CE 103: Surveying

Lecture 6: Compass (Contd.)

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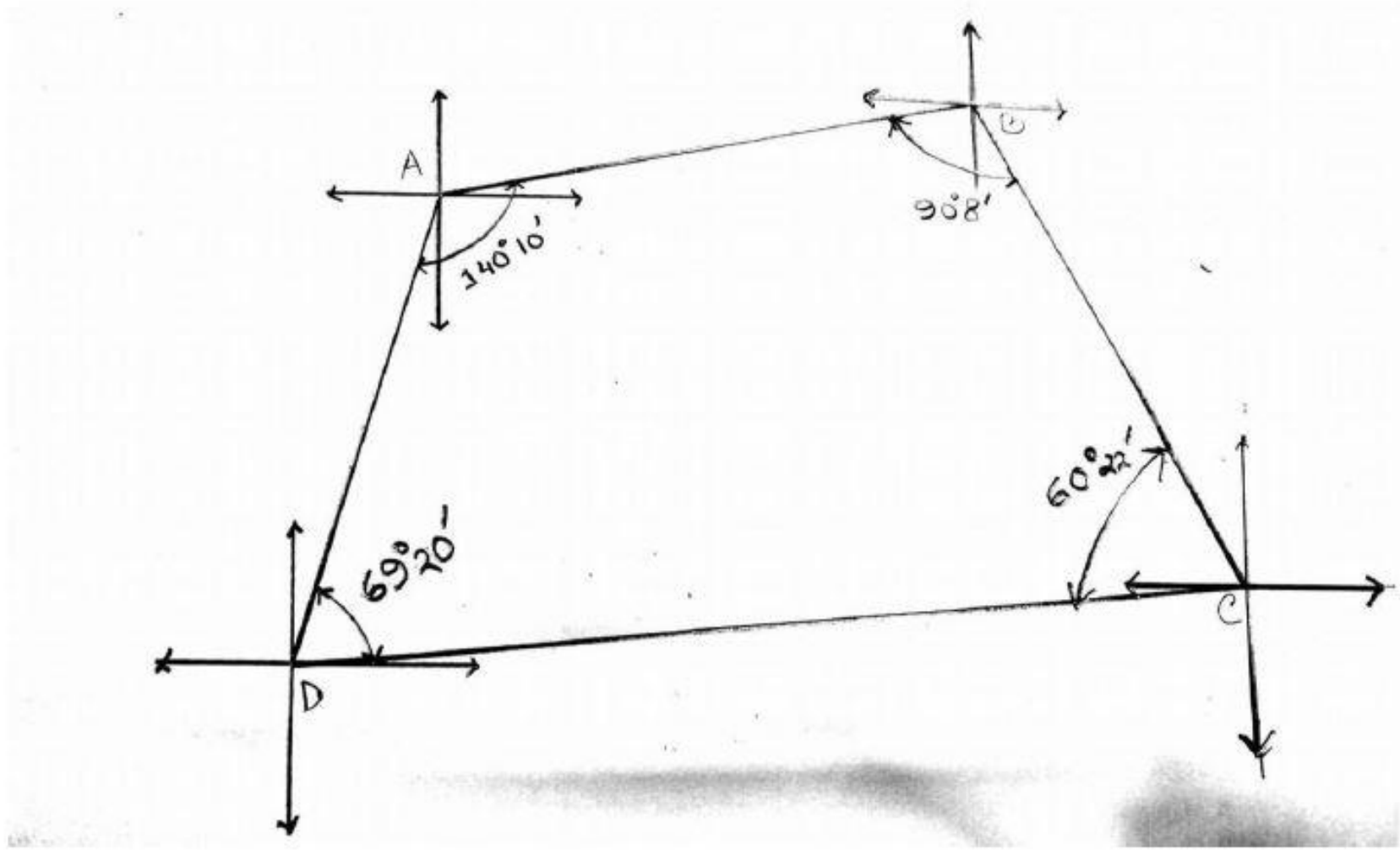
Outline

- ❑Bearing calculation
- ❑Magnetic declination
- ❑Closed compass traverse correction

Example 5.4

The following interior angles were measured with a theodolite in a closed traverse. The bearing of line AB was measured 60°00'. Calculate bearings of other lines.



Solution:

Bearing of AD = 140°10' + 60°00' = 200°10'

Difference between Bearing of AD and DA should be 180°, as Bearing of AD is 200°10' so Bearing of DA can also be calculated as = 200°10'-180° = 20°10'

Bearing of DC = Bearing of DA + <D = 20°10'+69°20' = 89°30'

Difference between Bearing of CD and DC should be 180°, as Bearing of DC is 89°30' so Bearing of CD can also be calculated as = 180°+89°30' = 269°30'

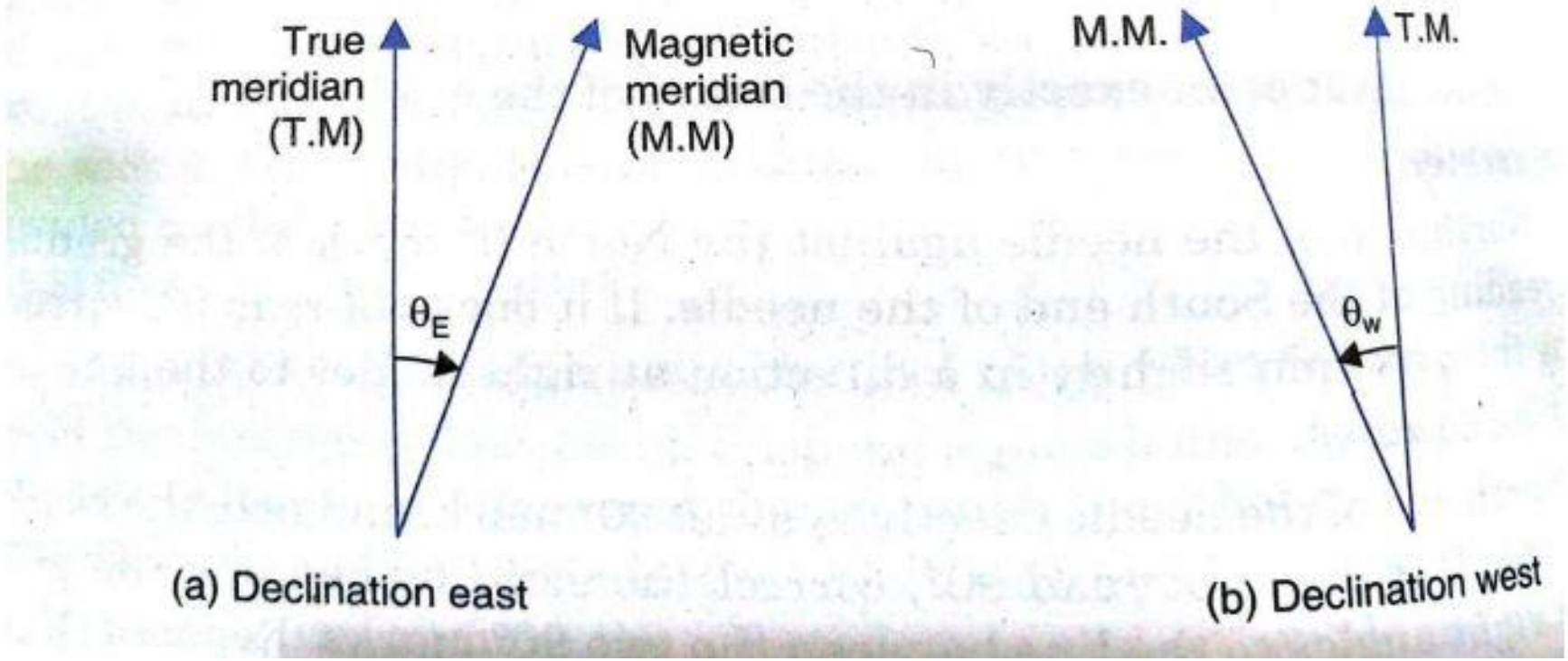
Bearing of CB = Bearing of CD+ <C = 269°30' + 60°22' = 329°52'

Difference between Bearing of CB and BC should be 180°, as Bearing of CB is 329°52' so Bearing of BC can also be calculated as = 329°52'-180° = 149°52'

6.5 Magnetic Declination

Magnetic *declination* at a place is the horizontal angle between the true meridian and the magnetic meridian shown by the needle at the time of observation.

If the magnetic meridian is to the right side (or eastern side) of the true meridian, declination is said to be eastern or positive.
If the magnetic meridian is to the left side (or western side) of the true meridian, declination is said to be western or negative.



True bearing = magnetic bearing ± declination

- Use plus sign if the declination is to be east.
- Use minus sign if the declination is to be west.
- This formula is applicable when magnetic meridian is expressed in W.C.B.

The magnetic bearing of a line is 48°24'. Calculate the true bearing if the magnetic declination is 5°38'.

Solution:

Declination = + 5°38'

So, True bearing = 48°24'+ 5°38' = 54°02'

Example 5.6:

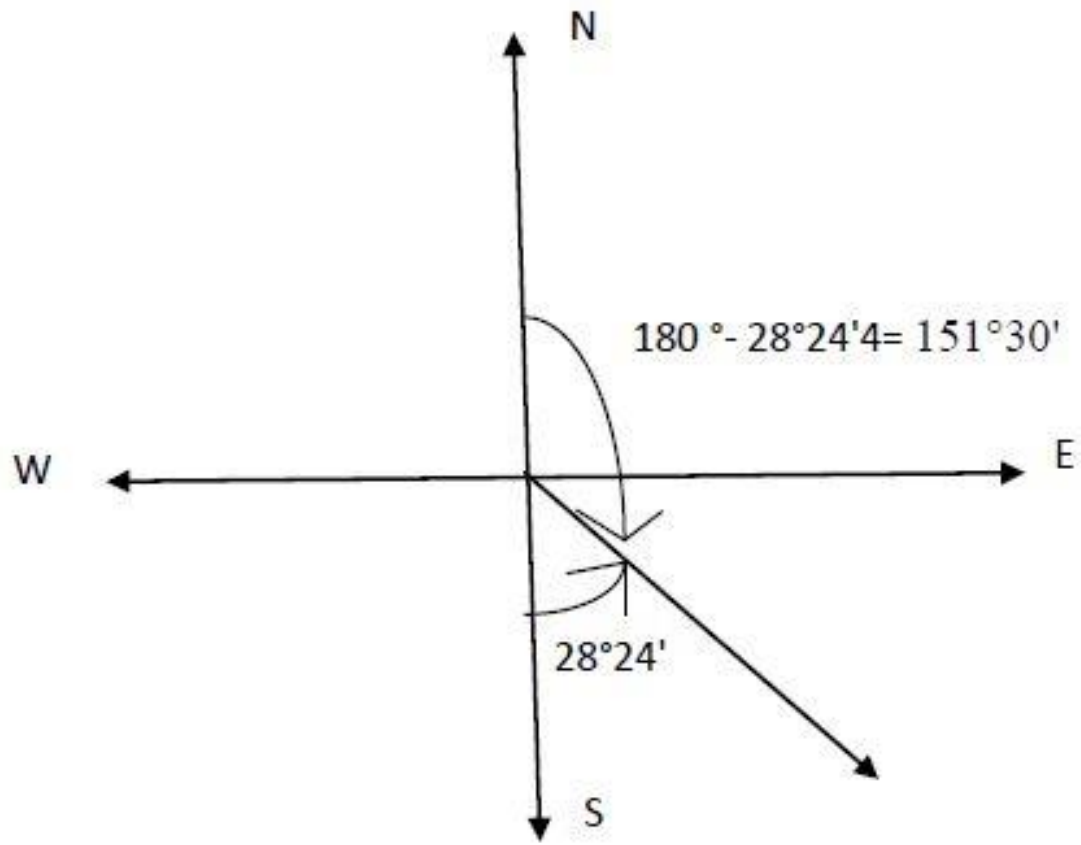
The magnetic bearing of line AB is S28°24'E. Calculate the true bearing if the magnetic declination is 7°30'West.

Solution:

Declination = - 7°30'

Magnetic bearing = S28°24'E = 180°-28°24' = 151°30'

So, True bearing = 151°30'- 7°30' = 144



6.6 Local Attraction

Sometimes, the magnetic needle may be attracted and prevented from indicating the true magnetic meridian when it is in proximity to certain magnetic substances. Local attraction is a term used to denote any influence which prevents the needle from pointing to the magnetic North in a given locality. Some of the sources of local attraction are: magnetite in the ground, wire carrying electric current, steel structures, railroad rails, underground iron pipes, keys, steel-bowed spectacles, metal buttons, axes, chain steel tapes etc., which may be lying on the ground nearby.

Detection of Local Attraction: The local attraction at a particular place can be detected by observing the fore and back bearings of each line and finding its difference. If the difference between fore and hack bearing is 180°, it may be taken that both the stations are free from local attraction, provided there are no observational and instrumental errors. If the difference is other than 180°, the fore bearing should be measured again to find out whether the discrepancy is due to avoidable attraction from the articles on person, chains, tapes etc. It the difference still remains, the local attraction exists at one or both the stations.

Example

The following are bearings taken on a closed compass traverse:

Line	F.B.	B.B.
AB	75°5'	254°20'
BC	115°20'	296°35'
CD	165°35'	345°35'
DE	224°50'	44°5'
EA	304°50'	125°5'

Mention which stations were affected by local attraction and determine the corrected bearings.

Solution:

As difference between fore and back bearing of CD is 180°, so it can be concluded that station C and station D is free from local attraction.

So , back bearing of BC is correct which is 296°35'.

fore bearing of BC = 296°35'-180° = 116°35'.

So amount of correction for station B = 116°35'-115°20' = 1°15'

As 116°35'> 115°20', so this correction is to be added for the readings taken from station B.

back bearing of AB = 254°20' +1°15" = 255°35'

fore bearing of AB = 255°35'-180° = 75°35'

So amount of correction for station A = 75°35'-75°5'= 30'

As 75°35'> 75°5', so this correction is to be added for the readings taken from station A.

back bearing of EA = 125°5'+ 30' = 125°35'

fore bearing of EA = 125°35'+ 180° =305°35'

So amount of correction for station E= 305°35'- 304°50' =45'

As 305°35'> 304°50', so this correction is to be added for the readings taken from station E.

back bearing of DE = 44°5'+45' = 44°50'

fore bearing of DE = 180° + 44°50' = 224°50' which is same as observed reading.

So corrected bearing are tabulated below:

Line	F.B.	B.B.
AB	75°35'	255°35'
BC	116°35'	296°35'
CD	165°35'	345°35'
DE	224°50'	44°50'
EA	305°35'	125°35'