

Attitude of the **geological structures** includes orientation linear structures and attitude planar structures.

**Linear structure:** resembles a geometric shape of line. (e.g. hinge line of fold, striation on fault).

**Attitude:** orientation of geometrical element (linear or planar) structures in space. Geologists specify the orientation of lines by giving their plunge and trend.

**Bearing:** the horizontal angle between a line and a specified coordinate direction, usually true north or south; the compass direction or azimuth (Fig.5-c).

**Trend:** the bearing (compass direction) of a line. Non-horizontal line trends in the down-plunge direction (Fig.1).

**Plunge:** the vertical angle between a line and an imaginary horizontal plane, as measured with an inclinometer in the vertical that contains the line (Fig.1).

**Pitch (rake):** angle measured with an inclined plane between a horizontal line and the line in question (Fig.2).

There are two ways of expressing the trends of lines and strikes of planes (Fig.3):

1-The **azimuth** method is measured clockwise from north and range between 0-360.

2-The **quadrant** method is based on four 90° quadrants.

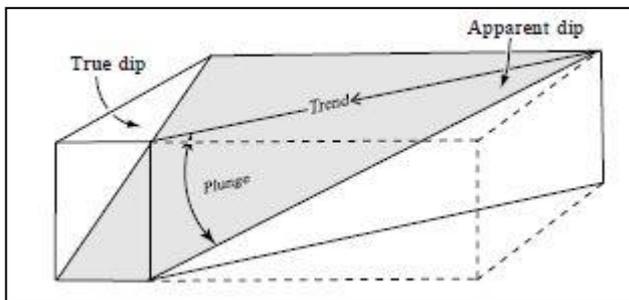


Fig.1 Trend and plunge of a line

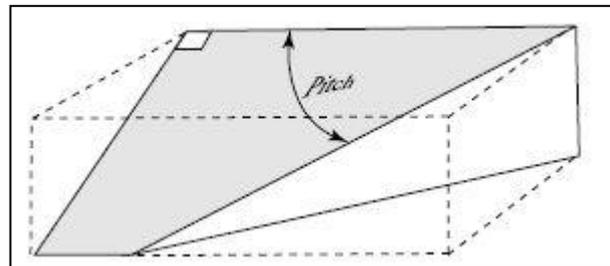


Fig.2 Pitch (or rake) of a line in an inclined plane

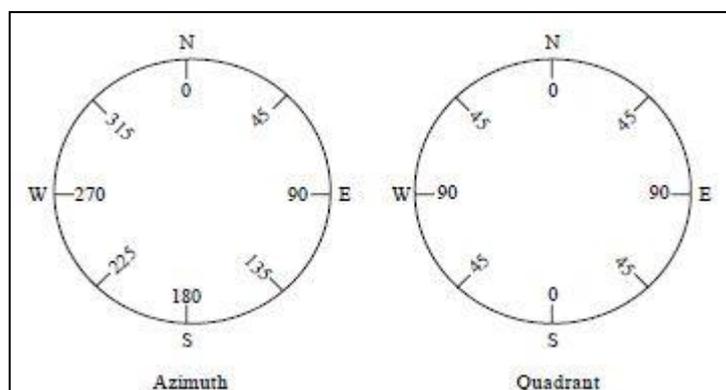


Fig.3 Azimuth and quadrant method of expressing compass direction

**Exercise 1:** Write all possible conventions of these attitudes of lines.

N72°W/32°, 129°/40°, 008°/53°, S61°W/15°

**Planar structures:** they resemble the geometric shape of a plane (like faults, joints, and veins). A planar structure's orientation can be specified by its strike and dip (Fig.4).

**Strike:** is the angle between an imaginary horizontal line (strike line) on the plane and the direction to true north (Fig.4&5). The strike is a line of equal elevation on a plane. There are an infinite number of parallel strike lines for any inclined plane. The strike is measure with magnetic compass.

**Dip:** is the angle of the plane's slope (more precisely, the angle between a horizontal plane and dip line, an imaginary line parallel to the steepest slope on the plane, as measured in vertical plane perpendicular to the strike) (Fig.4&5). The direction of dip can be thought of as the direction water would run down the plane (Fig.4&5).

There are two main conventions for writing attitude of planar structures:

I: Strike/True Dip Angle (T.D.D. = NE, or SE, or SW, or NW)

II: True Dip Direction/T.D.A.

❖ **The right-hand rule (R.H.R.)** states that you choose the strike azimuth such that the surface dips to your right (more precisely, record strike in the direction that your right-hand index finger points when your thumb points down the dip) (Fig.6). In azimuth method the right-hand rule is commonly followed:  $\text{Strike} - 90^\circ = \text{T.D.D.}$  Or  $\text{T.D.D.} + 90^\circ = \text{Strike}$

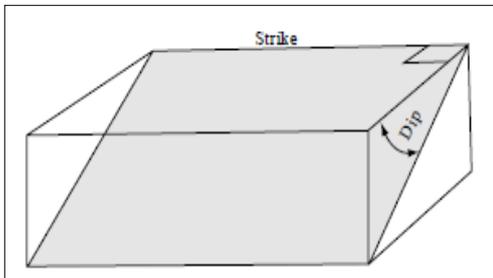


Fig.4 Strike and dip of a plane

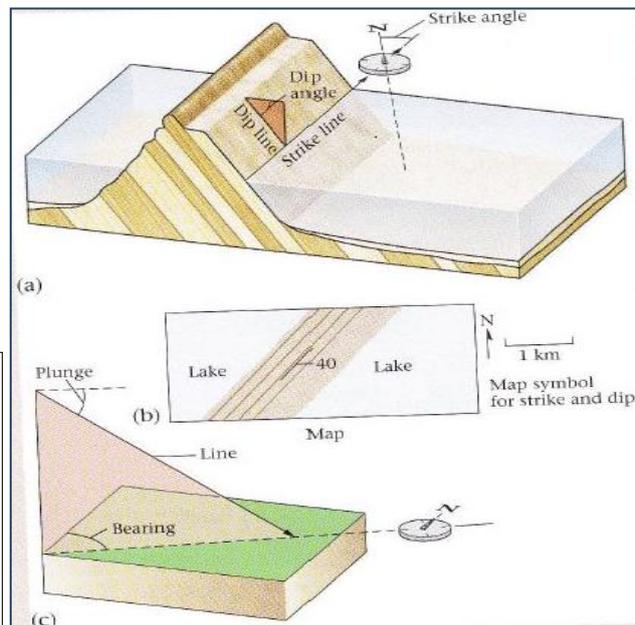


Fig.5 Strike and dip of inclined beds and attitude of inclined line

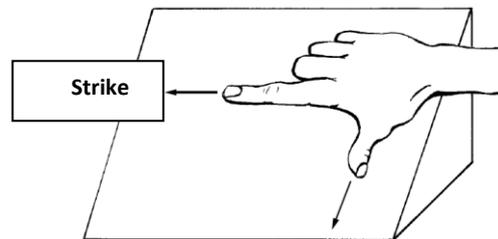


Fig.6 the (R.H.R.) method for measuring and recording dip and strike

**Exercise 2 :** Write all possible conventions for these attitudes of planes.

151°/62°, 024°/40°NW, S48°W/81°SE, 282°/79°