

CEST 50A PLANE SURVEYING

Angles, Bearings and Azimuths

INTRODUCTION:

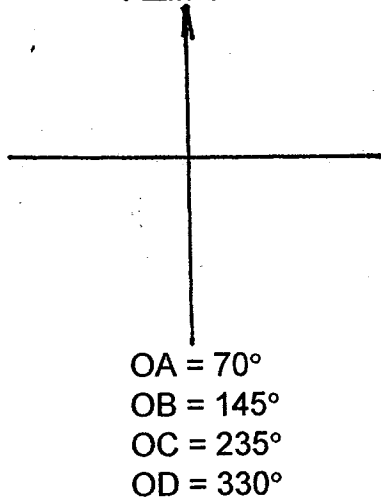
One of the basics functions in surveying is measuring and setting angles. There are three types of horizontal angles commonly used by surveyors; Angles to the Right, Interior Angles and Deflection Angles. No matter what form the angles take, the surveyor uses these angles to express a direction of a line. The direction of the line may be expressed in two forms; as a Bearing or an Azimuth. There are a few important rules you should know about horizontal angles, bearings and azimuths:

1. Horizontal angles are **ALWAYS** turned to the right, unless otherwise noted.
2. Deflection angles are turned to both the right and the left, and are designated as such.
3. It is preferable to turn interior angles to the right on a closed polygon traverse. The sum of the interior angles is equal to the number of angles, minus two, multiplied by 180° . If the angles turned to the right are exterior angles of a closed polygon, then the sum of the exterior angles is equal to the number of angles, plus two, multiplied by 180° .
4. A bearing can never be more than 90° .
5. A bearing must have two letters included with the angular units. The first letter will be either **N** or **S** indicating which end of the meridian it was measured from and the second letter will be an **E** or **W**, indicating in what direction the angle was turned. N $15^\circ 30'$ E means an angle is turn from the North meridian, $15^\circ 30'$ in the direction of East. A bearing of 0° would be either Due North or Due South. A bearing of 90° would be either Due East or Due West.
6. An azimuth is always measured in a clockwise direction from the North.
7. An azimuth contains no letter designations and contains 0° to 360° .

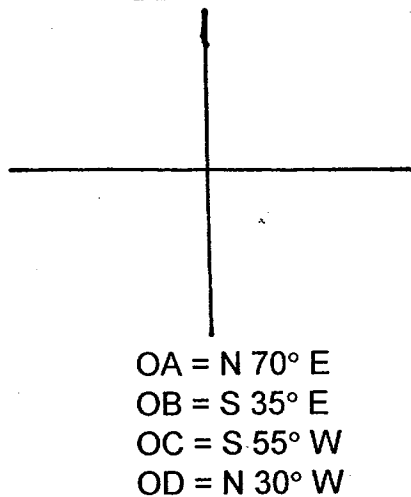
Remember, each **bearing** has a corresponding **azimuth** and vice versa. Always draw a compass rose when computing azimuths, bearings or the angles between.

DIRECTION OF A LINE:

AZIMUTH:

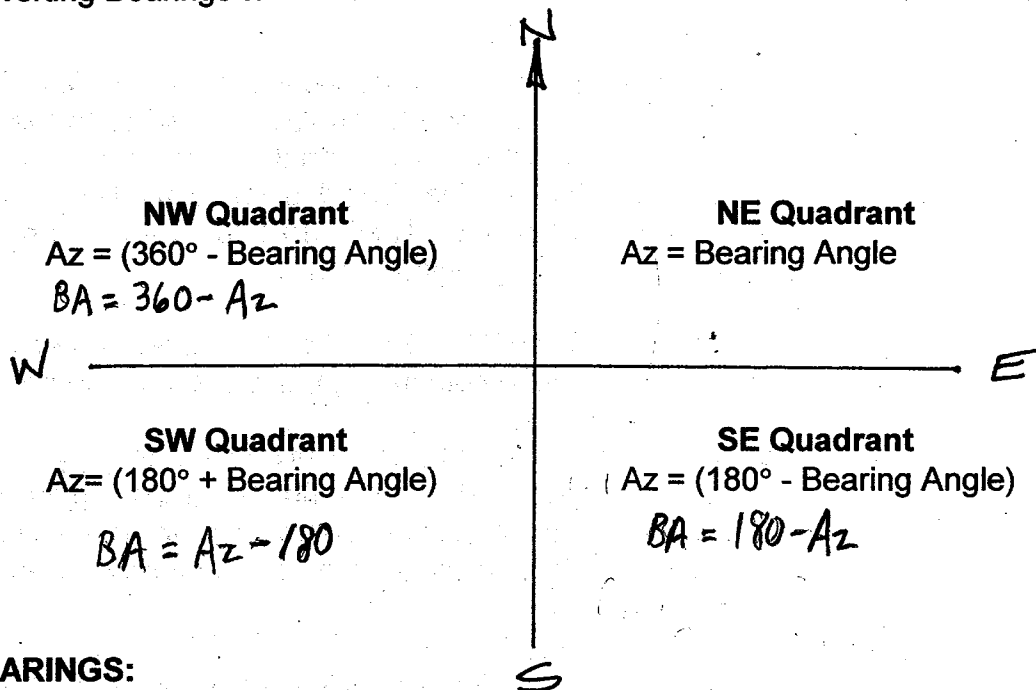


BEARING:



CONVERTING BEARINGS TO AZIMUTHS:

When converting Bearings to Azimuths follow these for rules: Azimuth of a line in the.....



BACK BEARINGS:

To convert a bearing to its corresponding Back Bearing, change the letter designations in front and back of the angular units. N $15^\circ 30'$ E becomes S $15^\circ 30'$ W.

BACK AZIMUTHS:

If the azimuth of a line is less than 180° ; **ADD** 180° to it. If the azimuth of the line is more than 180° ; **SUBTRACT** 180° from it.

CLOSED POLYGONS:

The sum of the interior angles of a closed polygon is equal to the number of angles minus two times 180° .

$$\Sigma \text{ interior angles} = (n - 2) 180^\circ$$

The sum of the exterior angles of a closed polygon is equal to the number of angles plus two times 180° .

$$\Sigma \text{ exterior angles} = (n + 2) 180^\circ$$