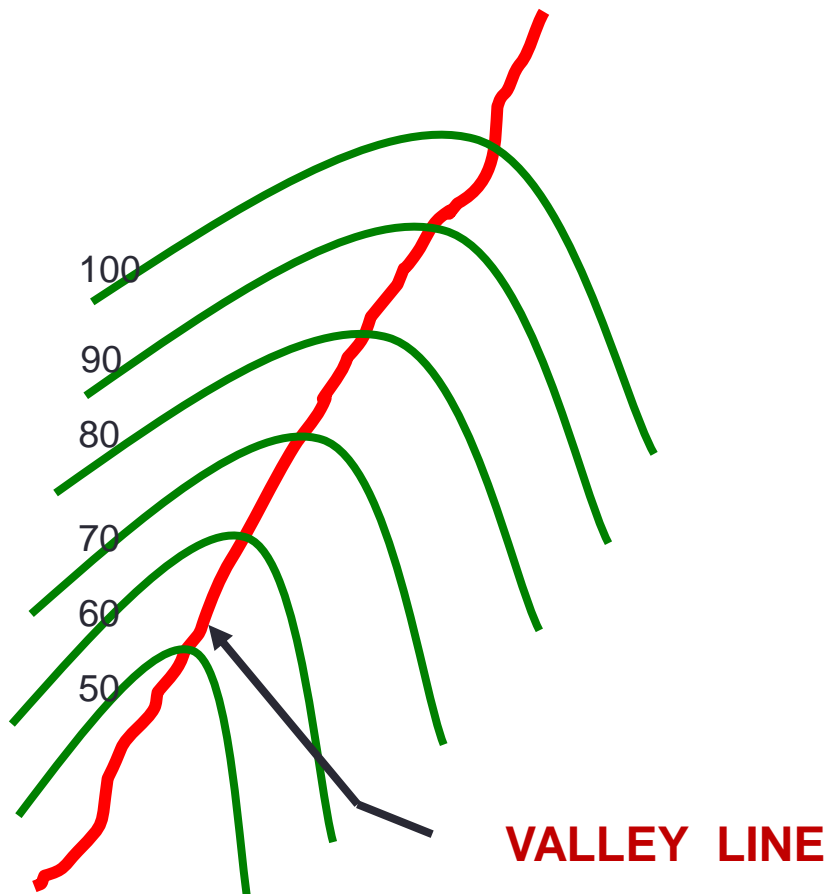
- Contour line cross ridge or valley line at right angles.



If the higher values are inside the bend or loop in the contour, it indicates a **Ridge**.

## Characteristics

- Contour line cross ridge or valley line at right angles.

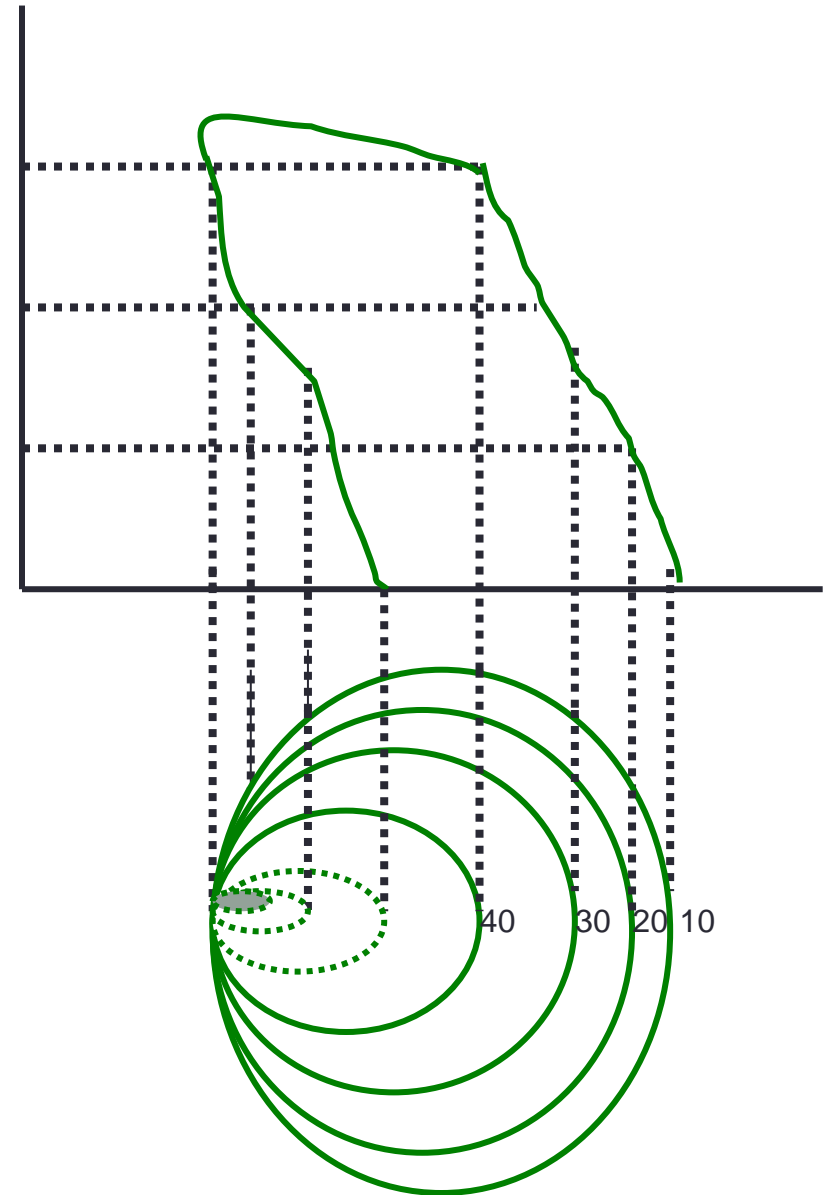


If the higher values are outside the bend, it represents a **Valley**.



## Characteristics

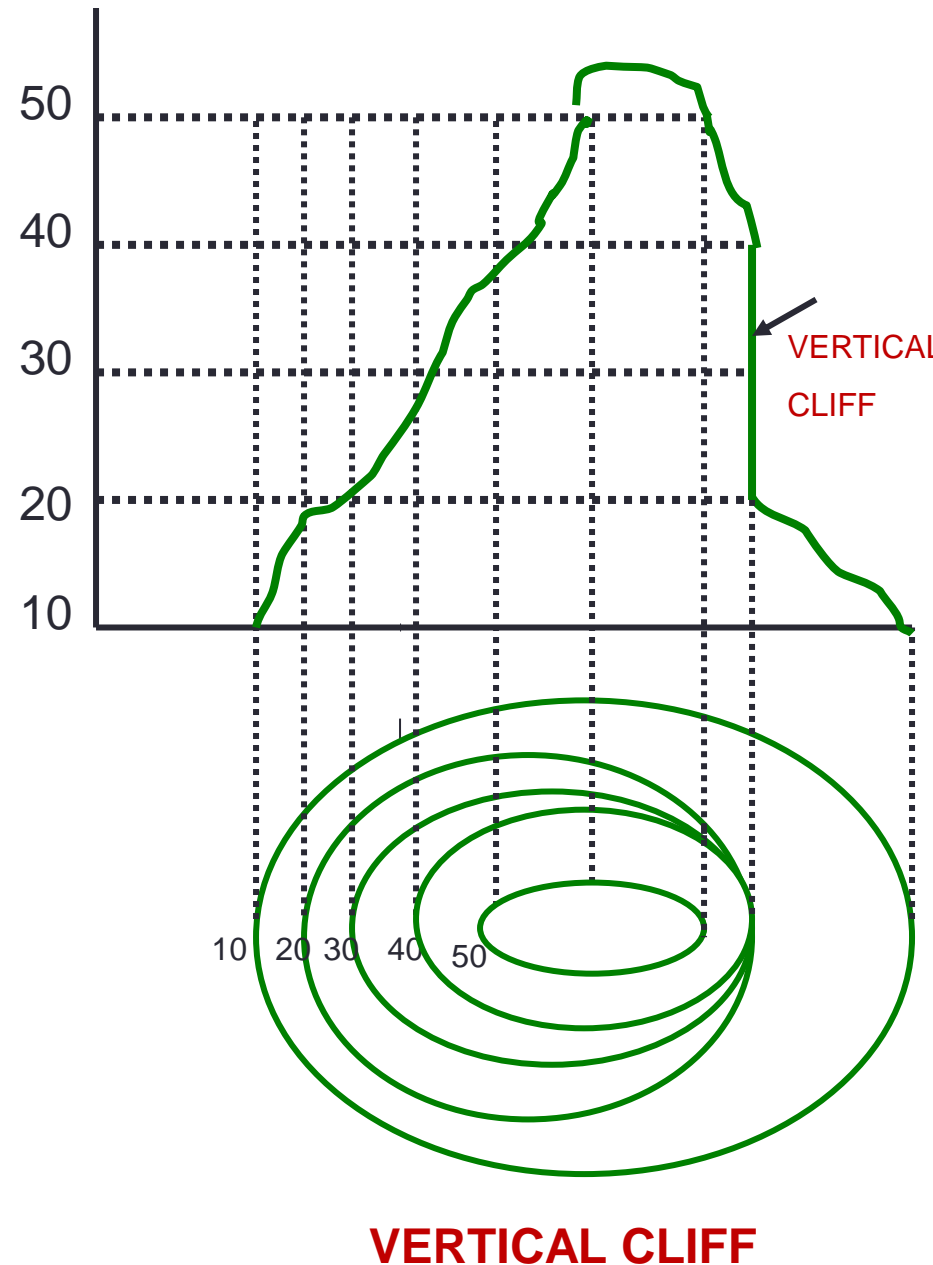
- Contours cannot end anywhere but close on themselves either within or outside the limits of the map.
- Contour lines cannot merge or cross one another on map except in the case of an **overhanging cliff**.



**OVERHANGING CLIFF**

## Characteristics

- Contour lines never run into one another except in the case of a vertical cliff. In this case, several contours coincide and the horizontal equivalent becomes zero.

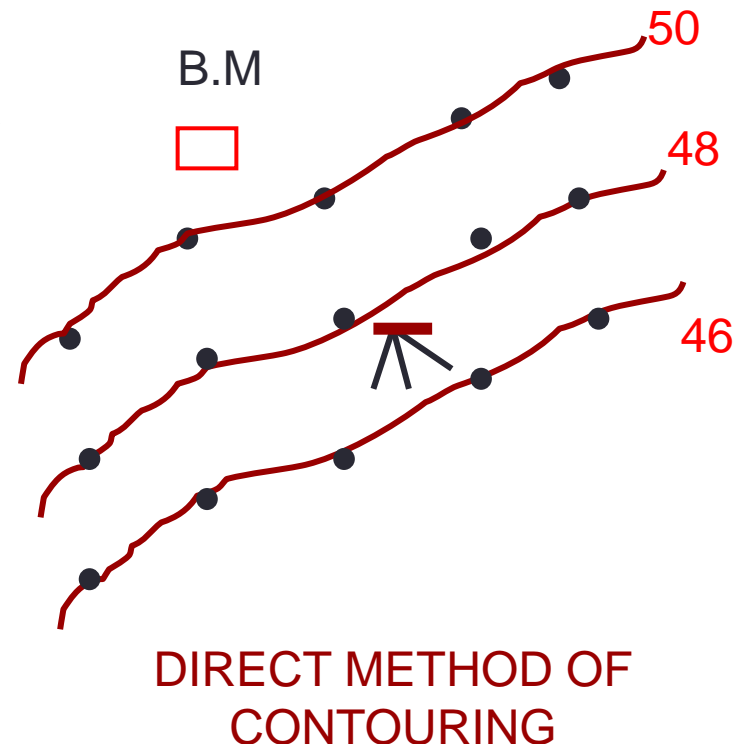


# Methods of Contouring

Direct Method & Indirect Method

## 1. Direct Method:

- In this method, the contours to be located are directly traced out in the field by locating and marking a number of points on each contour. These points are then surveyed and plotted on plan and the contours drawn through them.



## Direct Method

- This method is most accurate but very slow and tedious as **a lot of time is wasted** in searching points of the same elevation for a contour.
- This is suitable for small area and where great accuracy is required.

# Procedure:

1. To start with, a temporary B.M is established near the area to be surveyed with reference to a permanent B.M.
2. The level is then set up in such a position so that the maximum number of points can be commanded from the instrument station.
3. The height of instrument is determined by taking a back sight on the B.M. and adding it to the R.L. of bench mark.
4. The staff reading required to fix points on the various contours is determined by subtracting the R.L. of each of the contours from the height of instrument.

## Procedure

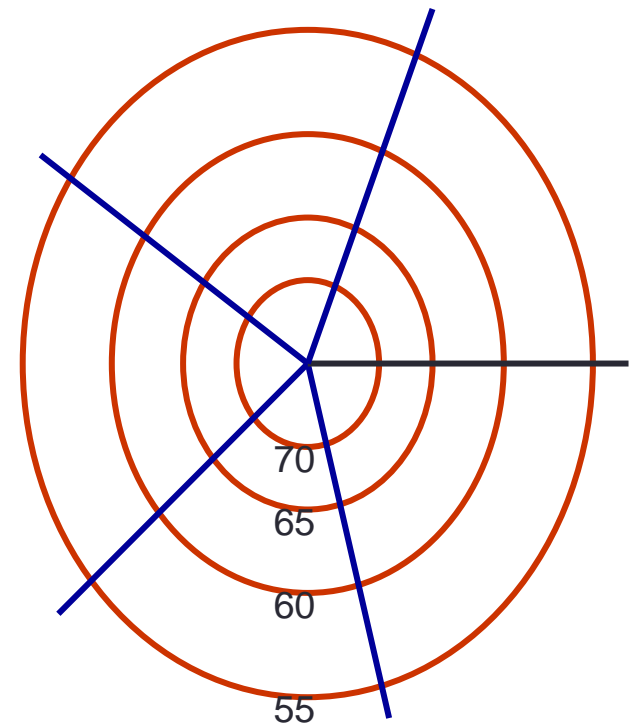
- Example:
- If the height of instrument is 82.48m., then the staff readings required to locate 82, 81 and 80m contours are 0.48, 1.48 and 2.48m respectively. The staff is held on an approximate position of point and then moved *up* and *down* the slope until the desired reading is obtained. The point is marked with a peg.
- Similarly various other points are marked on each contour. The line joining all these points give the required contour. It may be noted that one contour is located at a time. Having fixed the contours within the range of the instrument, the level is shifted and set up in a new position.

## Procedure

- The new height of instrument and the required staff readings are then calculated in a similar manner and the process repeated till all the contours are located. The positions of the contour points are located suitably either simultaneous with leveling afterwards.
- A theodolite, a compass or a plane table is usually adopted for locating these points. The points are then plotted on the plan and the contours drawn by joining the corresponding points by dotted curved lines.

# Direct Method By Radial Lines

- This method is suitable for small areas, where a single point in the center can command the whole area. Radial lines are laid out from the common center by theodolite or compass and their positions are fixed up by horizontal angles.



RADIAL LINES METHOD OF  
CONTOURING



## Direct Method By Radial Lines

- Temporary bench marks are first established at the center and near the ends of the radial lines.
- The contour points are then located and marked on these lines and their positions are determined by measuring their distances along the radial lines.
- They are then plotted on the plan and the contours drawn by joining all the corresponding points.

## 2. Indirect Method:

- The reduced level of point on the surface of the ground (ground point) is called the spot level or spot height.
- In the method the spot levels are taken along a series of lines laid out over the area.
- Their positions are then plotted on the map and the contours are then drawn by interpolation.

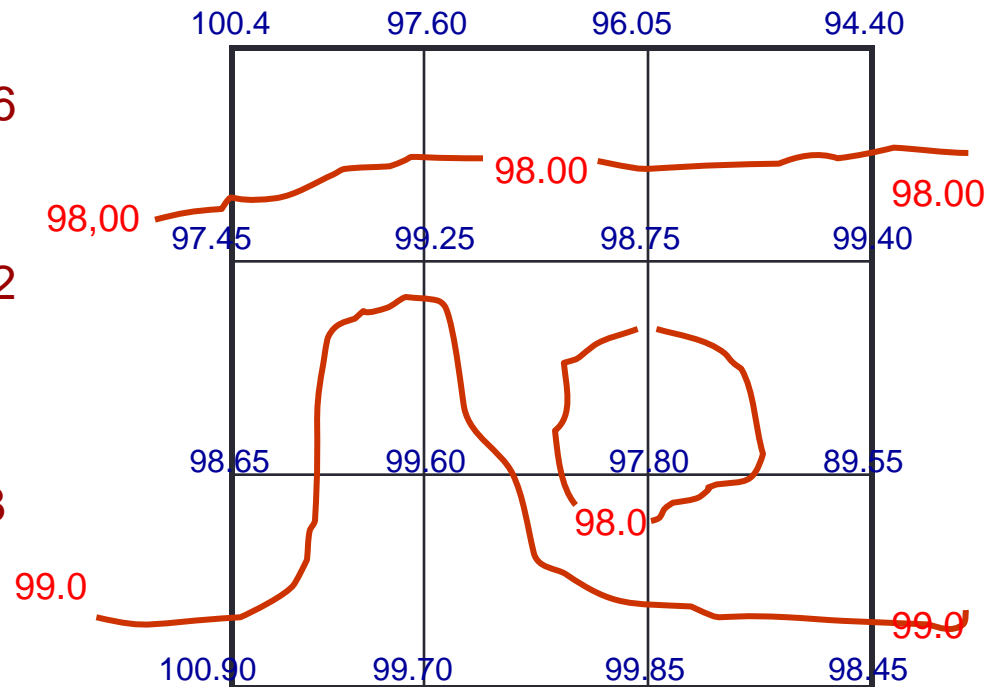
# Method of Squares:

- In this method, the whole area is divided into number of squares, the side of which may vary from **5m to 20m** depending upon the nature of the ground and the contour interval. The size of square need not be of the same throughout.
- The corners of the squares are pegged out and the elevations of these points are determined with a level.
- Intermediate points within the square may be taken when required. The system of squares are plotted and elevations of the corners are written on plan.
- The contour lines are then interpolated in usual way.

# Method of Squares



1 2 3 4  
SQUARES LAID ON GROUND



CONTOURS INTERPOLATED

# Drawing of Contour Lines

- Contour lines are drawn as fine and smooth free hand curved lines. Sometimes they are represented by broken lines. They are inked in either in black or brown colour. Every fifth contour is made **thicker** than the rest.
- The elevation of contours must be written in a uniform manner, either on the higher side or in a gap left in the line. When the contour lines are very long, their elevations are written at two or three places along the contour.