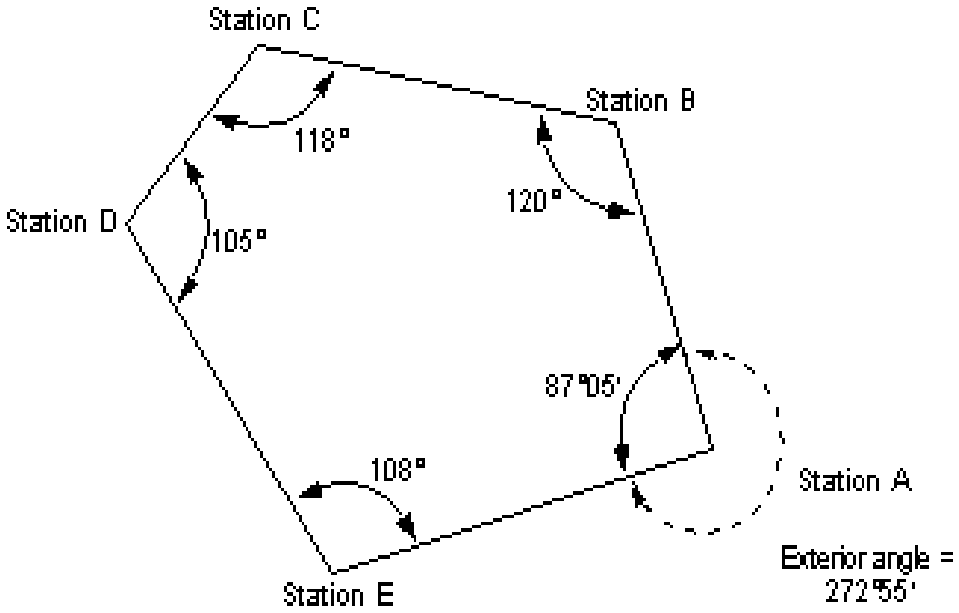
TRAVERSE SURVEY

Lecture - 2



Basic Principle of Surveying

- The ruling principle of surveying is:

“To work from whole to part and not form part to whole”.

- First; control points are established in the area to be surveyed. This can be done through a network of triangles or traversing.
- Control points for the ‘primary network’ are provided with the help of instruments of highest precision and by adopting well established methods of observation.

Basic Principle of Surveying

- If these control points are quite far apart and it is difficult to plot details, the primary network can be further divided into a network of 'secondary triangles'. This work is conducted by less precise methods & instruments. In the end 'survey of details' is conducted by taking these established control points as the base points. The underlying idea is to minimize the accumulation of the error and to localize the error.
- If survey is made to expand outward from central point, the minor errors will become so magnified as to become uncontrollable at the end.
- But if the basic control points are established with highest precision, minor errors, if any, are further localized between the small networks in which the work is conducted.

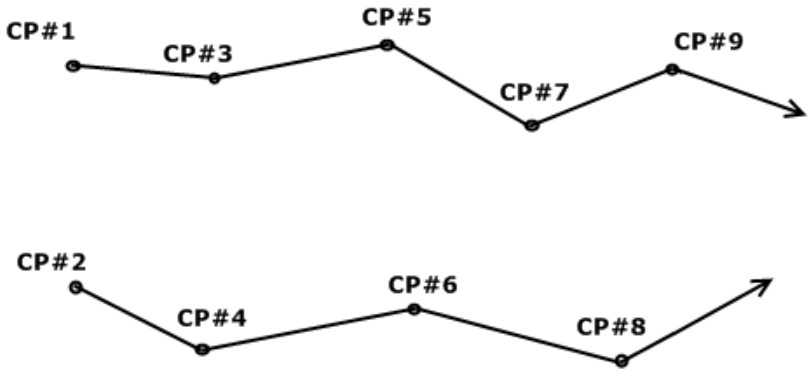
Traverse Surveying

- A traverse surveying is one in which the framework consists of connected lines whose lengths are measured with a chain or tape and the directions are determined with an angular instrument.

1. Open Traverse
2. Closed Traverse

Open Traverse:

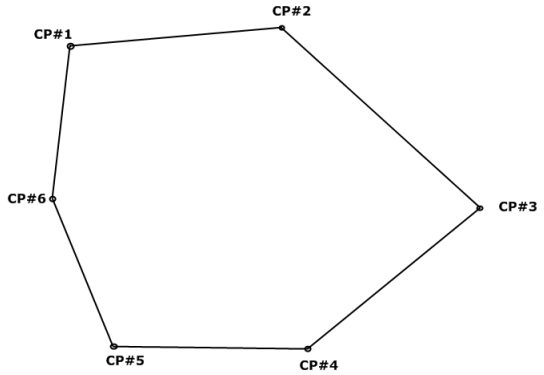
- A traverse is said to be an open traverse when it does not form a closed polygon.



- It consists of a series of lines extending in the same general direction and does not return to the starting point. Similarly, it does not start and end at points whose positions on plan are known.
- It is suitable for the survey of a long narrow strip of country e.g the roads, canals or railways etc.

Closed Traverse:

- A traverse is said to be closed when a complete circuit is made i.e. when it returns to the starting point forming a closed polygon as shown in figure. Or when it begins and ends at points whose positions on the plan are known.



- Sum of angles for a closed traverse = $(2N \pm 4)\ 90^0$
- Where N = No. of sides of closed traverse.
- +ve sign for exterior angles and –ve sign for the interior angles.

Bearing of a line:

- The direction of a survey may be defined by the horizontal angle between the line and the fixed line of reference (called the meridian) called the bearing of a line.

- "It is the horizontal angle which a line makes with some reference direction. Reference Direction is called meridian."

- The reference direction employed in a survey may be

1. A true or geographic meridian
2. A magnetic meridian
3. An arbitrary or assumed meridian

1. True or Geographic Meridian:

- The true or geographic meridian is a line in which the plane passing through the given point and the north and south poles intersect the surface of earth.
- The direction of a true meridian is invariable. The true meridians through the various stations are not parallel, but converge to the poles.
- However, for ordinary small surveys, they are assumed to be parallel to each other.
- The horizontal angle between the true meridian and the line is called true bearing of a line. It is also known as Azimuth.

2. Magnetic Meridian:

- The magnetic meridian is the direction indicated by a freely suspended and properly balanced magnetic needle, unaffected by the local attractive forces.

- The angle which the line make with the magnetic meridian is called a magnetic meridian of a line or simply bearing of the line.

3. Arbitrary or Assumed Meridian:

- The arbitrary or assumed meridian is usually the direction from a survey station to some well defined permanent object or the first line of a survey.

- The angle between this meridian and a line is known as arbitrary or assumed Bearing.

Designations of Bearings:

- The following two systems are commonly used to express the bearings:

1. Whole Circle Bearing System (WCB)
2. Quadrantal Bearing System (QB)

Whole Circle Bearing System:

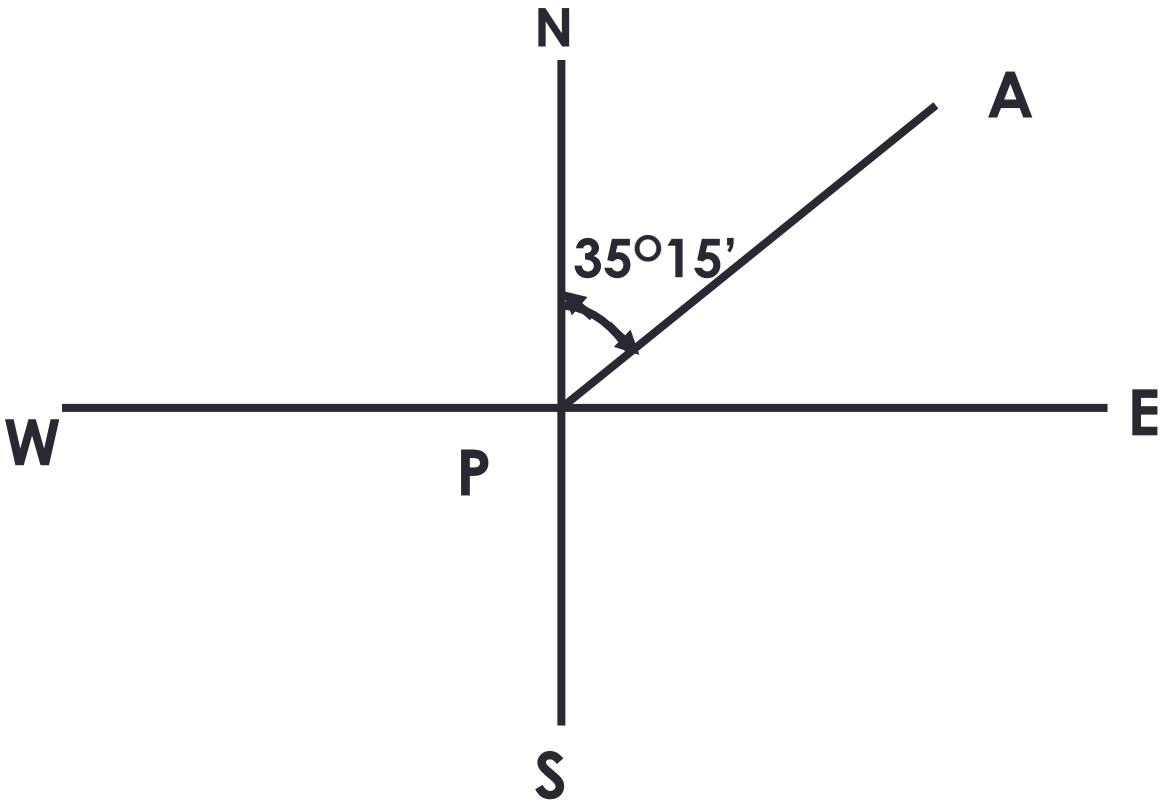
- In the whole circle bearing system (W.C.B), the bearing of a line is always measured clockwise from the north point of the reference meridian towards the line right round the circle.
- The angle measured is called whole circle bearing (W.C.B).
- It may have any values between 0^0 and 360^0.
- The bearing observed with the prismatic compass are the whole circle bearings.

Quadrantal Bearing System:

- In a Quadrantal bearing system, the bearing of a line is measured clockwise or anticlockwise from the north or the south point whichever is nearer the line, towards the east or west. In this system, the bearing is reckoned from 0^0 and 90^0 in each quadrant.

- The bearings observed with the surveyor's compass are the quadrantal bearing .

To find QB from WCB

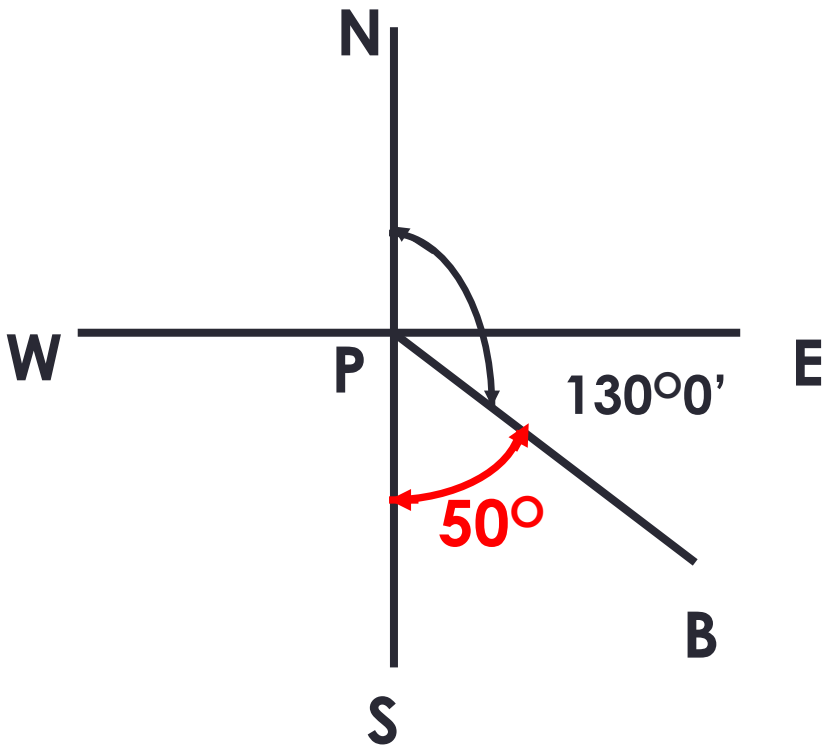


Solution :

Line PA lies in 1st quadrant.

Quadrant Bearing bearing of PA = N 35° 15′ E

To find QB from WCB

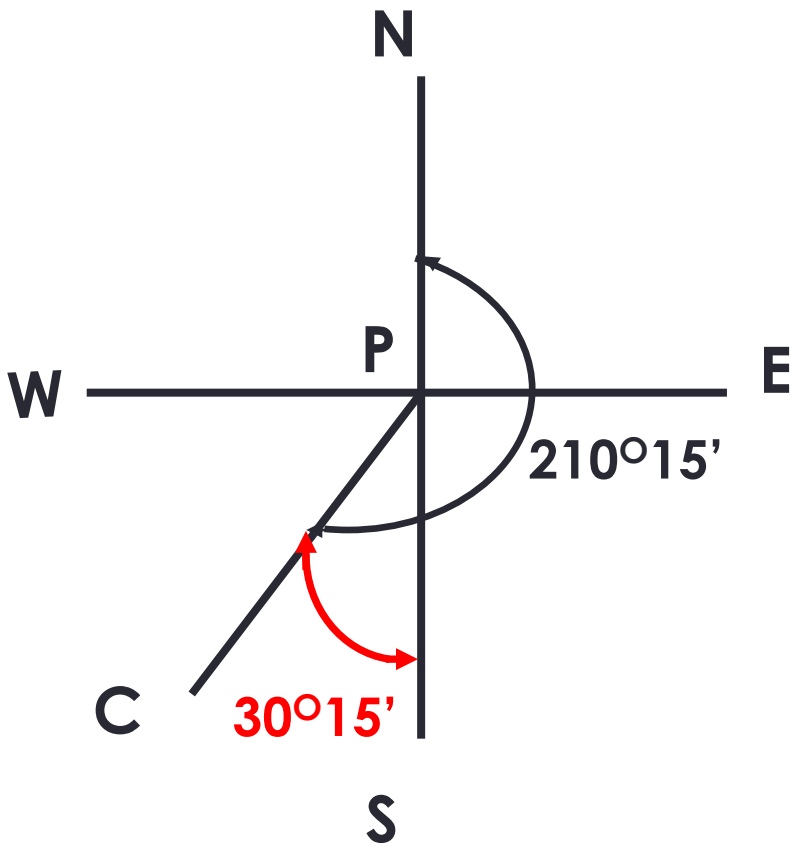


Solution :

Line PB lies in 2nd quadrant.

Quadrant Bearing of PB = S 50° 00′ E

To find QB from WCB

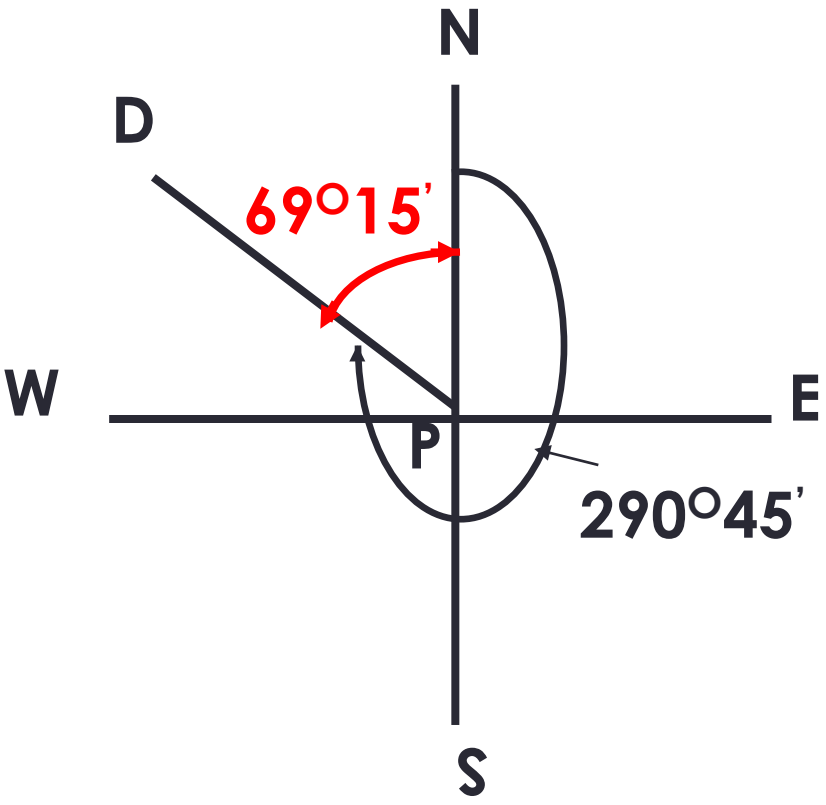


Solution :

Line PC lies in 3rd quadrant.

Quadrant Bearing of PC = S 30° 15′ W

To find QB from WCB



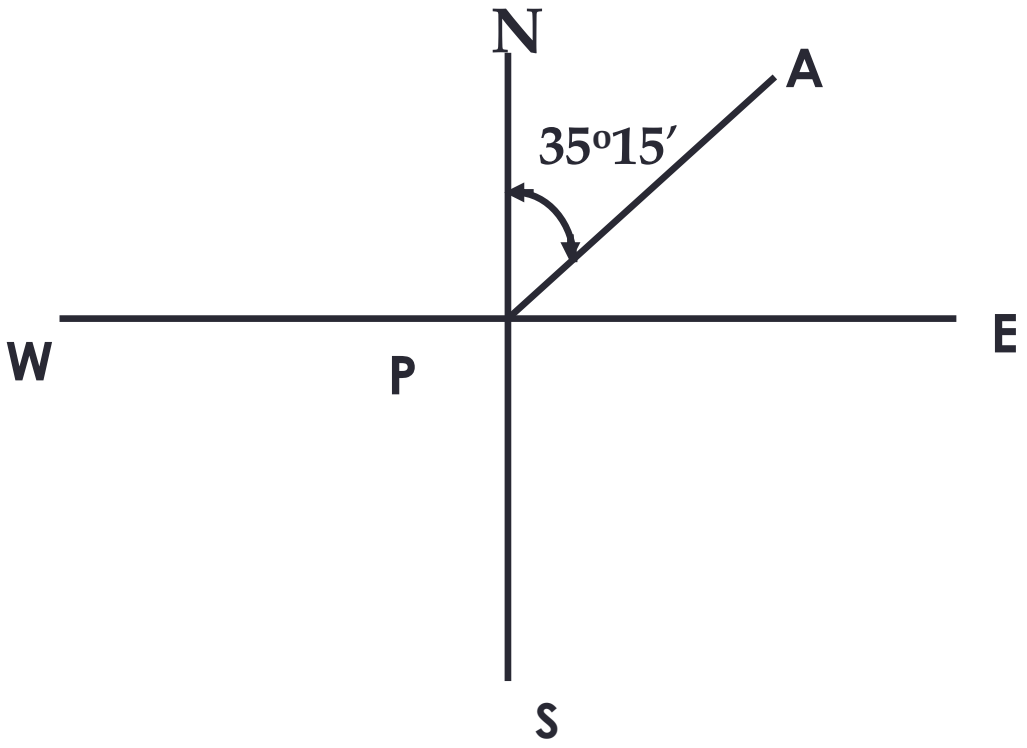
Solution :

Line PD lies in 4th quadrant.

Quadrant Bearing bearing of PD = N 69° 15′ W

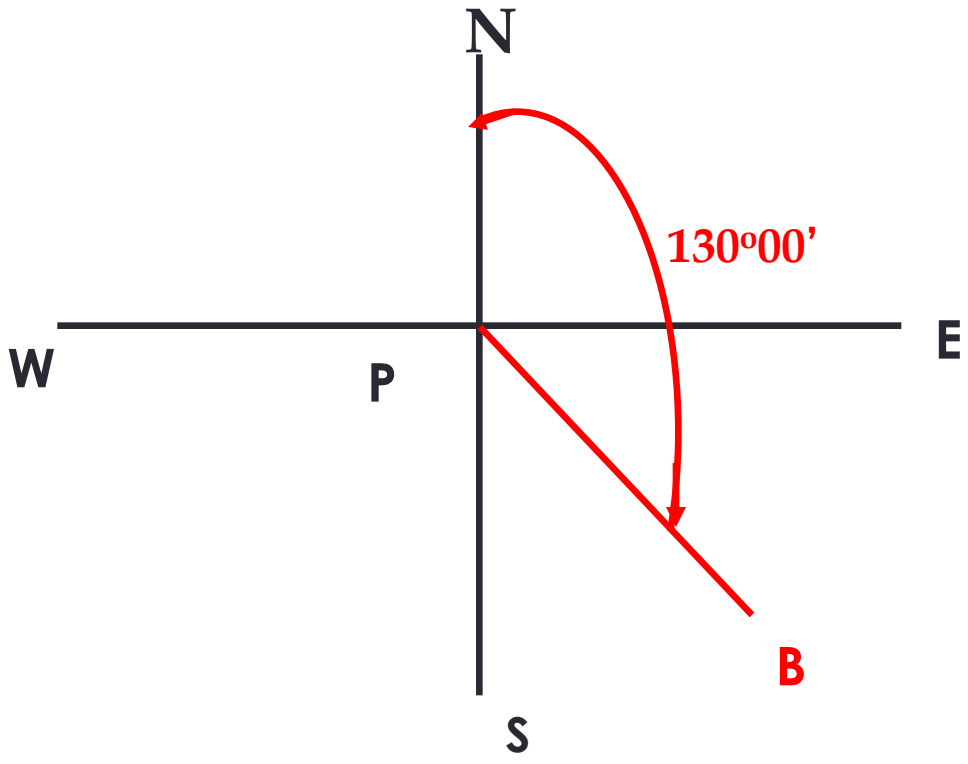
To find Whole Circle Bearing from QB

- **Qn: PA**
- Ans: Line PA is in the first quadrant. Its WCB is 35°15′



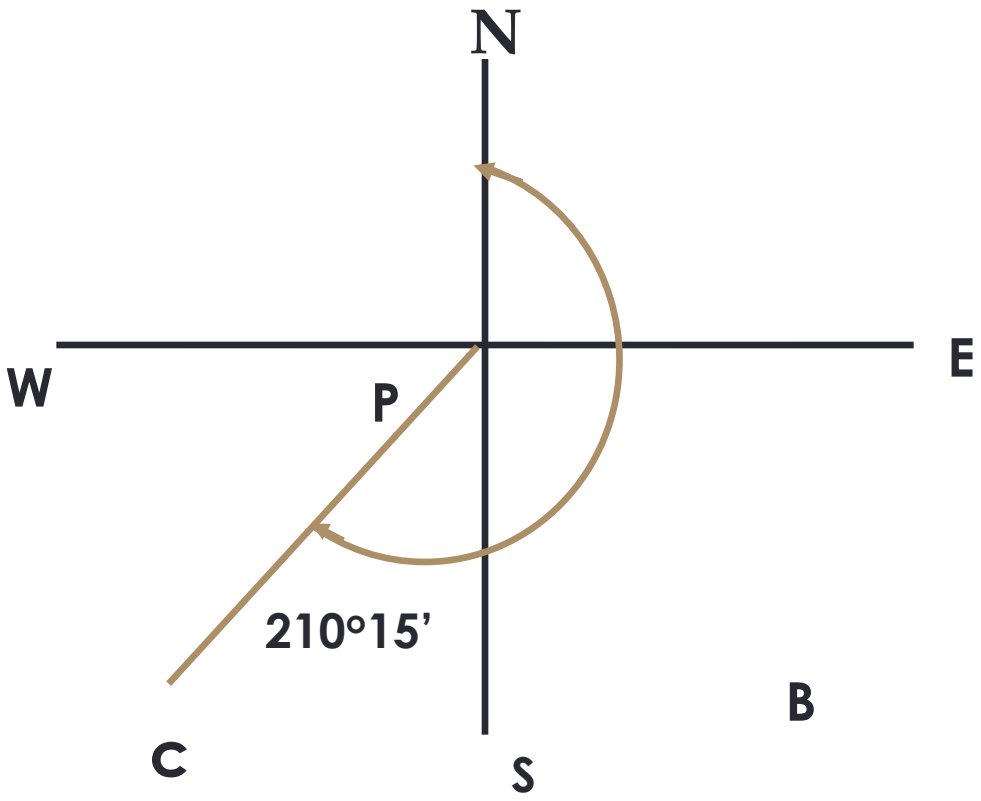
To find Whole Circle Bearing from QB

- **Qn: PB**
- Line PB is in second quadrant. Its WCB is 180°00′-50°00′ = **130°00′**



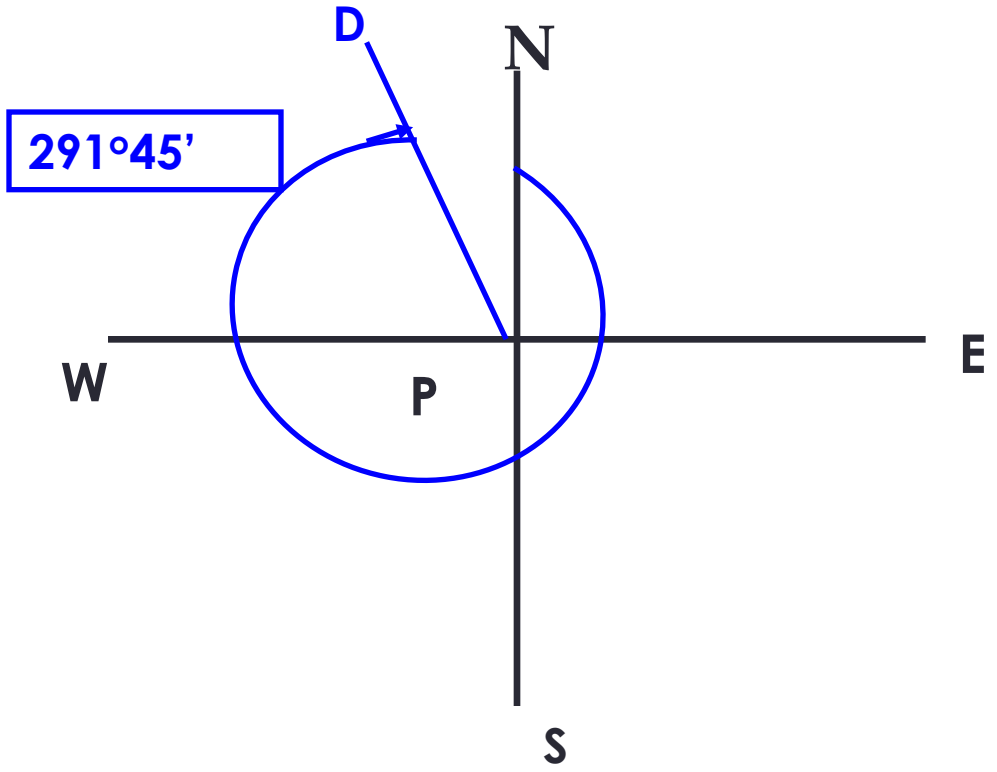
To find Whole Circle Bearing from QB

- **Qn: PC**
- Line PC is third quadrant. Its WCB is 180°00′+30°15′ = **210°15′**



To find Whole Circle Bearing from QB

- **Qn: PD**
- Line PD is in fourth quadrant. Its WCB is 360°00′-69°15′= **291°15′**



Reduced Bearings:

- When the whole circle bearing of a line exceed 90^0, it may be reduced to the corresponding angle less than 90^0, which has the same numerical values of the trigonometric functions. The angle is known as the reduced bearing (R.B). In order to obtain the reduced bearings o the lines, the following table may be used:

Case	W.C.B between	Rule of R.B	Quadrant
I	0^o and 90^o	= W.C.B	N-E
II	90^o and 180^o	= 180^o - W.C.B	S-E
III	180^o and 270^o	= W.C.B - 180^o	S-W
IV	270^o and 360^o	= 360^o - W.C.B	N-W

Any Questions?