



# **SNS COLLEGE OF TECHNOLOGY**

*Coimbatore – 641 035*

**An Autonomous Institution**



## **DEPARTMENT OF CIVIL ENGINEERING**

### **19GET102-BASIC CIVIL AND MECHANICAL ENGINEERING**

*I YEAR / I SEMESTER*

#### **UNIT 1 : CIVIL ENGINEERING MATERIALS AND SURVEYING**

*Topic : Measurement of Angles*



# UNIT 1 : CIVIL ENGINEERING MATERIALS AND SURVEYING



1. *Introduction to Civil engineering*
2. *Scope of civil engineering*
3. *Building materials*
4. *Brick, stone, cement, concrete, properties-uses*
5. *Introduction to Surveying*
6. *Objectives – types – classification – principles of Surveying*
7. *Measurements of distances, angles*
8. *Concepts of Levelling*
9. *determination of areas*
10. *Illustrative examples.*



# Measurement of Angles



*Instruments used for measurement of angles are*

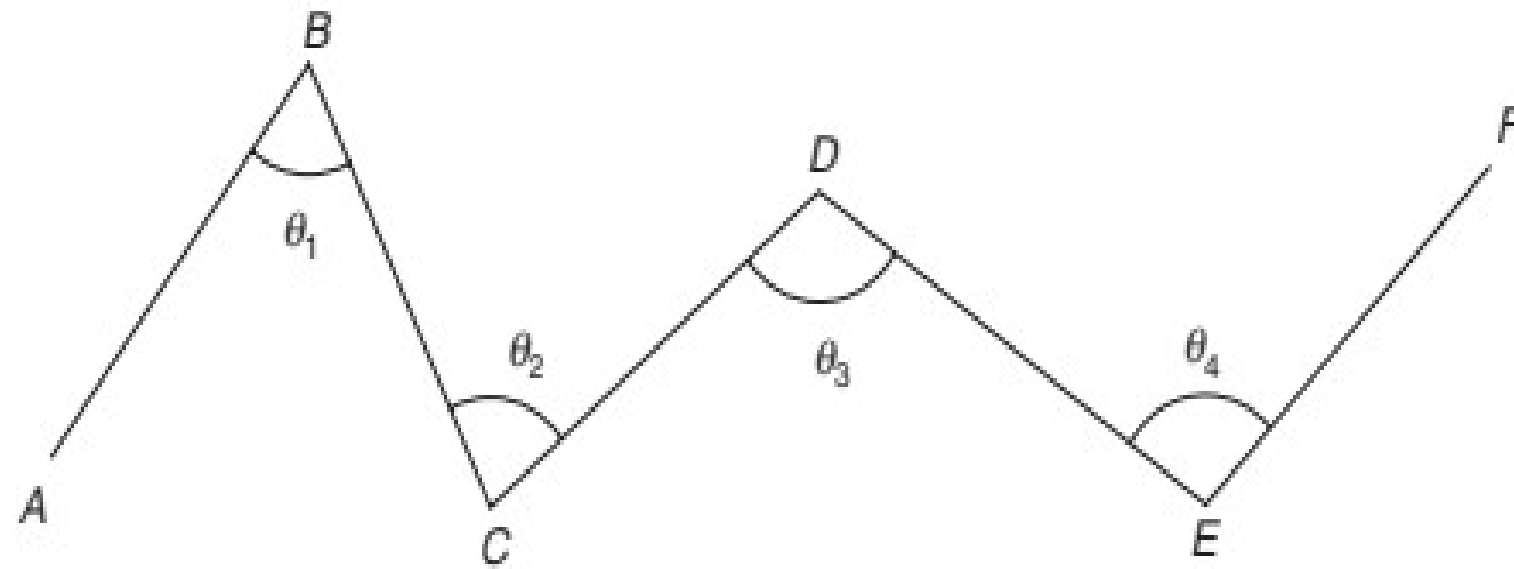
- *Compass*
- *Theodolite*
- *Box Sextant*



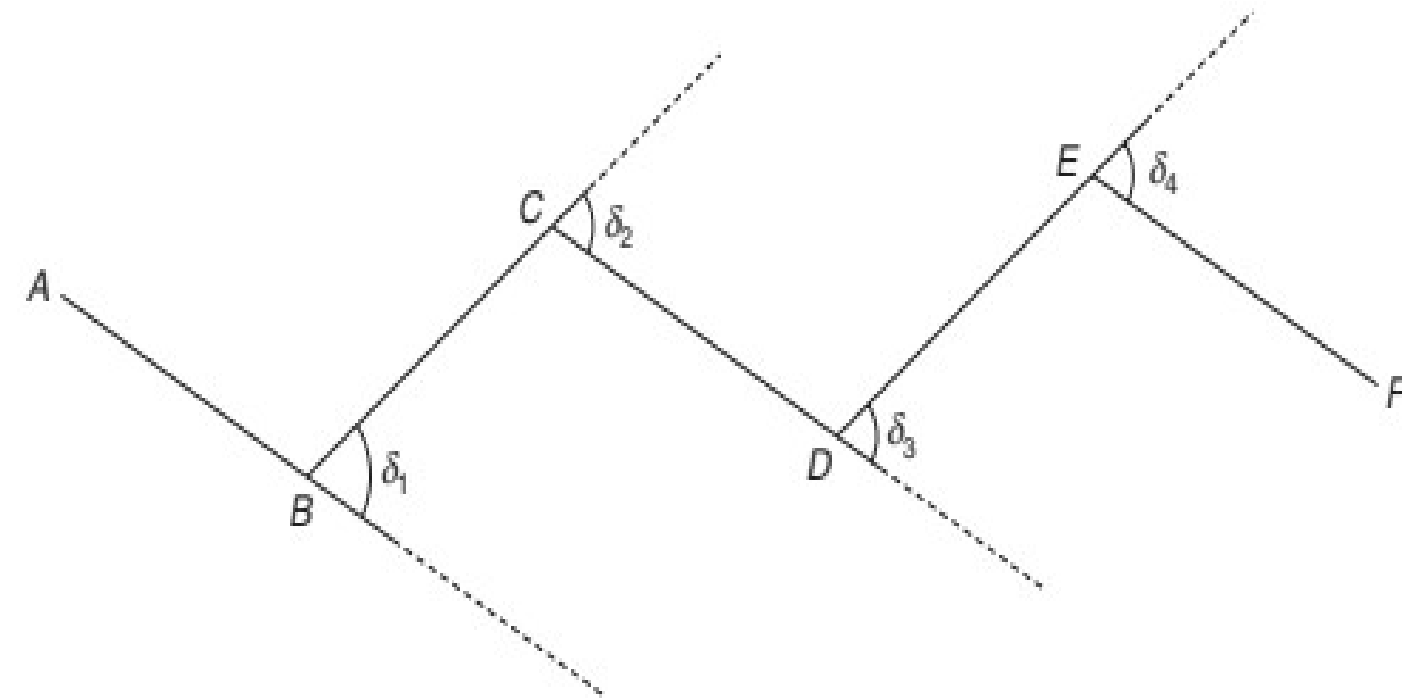
# Methods of Measurement of Angles



## □ *Included Angle Measurement*



## □ *Successive Angle Measurement*





# Compass



- *This instrument essentially consists of a **freely suspended magnetic needle** on a pivot, which can move over a graduated scale. In addition to the above, it has an **object vane and an eye vane** which will be useful to get **the line of sight**. This instrument will **be supported by a tripod** stand while taking observations.*



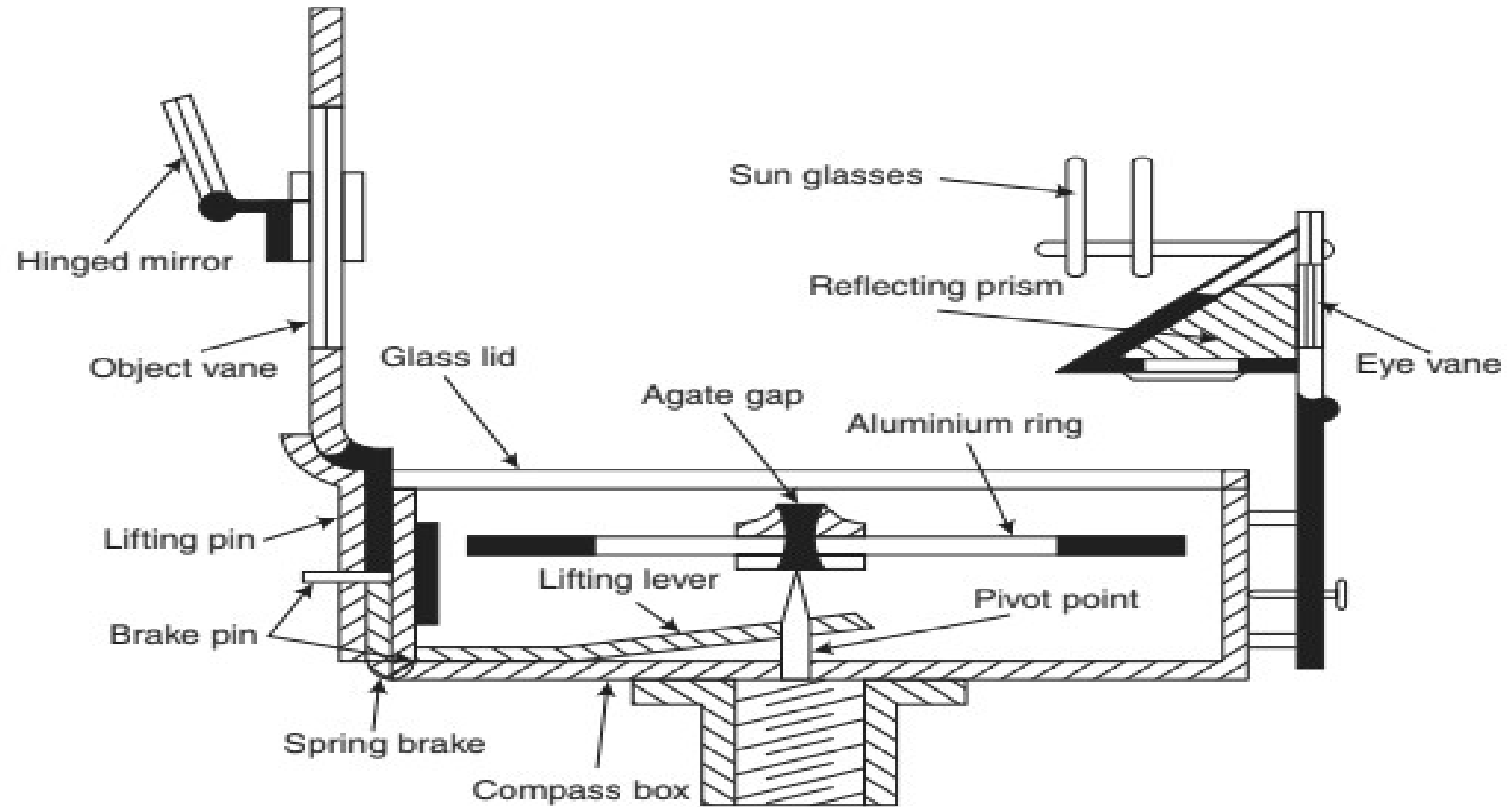
# Types of Compass



- *Prismatic Compass*
- *Surveyor's Compass*
- *Trough Compass*
- *Tubular Compass*

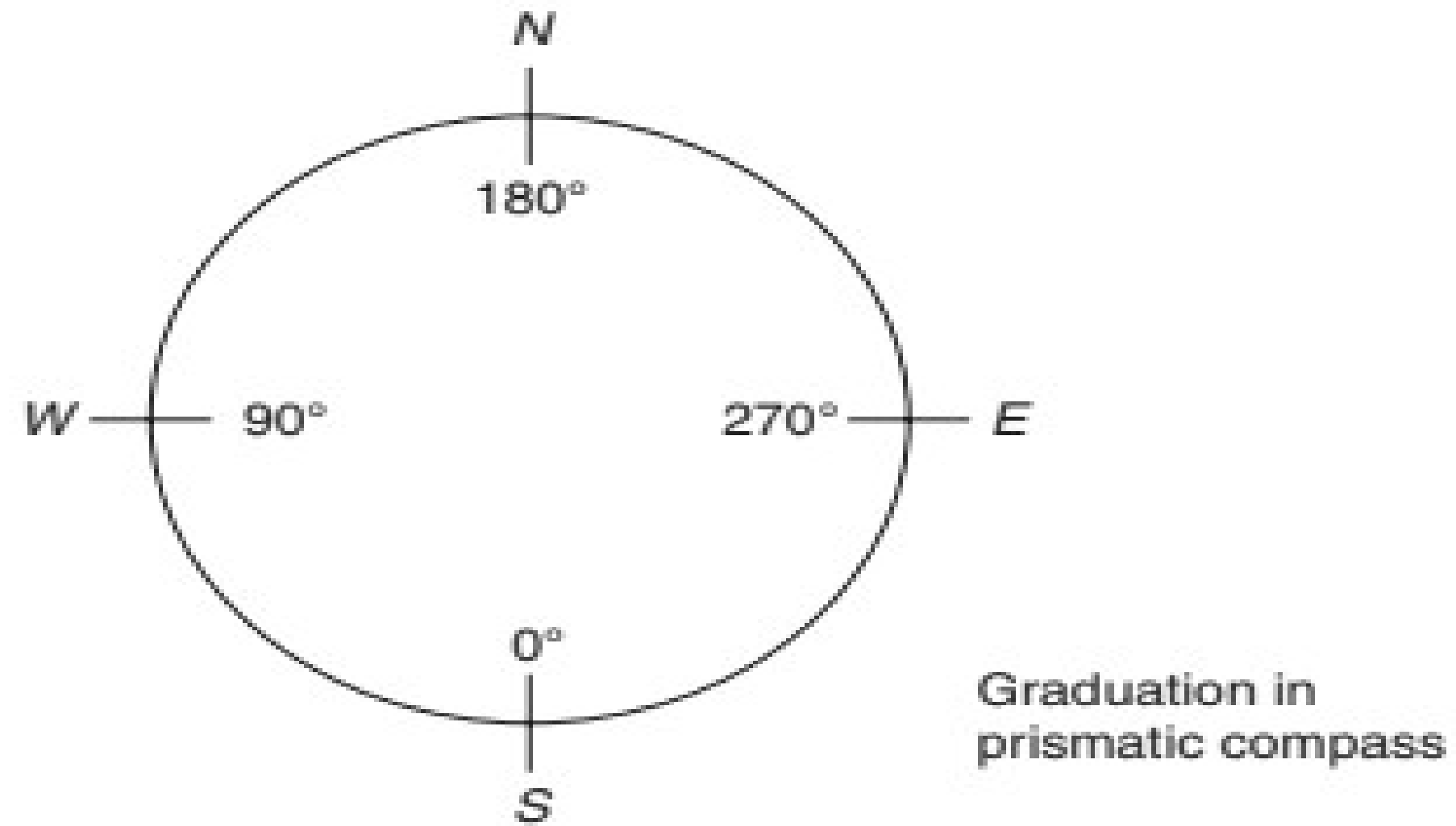


# Prismatic Compass





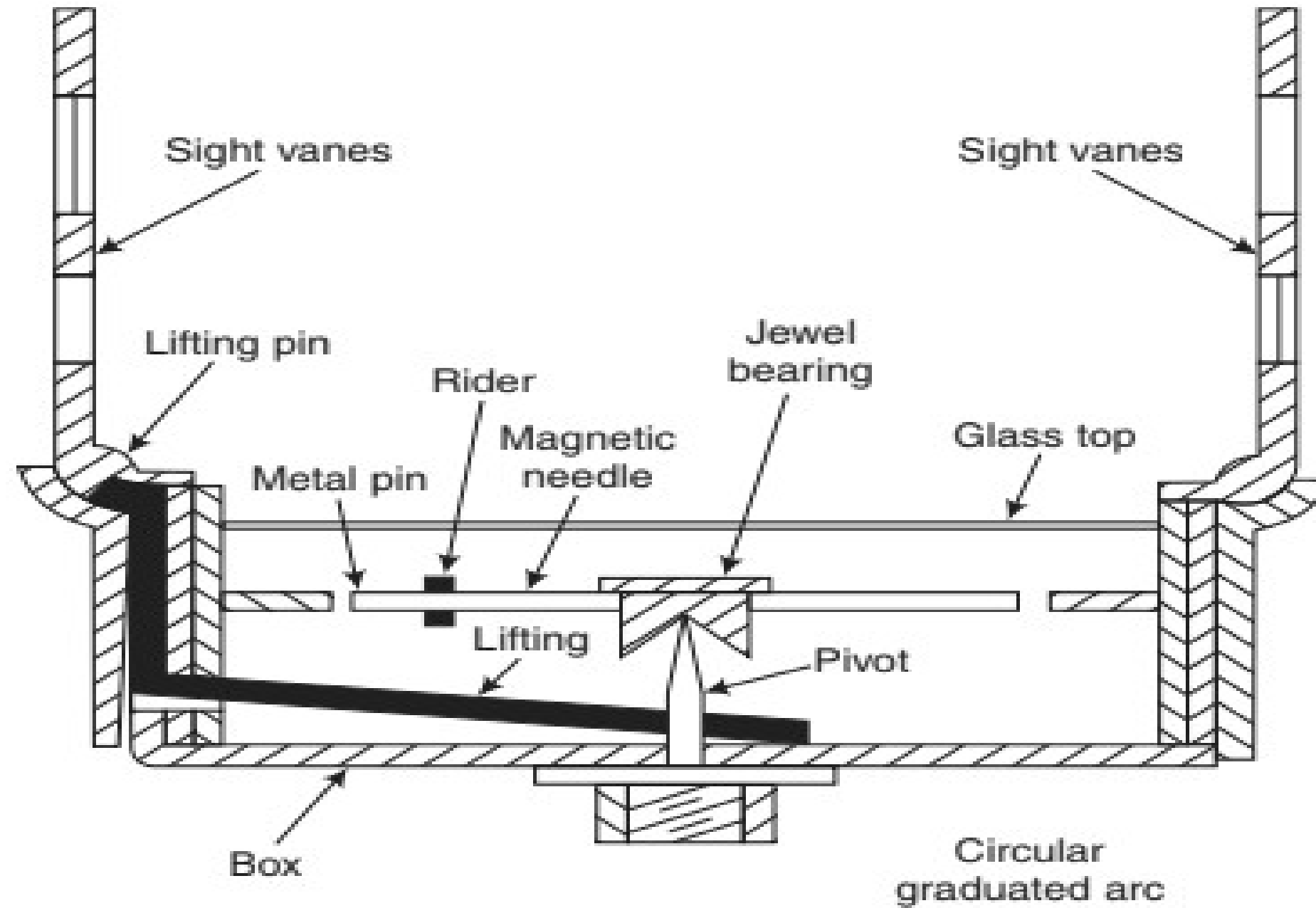
# Graduation In Prismatic Compass







# Surveyor's Compass





# Important Definitions



- *True Bearing*

*True bearing of a line is the angle which a line makes with the true north or geographical north, measured always in the clockwise direction. The range of measurement is from  $0^{\circ}$ – $360^{\circ}$ .*

- *Magnetic Bearing*

*It is the angle which a line makes with the magnetic north measured always in the clockwise direction. The measuring range is from  $0^{\circ}$ – $360^{\circ}$ .*



# Important Definitions



- *Whole Circle Bearing (WCB)*

*Since the range of  $0^\circ$  to  $360^\circ$  completes a circle, any angle measured in between  $0^\circ$  to  $360^\circ$  directly is called a whole circle bearing. The magnetic and true bearing are just whole circle bearings.*

- *Reduced Bearing (RB)*

*This is based on quadrantal system wherein any angle is measured with respect to the north – south line, towards east or west*



# Important Definitions



- *Fore Bearing (FB)*

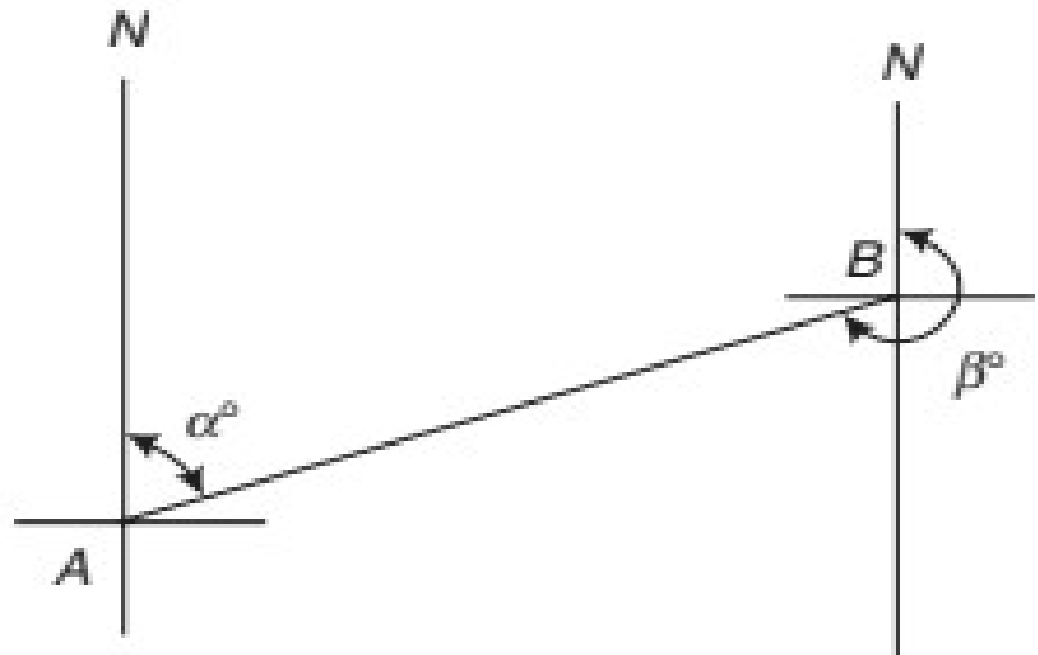
*The angle measured from a survey station to the other station, in the direction in which survey is conducted, is called the fore bearing.*

- *Back Bearing (BB)*

*It is the bearing taken from the next station to its preceding station from which the fore bearing was taken.*



# Reduced Bearing and Fore and Back Bearing

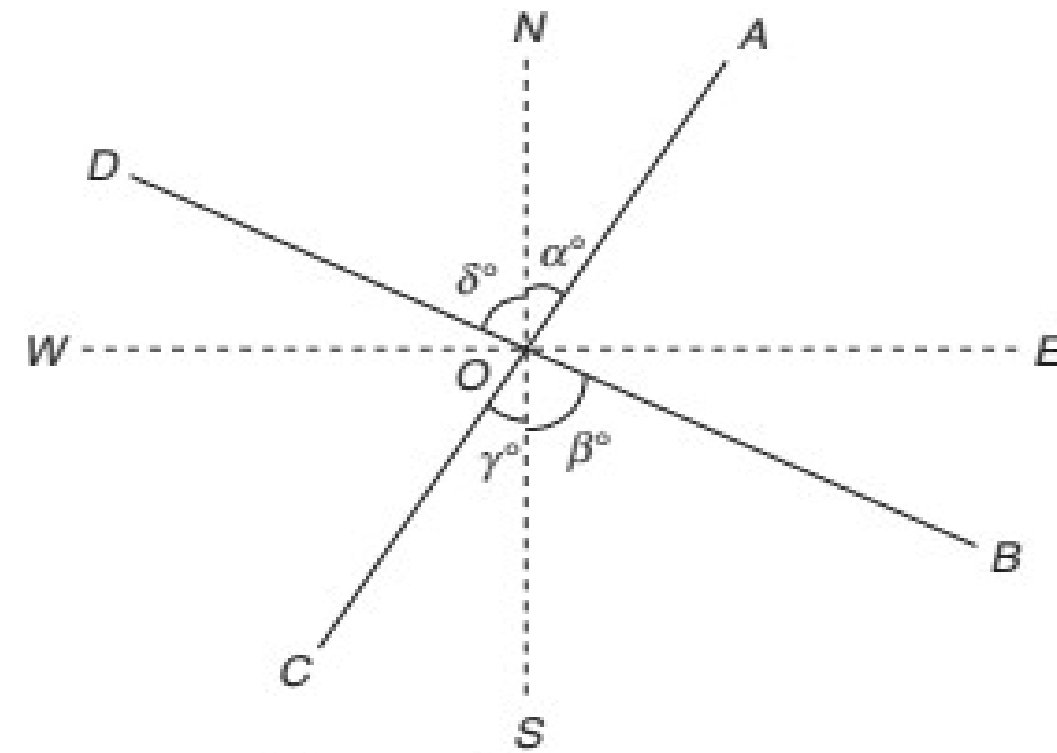


$NAB = \alpha^\circ = \text{fore bearing}$

$NBA = \beta^\circ = \text{back bearing}$

$\therefore \text{Fore bearing} - \text{back bearing} = 180^\circ$

**Fig. 2.11** *Fore and back bearing*



Representation

Line  $OA \rightarrow N \alpha^\circ E$

Line  $OB \rightarrow S \beta^\circ E$

Line  $OC \rightarrow S \gamma^\circ W$

Line  $OD \rightarrow N \delta^\circ W$

**Fig. 2.10** *Reduced bearing (or) quadrantal bearing*



# Difference Between Prismatic and Surveyor's Compass



<i>Prismatic compass</i>	<i>Surveyor's compass</i>
<ol style="list-style-type: none"><li>1. In the prismatic compass, the magnetic needle and the graduated dial are attached together while the prism and the box rotate.</li><li>2. The graduations are provided in the clockwise direction.</li><li>3. Readings are observed by looking through the prism eye-piece from the south end of the compass.</li><li>4. The zero of the reading is marked on the south end of the instrument.</li><li>5. A mirror is attached to the object vane for sighting objects at higher elevations or depression.</li><li>6. The position of east and west are in their correct positions.</li><li>7. By using this, one can obtain directly the whole circle bearings.</li><li>8. The prismatic compass may be held in hand while taking observations.</li></ol>	<p>In the surveyor's compass, the magnetic needle remains freely suspended and stationary while the dial is attached to the box.</p> <p>In this case, the graduations are marked from 0° to 90° in all the four quadrants.</p> <p>Readings are taken by directly looking on the dial immediately below the north end of the needle.</p> <p>Here, it is marked on the north and south end.</p> <p>No such mirror is provided in the object vane.</p> <p>The position of east and west are interchanged.</p> <p>This is based on quadrantal system having 0° at north and 90° at east and west ends. With this, it is possible to read only the reduced bearings.</p> <p>The surveyor's compass needs a light tripod or a single pointed rod to support it.</p>



# Conversions



**Table 2.2** Conversion of WCB to RB

<i>Case</i>	<i>WCB between</i>	<i>Rule for RB</i>	<i>Quadrant</i>
I	0° and 90°	WEB	NE
II	90° and 180°	180° – WCB	SE
III	180° and 270°	WCB – 180°	SW
IV	270° and 360°	360° – WCB	NW

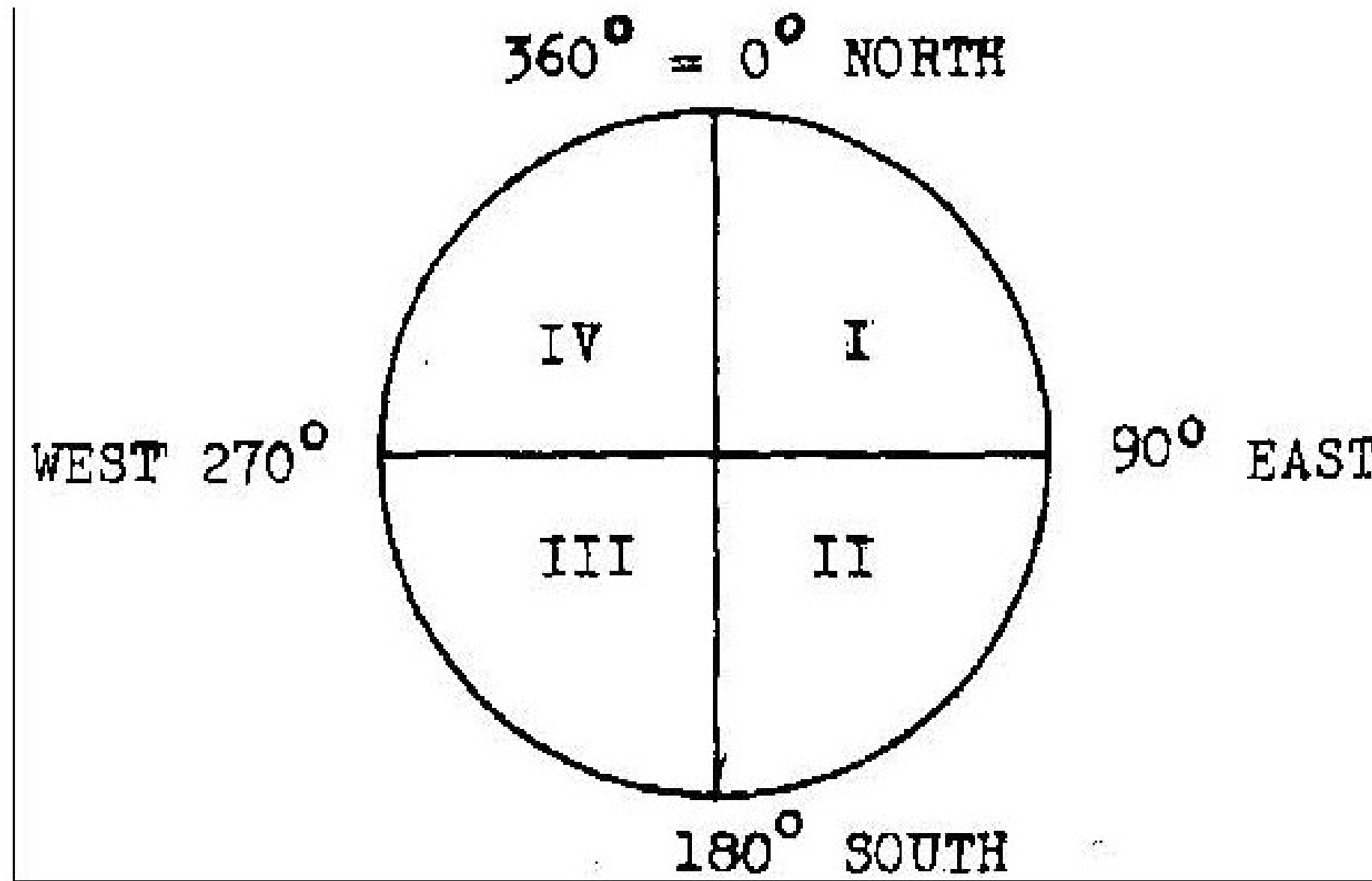
**Table 2.3** Conversion of RB to WCB

<i>Case</i>	<i>RB Quadrant</i>	<i>Rule for WCB</i>	<i>WCB between</i>
I	NE	RB	0° and 90°
II	SE	180° – RB	90° and 180°
III	SW	180° + RB	180° and 270°
IV	NW	360° – RB	270° and 360°





# Graduations







# Local Attraction in Compass

- *If external magnetic influences are present in the place of observation using a compass, the needle will be seriously deflected from its normal position. Such **disturbance due to the surrounding magnetic field** is called local attraction.*

