وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الجنوبية
المعهد التقني العمارة
قسم تقنيات المساحة

الحقيبة التدريسية لمادة

المساحة /2
Surveying/ 2
الصف الاول

تدريسي المادة

م . م احمد عبدالمنعم

الفصل الدراسي الثاني

جدول مفردات مادة مساحة 2

الاسبوع	المفردات
1	أجهزة الثيودولايت والتعرف على أجزاءه الرئيسية ووظيفة كل جزء، تعلم كيفية قراءة الدوائر الأفقية والرأسية وتسجيلها في دفتر الحقل.
2	كيفية قراءة وحساب الزوايا الرأسية والخطأ الهامشي (خطأ الاستدلال أو المؤشر) وتوضيح المواقع التي يستفاد منه
3	تعلم أنواع الشمال (الحقيقي والمغناطيسي والافتراضي وحساب اتجاهات الأضلاع من خلال الزوايا المرصودة في الحقل.
4	تعلم الطالب على طرق رصد الزوايا الأفقية.
5	أنواع المضلعات واستخدامها ودرجاتها (تصنيفها) مع الأعمال الحقلية الخاصة بالتضليع وأنواع الزوايا المستخدمة في المضلعات الدائرية المغلقة.
6	(Closed Loop Trav., Closed Connected Trav.).
7	إجراء التصحيحات للزوايا بمختلف أنواعها في المضلعات الدائرية المغلقة وحساب الاتجاهات الصحيحة من خلالها.
8	حساب المركبات الأفقية والرأسية في المضلعات الدائرية المغلقة وطرق تصحيحها (بالبوصلة والعبور).(Compass Rule & Transit Rule)
9	الحسابات الأمامية والحسابات العكسية لمواقع النقاط.
10	حساب الإحداثيات (مواقع النقاط) باستخدام المركبات الأفقية والرأسية المصححة وتصحيح الإحداثيات باستخدام المركبات الأفقية والرأسية التي تحتوي على خطأ قفل (Closure error) بطريقتي البوصلة والعبور.
11	تعلم الطالب كيفية انتخاب نقاط مضلع رابط مغلق (Connected Traverse) ورصد كافة الزوايا (باتجاه اليمين وزوايا الالتفاف).
12	تعلم كيفية تصحيح زوايا المضلع الرابط بطريقتي(Deflection angle – angle to the right
13	حسابات تعلم الطالب كيفية إجراء المضلع الرابط المغلق (المركبات الأفقية والرأسية) وحساب الإحداثيات
14	إجراء التصحيحات بطريقتي البوصلة والعبور، وكيفية التغلب على (تصحيح) خطأ القفل، مع كيفية رسم المضلع الرابط المغلق.
15	أجهزة الثيودولايت والتعرف على أجزاءه الرئيسية ووظيفة كل جزء، تعلم كيفية قراءة الدوائر الأفقية والرأسية وتسجيلها في دفتر الحقل.

الهدف من دراسة مادة المساحة 2 (الهدف العام):

تهدف دراسة مادة المساحة 2 للصف الاول الى:

1) يفهم الطالب أساسيات الحسابات الرياضية لإيجاد القياسات الحقيقية للمسافات والزوايا .
2) حساب الاحداثيات لمواقع النقاط الارضية لأجل توقيعها على الورق بمقياس رسم معين.

الفئة المستهدفة:

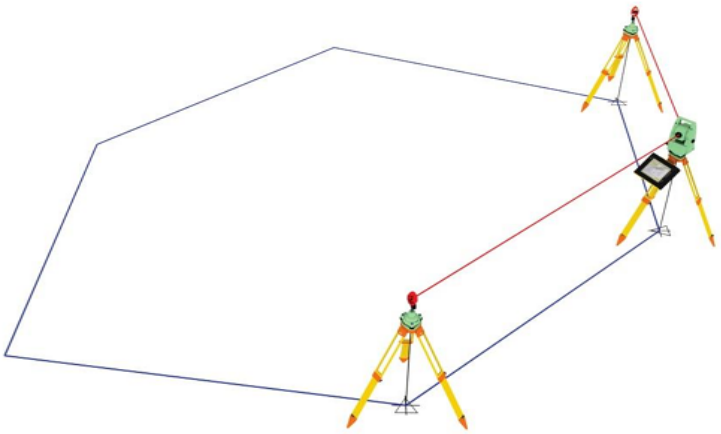
طلبة الصف الاول / قسم تقنيات المساحة

التقنيات التربوية المستخدمة:

1. سبورة واقلام
2. السبورة التفاعلية
3. عارض البيانات Data Show
4. جهاز حاسوب محمول Laptop
5. .....
6. ....
7. .....

Traversing

It is to connect a group of ground points with certain coordinates with each other by lines called polygon lines and these lines are confined to each other at horizontal angles that are used to know the coordinates.



Types of traverses

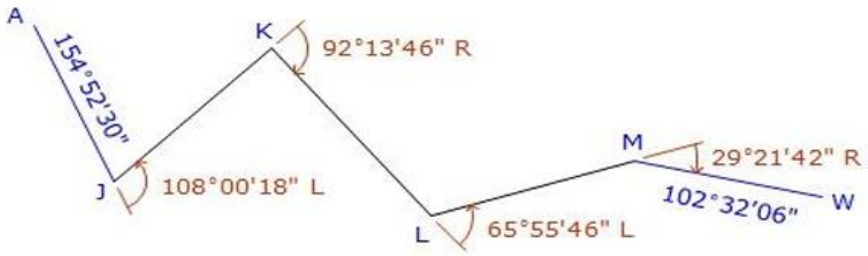
1- Closed loop traverse

Which starts with a point of known location (coordinates) and ends with the point itself and one of its sides is known direction and is measured by the interior angles and lengths of the sides.

N

3- Link travers

is the polygon that starts with a point that has a known horizontal location and ends with another point that has another known horizontal location.



Closed traverse calculations

After completing the practical aspect related to measuring the horizontal distances between the points of the polygon and the rolling angles between the sides, the calculations for the polygon begin as follows:

1- Correction of the Measured internal angle:

The correction is made by comparing its sum with the theoretical sum of the interior angles of the polygon and equal to (**(n-2) × 180**) where (**n**) is the number of points of the polygon

Correction = Theoretical sum of internal angles - the measured sum of internal angles

2- Calculation of the full circular directions of the sides (ΔZ)

$$E_X = \sum_{i=1}^{n} \Delta x \ , \quad E_y = \sum_{i=1}^{n} \Delta y$$

Δ_X

Δ_Y=

7- Computation of coordinated

XB=XA+ Δx' AB

YB=YA+ Δy' AB

6- Correction Δx & Δy

$$Cxk = \frac{-EX}{\sum di} * dk$$

$$Cyk = \frac{-Ey}{\sum di} * dk$$

Cxk = Correction Δx

Cyk = Correction Δy

dk = Length of the side

$\sum di$ = total lengths

The correction is calculated as follows

Δx' = Δx + Cxk

Δy' = Δy + Cyk

*Note . to check

$\sum \Delta x' = 0$

$\sum \Delta y' = 0$

Exam: The polygon (ABCD) angles and side lengths were measured with a total station

SOL:

Correction = Theoretical sum of internal angles - the measured sum of internal angles

Theoretical sum of internal angles = (n-2)180=(4-2)180=360°

the measured sum of internal angles = 360° 00' 12"

Correction = 360° - 360° 00' 12" = - 12"

T.C = -12" / 4 = **- 3"**

Point	Int.angle	T.C	Corr.angle
A	96° 09' 38"	- 3"	96° 09' 35"
B	82° 58' 03"	- 3"	82° 58' 00"
C	81° 31' 59"	- 3"	81° 31' 55"
D	99° 20' 32"	- 3"	99° 20' 29"

Point	**Side**	**L. side**	**AZ**	**Δx**	**Δy**	**Corr . Δx**	**Corr . Δy**	**Δx'**	**Δy'**	**X**	**Y**
A	A B	68.351	323° 32 '00"	-40.625	+ 54.968	-0.002	-0.015	-40.627	+54.953	650.915	371.701
B	BC	140.289	226° 30' 00"	-101.762	-96.569	-0.004	-0.027	-101.766	-96.569	610.288	426.654
C	CD	66.653	128° 01' 56"	+52.500	-41.065	-0.002	-0.011	+52.498	-41.077	508.522	330.058
D	DA	122.181	47° 22' 25"	+89.899	+82.743	-0.004	-0.023	+89.895	+82.720	561.020	288.981
A		**397.474**		**+0.012**	**+0.077**			**∑ 0 OK**	**∑ 0 OK**	**650.915OK**	**371.701OK**

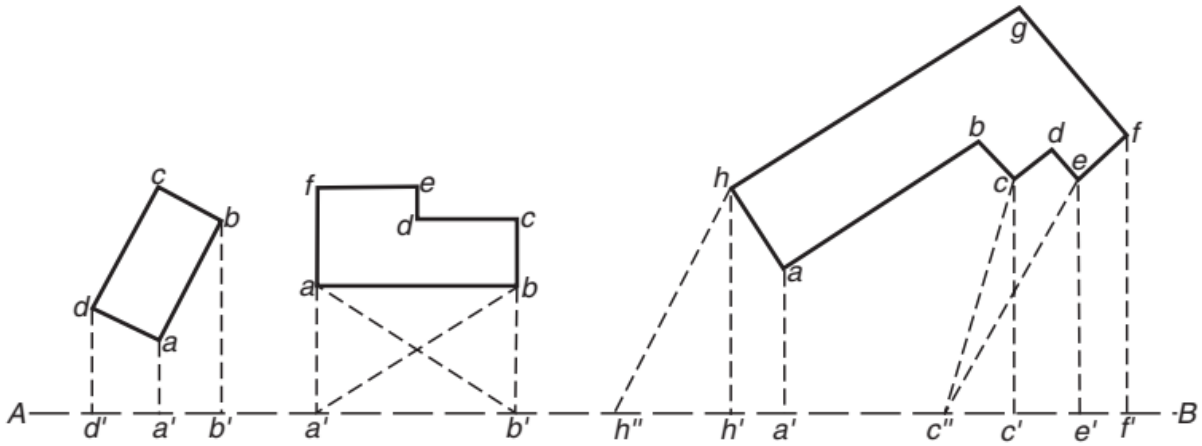
Miscellaneous field problems

OFFSETS

In chain surveying, the positions of details *i.e.*, boundaries, culverts, roads stream bends, etc., are located with respect to the chain line by measuring their distances right or left of the chain line. Such lateral measurements are called *offsets.* There are two types of offsets *i.e.,*

(i) Perpendicular offsets, (*ii*) Oblique offsets.

Perpendicular and oblique offsets.



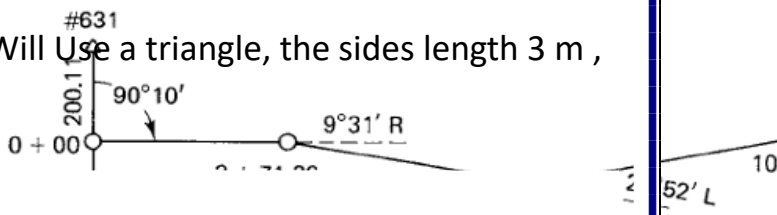
Offsets to building corners.

1- erecting perpendicular:

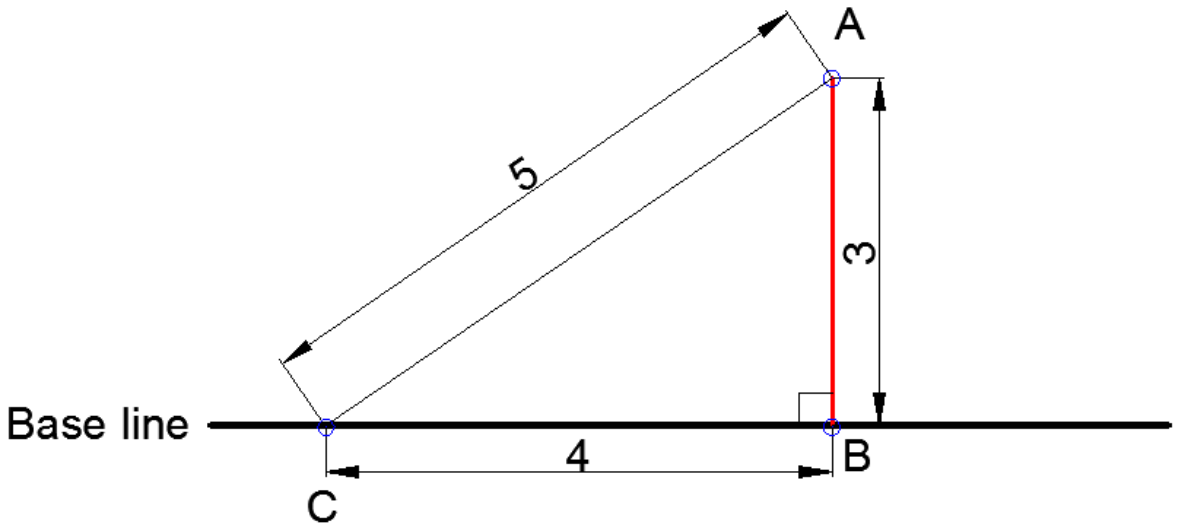
a- erecting perpendicular line from point lies on the baseline

2- Open traverse:

It is the polygon that begins with a point that has a known not end with a point



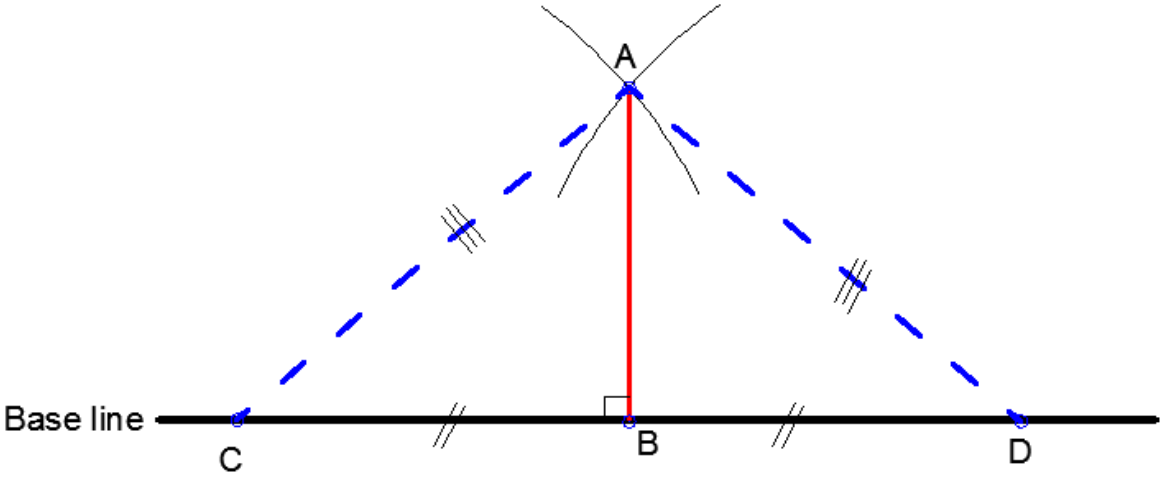
to erecting perpendicular line on point (B) Will Use a triangle, the sides length 3 m , 4 m and the length of chord is 5 m.



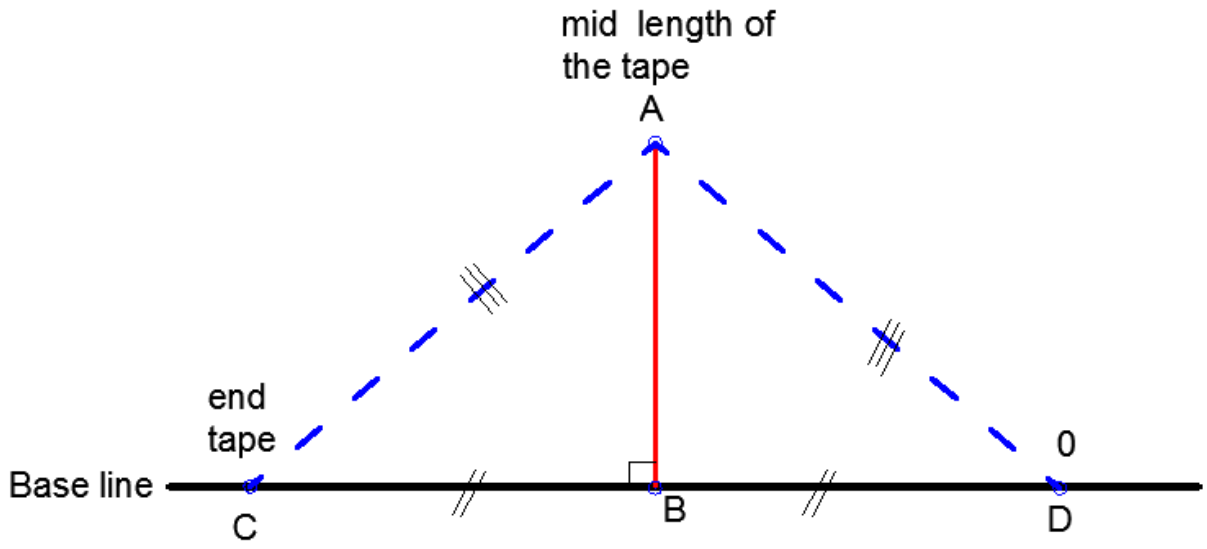
b- Erecting perpendicular line from point lies on the baseline:

To Erecting a perpendicular from given station (B) on a given base line.

Specify (CB = BD) from Draw two equality circular radius from D&C, the two radius will intersection at A, the line AB is perpendicular to CD



c- Erecting perpendicular line from point lies on the baseline:(length of tape)



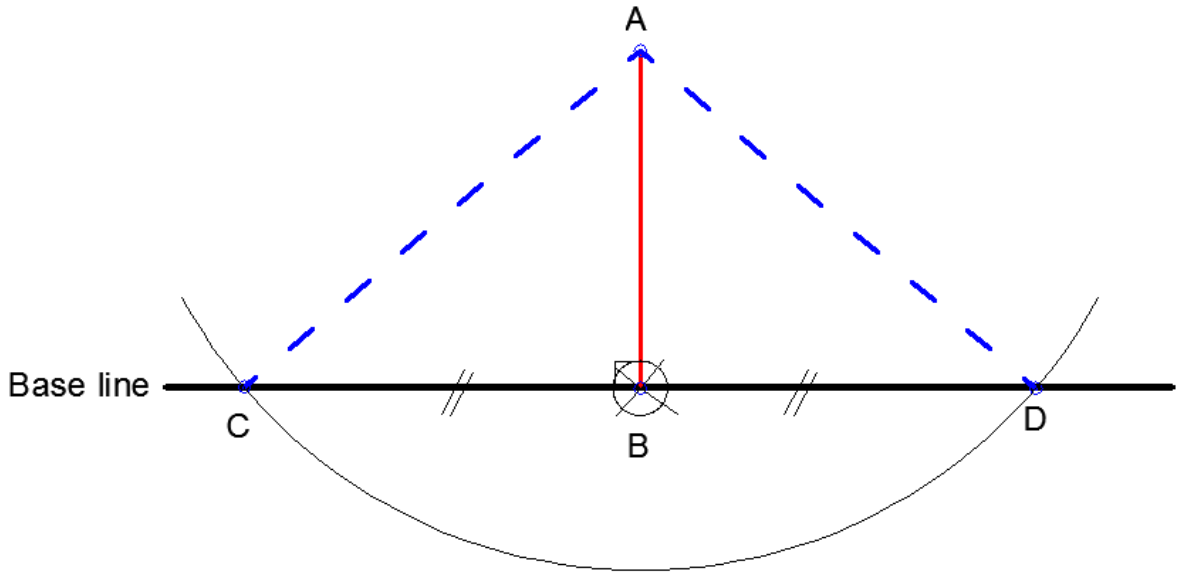
2- Dropping perpendicular:

Dropping perpendicular line from point <u>outside</u> the baseline

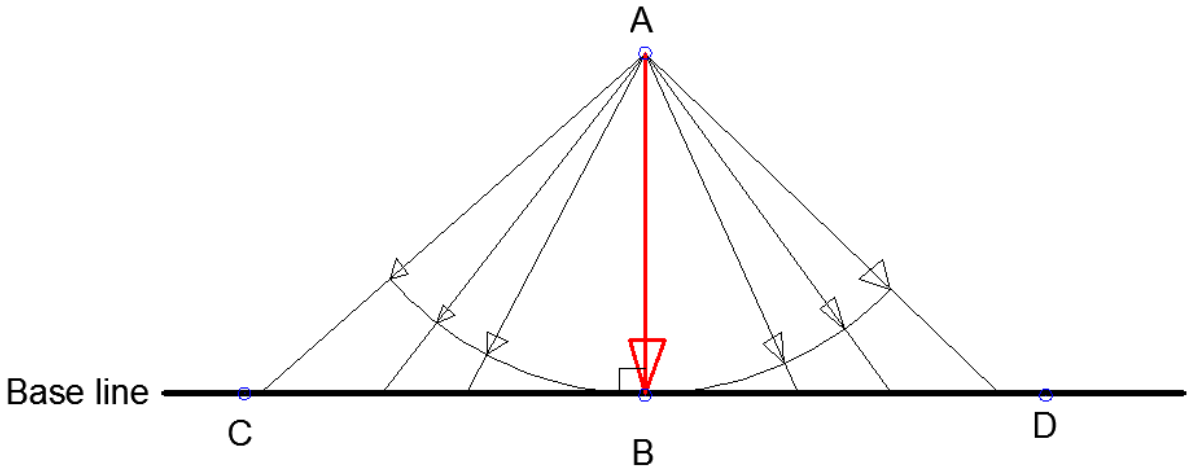
A-When the point is accessible

Note accessible=clear

i-the radius method



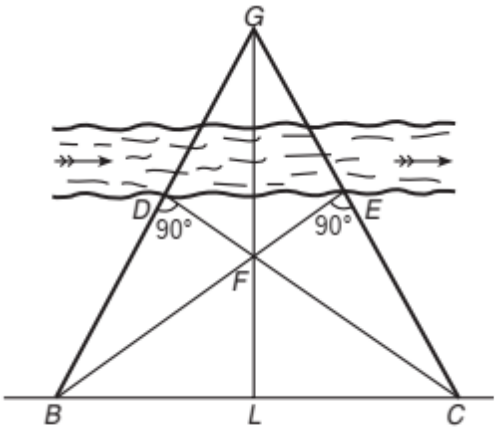
ii-short distance



B- **When the point is inaccessible**

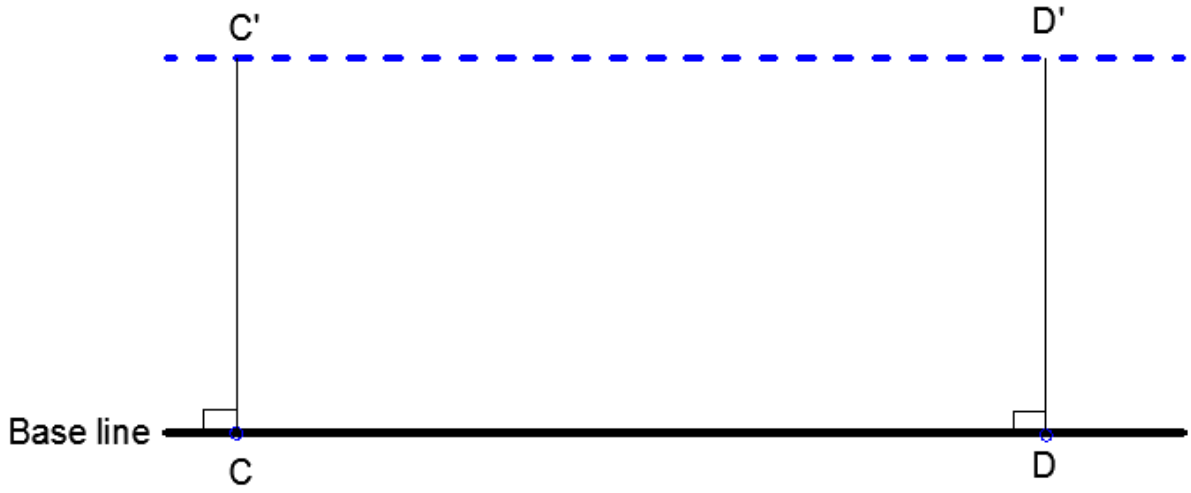
dropping perpendicular

Method. Select two points *B* and *C* on the chain line. Drop *perpendiculars BE to CG* and *CD* to *BG*. Locate their point of intersection *F*. Produce GF to L which is the required perpendicular to BC. This solution is based on the geometrical property of a triangle *i.e.* Perpendiculars drawn from the vertices on opposite sides, intersect at a point.



Parallel baseline

Parallel line to accessible line through a given point.



OBSTACLES IN CHAINING

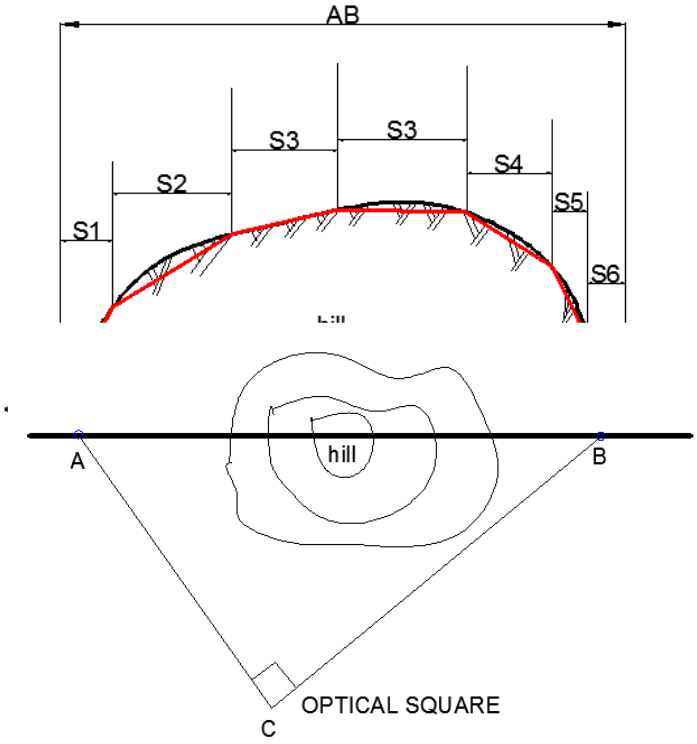
Various types of obstacles generally met during chaining, may be overcome by any one of the following methods.

Obstacles to chaining are of the following types:
1. Obstacles which obstruct ranging but not chaining.
2. Obstacles which obstruct chaining but not ranging.
3. Obstacles which obstruct both ranging and chaining.

1. Obstacles which obstruct ranging but not chaining.
   Obstacles which obstruct ranging but not chaining are hills and depressions

a-in case hills
choose points between A and B

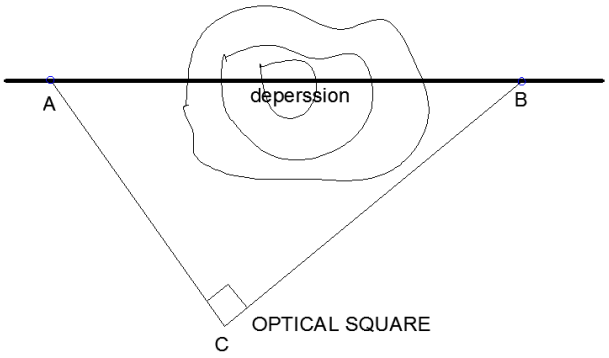
AB=S1+S2+S3+……

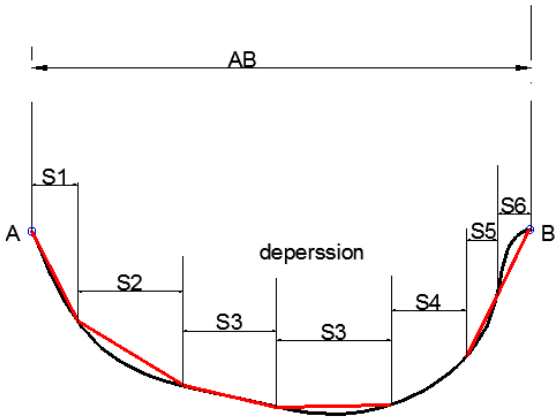


$AB^2 = AC^2 + CB^2$

$AB = \sqrt{AC^2 + CB^2}$

b-in case depression
Choose points between A and B





$$AB^2 = AC^2 + CB^2$$
$$AB = \sqrt{AC^2 + CB^2}$$

Types of North

There are **three main types of North** used in surveying, navigation, and mapping. Each serves a specific purpose depending on the context. Here's a brief explanation of each:

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1. True North (Geographic North / Real North)

- **Definition:** The direction along the Earth's surface towards the geographic North Pole.
- **Reference:** Based on the axis of the Earth's rotation.
- **Symbol:** Usually represented by a star or "TN" on maps.
- **Use:** Most accurate and permanent reference; used in astronomy, GPS, and topographic maps.

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2. Magnetic North

- **Definition:** The direction a magnetic compass points, towards the Earth's magnetic north pole.
- **Reference:** Based on the Earth's magnetic field.
- **Variable:** Changes over time due to changes in the Earth's magnetic field (magnetic declination).
- **Symbol:** Often marked as "MN" on maps.
- **Use:** Used in compass navigation and field surveys.

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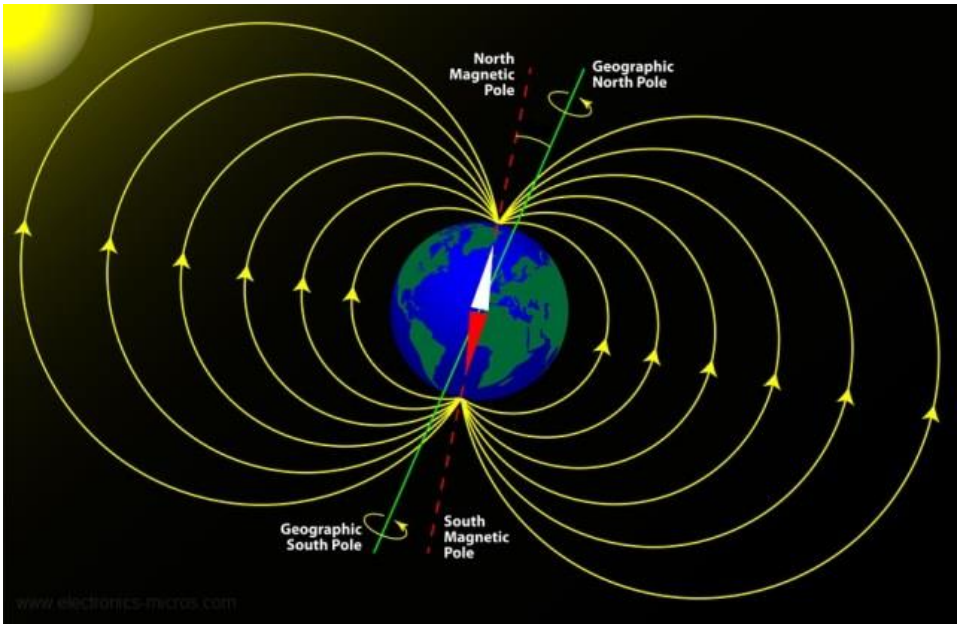
3. Grid North (Virtual North)

- **Definition:** The direction northwards along the grid lines of a map projection (like UTM).

- **Reference:** Based on a grid system laid over a curved surface (Earth) to make mapping easier.
- **Symbol:** Indicated as "GN" on maps.
- **Use:** Used in map reading and cartographic computations for convenience.



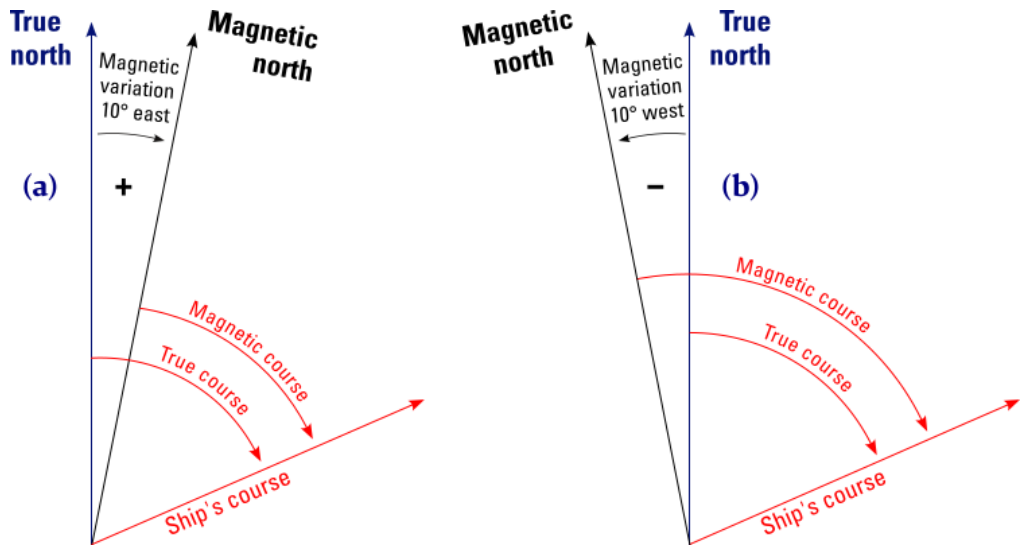
Summary Table:

Type of North	Reference System	Changes Over Time	Use Case
True North	Earth's rotation axis	No	GPS, astronomy, mapping
Magnetic North	Earth's magnetic field	Yes	Compass, field navigation
Grid (Virtual) North	Map grid/projection	No (static grid)	Map reading, CAD, GIS

Relationships Between Them

🔄 True North vs Magnetic North

- **Angle Between Them**: Called **Magnetic Declination** (or variation).
- **East or West**: Magnetic North can lie **east or west** of True North depending on your location.
- **Changes Over Time**: Declination values must be updated regularly.



Azimuth (AZ) And **Bearing**

It looks like you're asking about **azimuth (AZ)** and **bearing**, which are both ways of expressing directions in surveying and navigation. Here's a quick breakdown of both:

🔄 Azimuth (AZ):

- **Definition**: Azimuth is the **clockwise angle** measured from the **north direction (0°)** all the way around the circle (0° to 360°).
- **Measured From**: Always from **true north (or magnetic north)**.
- **Format**: Expressed as a single angle in degrees (e.g., **135°**).
- **Range**: 0° to 360°.
- **Example**:
  - East = 90°
  - South = 180°
  - Southwest = 225°

🔄 Bearing:

- **Definition**: Bearing describes direction using **quadrants** (NE, SE, SW, NW) and is measured as an acute angle **(0° to 90°)** from the **north or south** toward the **east or west**.
- **Format**: Written as a combination like **N 45° E** or **S 30° W**.
- **Range**: 0° to 90° in each quadrant.

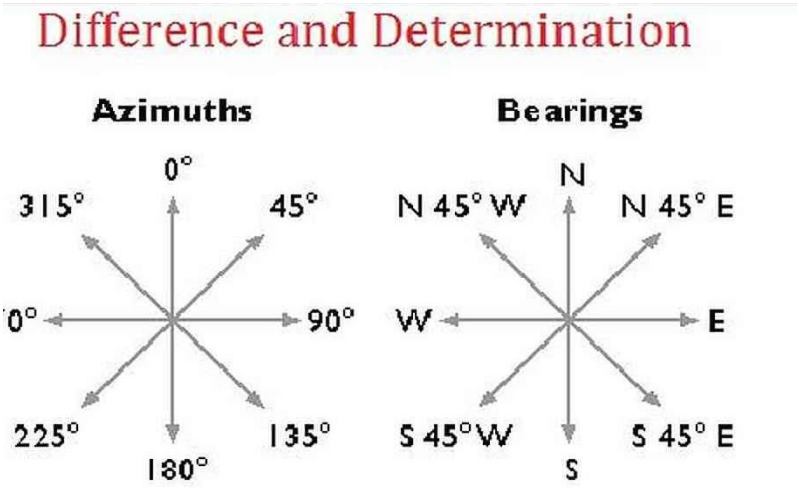
Quadrant	Bearing Format	Azimuth Range
NE	N θ° E	0° – 90°

Quadrant	Bearing Format	Azimuth Range
SE	S θ° E	90° – 180°
SW	S θ° W	180° – 270°
NW	N θ° W	270° – 360°

🔄 Conversion between Azimuth and Bearing:

1. **From Azimuth to Bearing**:
   - 0° to 90°: Bearing = N θ° E
   - 90° to 180°: Bearing = S (180° – θ) ° E
   - 180° to 270°: Bearing = S (θ – 180°) ° W
   - 270° to 360°: Bearing = N (360° – θ) ° W
2. **From Bearing to Azimuth**:
   - N θ° E → Azimuth = θ°
   - S θ° E → Azimuth = 180° – θ°
   - S θ° W → Azimuth = 180° + θ°
   - N θ° W → Azimuth = 360° – θ°

Examples



Azimuth	Bearing
45°	N45°E
135°	S45°E
225°	S45°W
315°	N45°W
Bearing	**Azimuth**
N60°E	60°
S30°E	150°

Azimuth	Bearing
S20°W	200°
N75°W	285°

Longitudinal section

Longitudinal section: It is a graph with two axes: the horizontal axis represents distances, and the vertical axis represents levels. It has a horizontal scale and a vertical scale.

Steps for drawing a longitudinal section

A- Horizontal axis

1- Calculating the length of the horizontal axis (the length of the project in the map)

$$\text{length of the horizontal axis} = \frac{\text{Project length in the ground (last distance) (M)}}{\text{scale factor (M)}}$$

2- Locate each point on the horizontal axis

$$\text{The distance between one point and the next} = \frac{\text{point distance (M)}}{\text{scale factor (M)}}$$

3- We write in the horizontal axis the number of each point, the distance of each point, and the level of each point.

B- vertical axis

1- It **starts** from a level lower than the lowest level and **ends** with a level higher than the highest level.
1- The levels are added on the vertical axis depending on the **scale drawing**.
2- Each point is placed the value of its level.

Calculate the number of cuts and fulling

Calculation methods Cut and filling quantities are divided into three types

1- Horizontal longitudinal section (One level for the project)

2- The longitudinal section has a slope (It gives one level ... and the required slope for the project (up or down) and writes the slope percentage)

3- Longitudinal section with longitudinal and lateral inclinations (Inclination + slope + lateral slope)

Steps for calculating cut and filling

1- Construction level office below the horizontal axis
2- Projecting construction points at each point
3- Calculation of cut depth or full height =

Point level - construction level

(+) cut

(-) fill

4- Connecting a vertical column from each point to the construction line.
5- It will produce a number of shapes (triangles and trapezoids).

The area of a triangle is half the base times the height

The area of a trapezoid is one-half (base 1 + base 2) times the height

note:

1 -The base is the depth of the cut or the height of the full

2- The height is the difference between the distance of the end of the shape - the distance of the beginning of the shape

6- We calculate the cut volume = the total cut area in the width of the project

7- We calculate the full volume = the total full area in the width of the project

Example:

I made a longitudinal budget and the readings were

2.7, 2.2, 1.5, 1.9, 2.5, 3.2, 3.7, 2.8, 3.9, 2.4

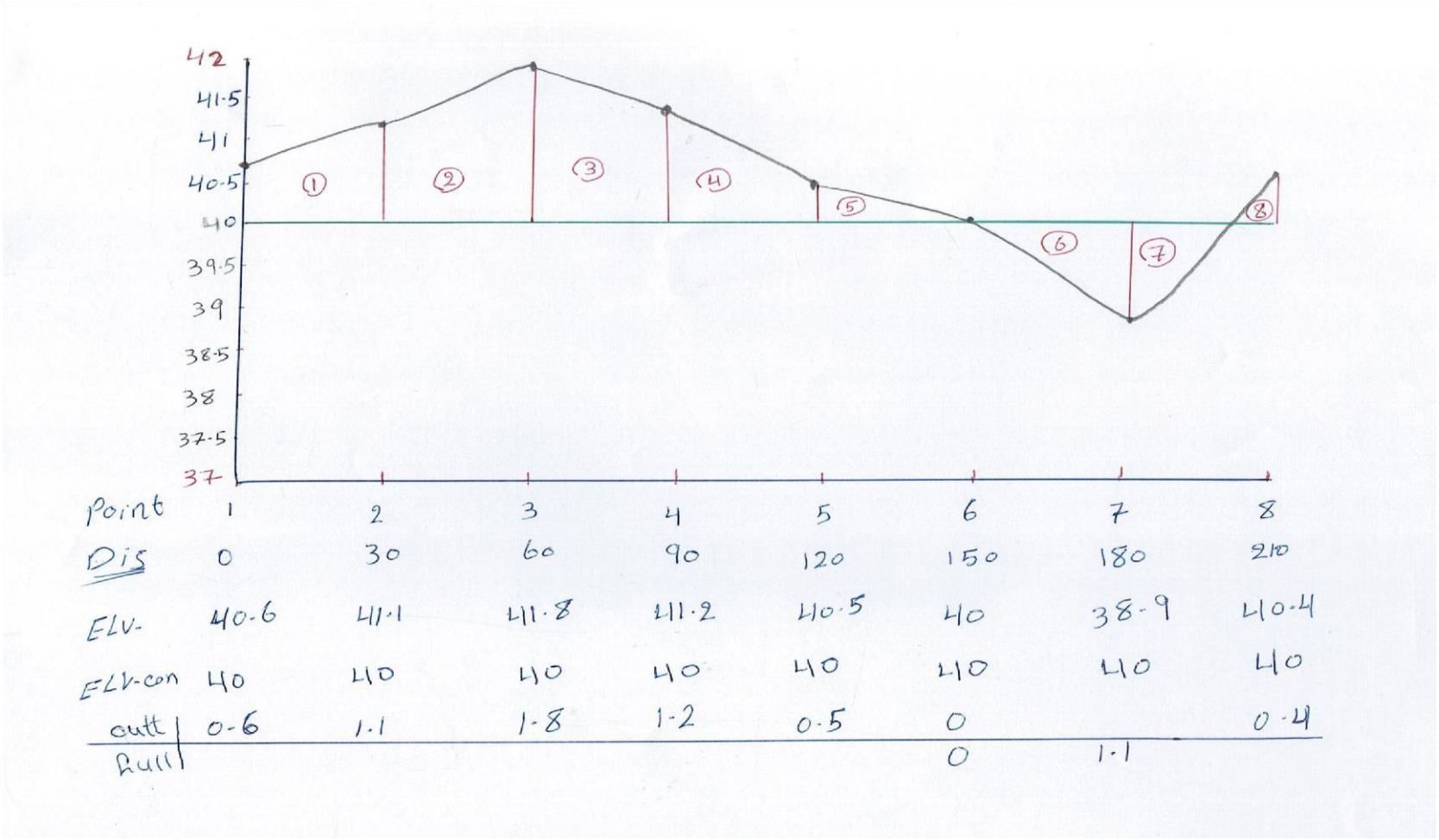
If you know that the *third and sixth* points are rotation and the distance between the points is equal to 30 meters

1- the points levels
2- the longitudinal segment if the horizontal scale is 1:1000 and the vertical is 1:50
3- the amount of cut and full to make the road at a level of 40 and a width of 20 meters.

soul:

Number of points = number of readings-number of rotation points = 10-2=8

point	Distans	B.S	I.F.S	F.S	H.I	RL	construction level	Remark	cut	full	AREA CUT	AREAFULL	
1	0	2.7			43.3	40.6	40		0.6		25.5		trapezoid
2	30		2.2			41.1	40		1.1		43.5		trapezoid
3	60	1.9		1.5	43.7	41.8	40	T. P	1.8		45		trapezoid
4	90		2.5			41.2	40		1.2		25.5		trapezoid
5	120		3.2			40.5	40		0.5		7.5		triangle
6	150	2.8		3.7	42.8	40	40	T.P (B.M)	0			16.5	triangle
7	180		3.9			38.9	40			1.1		13.75	triangle
8	210			2.4		40.4	40		0.4		1		triangle
SUM		7.4		7.6		-0.2					148	30.25	



Point	1	2	3	4	5	6	7	8
Dis	0	30	60	90	120	150	180	210
ELV.	40.6	41.1	41.8	41.2	40.5	40	38.9	40.4
ELV-con	40	40	40	40	40	40	40	40
outt	0.6	1.1	1.8	1.2	0.5	0		0.4
fill						0	1.1	

Leveling Device

leveling device is an instrument used in surveying to measure or establish a horizontal plane or line. It plays a crucial role in determining the elevation of points, leveling ground, and ensuring the accuracy of construction projects.

Main Parts of a Surveying Level

1. **Telescope**
   - **Objective Lens**: Focuses on distant objects to bring them into the field of view.
   - **Eyepiece**: Allows the user to view the magnified image of the object.
   - **Crosshairs**: Helps in aligning the level accurately with the target point.
2. **Leveling Screws (Foot Screws)**
   - Used to adjust and level the instrument by tilting its base plate.
3. **Base Plate (Tribrach)**
   - Supports the level and provides a stable connection to the tripod.
4. **Circular Level (Bubble Level)**
   - Ensures the instrument is horizontally level.
5. **Tripod Mounting Head**
   - A platform to secure the level to the tripod.
6. **Vertical Spindle**
   - Allows the instrument to rotate horizontally during observation.
7. **Focusing Knob**
   - Adjusts the focus of the telescope to ensure the target is sharp and clear.
8. **Horizontal Tangent Screw**
   - Permits fine adjustments in the horizontal direction for precise alignment with the target.
9. **Line of Sight/Line of Collimation**
   - The imaginary straight line through the crosshairs to the object being sighted.
10. **Plumb Bob or Optical Plummet**

- Ensures that the instrument is set directly above a specific ground point (e.g., a benchmark).

11. **Mirror (in some levels)**

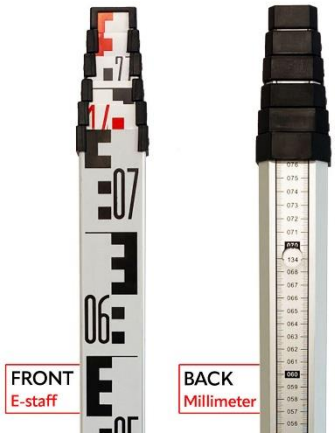
- Assists in viewing the bubble level when it is not visible directly.

12. **Compensator (in Automatic Levels)**

***level measurement staff** (or leveling rod) is an essential tool in surveying and leveling operations. It is a graduated pole or rod used to measure vertical distances, typically in conjunction with a leveling instrument. The staff provides a reference point for determining the relative elevation of a surveyed point.

Uses of Leveling Staff

- **Leveling Surveys**: To measure the difference in elevation between points.
- **Height Measurement**: Used to determine the height of points above a reference plane.
- **Digital Leveling**: Paired with digital levels for precise readings



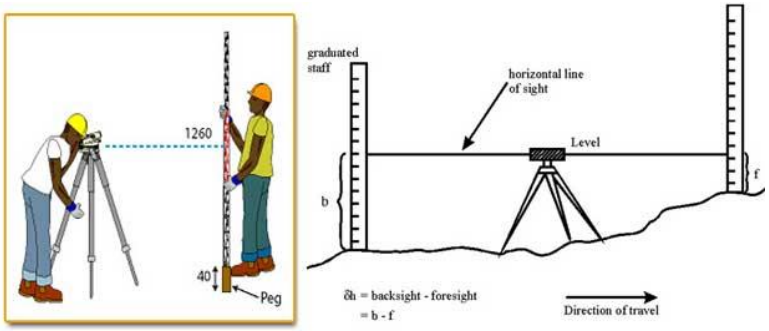
level survey process involves determining the relative heights or elevations of points on the Earth's surface.

Types of Leveling

1. **Direct Leveling (Spirit Leveling)**

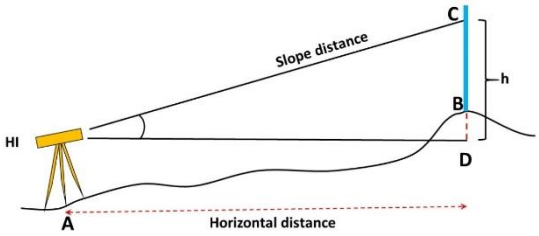
    - **Definition**: The most common and accurate method of leveling, where a leveling instrument is used to measure vertical distances directly.
    - **Methods**:

1) **Simple Leveling**: Used when the points to be leveled are close to each other and on the same line of sight.
2) **Differential Leveling**: Used when points are at different elevations or separated by obstacles.
3) **Profile Leveling**: Used to determine the elevations along a line, such as for a road or canal alignment.
4) **Cross-Section Leveling**: Similar to profile leveling, but involves measuring elevations perpendicular to a central line.
5) **Reciprocal Leveling**: Used to eliminate errors caused by instrument imperfections or refraction, especially over long distances.



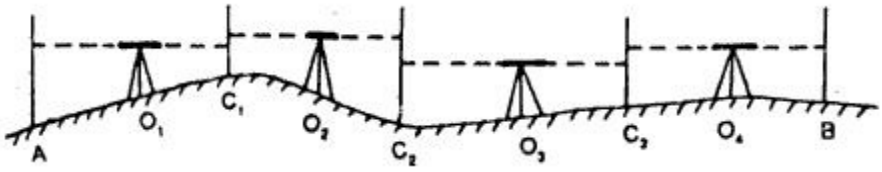
2. **Indirect Leveling**

- **Definition**: Heights are determined indirectly using trigonometric principles or GPS.
- **Examples**: Trigonometric leveling, barometric leveling, and GPS leveling.



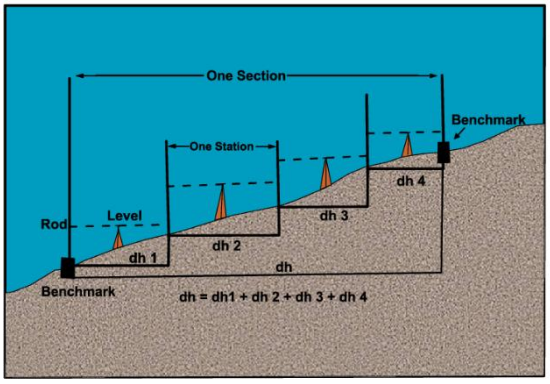
3. **Fly Leveling**

- A rapid method of leveling used to establish temporary benchmarks or check previous levels.



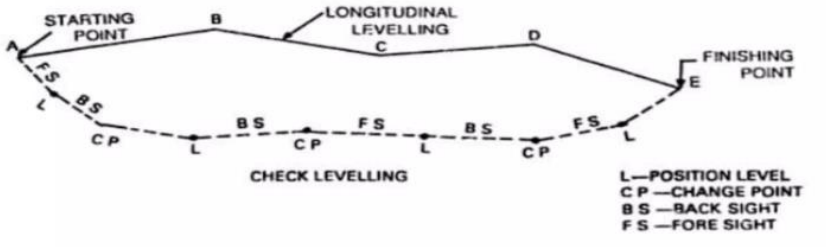
4. **Precise Leveling**

- A highly accurate method used in large-scale projects such as railway construction or dam surveys.



5. **Check Leveling**

    - A method used to verify the accuracy of previous leveling results.



Here are the definitions of key terms in leveling:

- **Level Line**

A line that is everywhere perpendicular to the direction of gravity. It is a curved line following the Earth's surface.

- **Level Surface**

A continuous surface that is perpendicular to the direction of gravity at every point, such as the surface of a calm lake.

- **Horizontal Line**

A straight line tangent to the level line at a point. It is perpendicular to the direction of gravity at that point.

- **Datum**

A reference surface or level from which elevations are measured. Common datums include mean sea level or an arbitrary point.

- **Mean Sea Level (MSL)**

The average level of the sea over a long period, used as a standard for measuring elevations.

- **Elevation**

The vertical distance of a point above or below the datum.

- **Benchmark (BM)**

A fixed reference point of known elevation. Benchmarks are used as starting points in leveling.

Characteristics of Benchmarks

1) **Stability**: Fixed to minimize shifts over time.
2) **Accessibility**: Placed in visible, easily reachable locations.
3) **Durability**: Built to withstand environmental conditions.

- **Line of Sight**

The straight line extending from the instrument to the leveling staff, through the crosshairs.

- **Height of Instrument (HI)**

The elevation of the line of sight of the leveling instrument, measured from the datum or a benchmark.

- **Elevation Difference**

The vertical distance between two points.

- **Backsight (BS)**

A staff reading taken on a known elevation point (e.g., a benchmark) to determine the height of the instrument.

- **Foresight (FS)**

A staff reading taken on a point of unknown elevation to determine its height relative to the instrument.

- **Intermediate Sight (IS)**

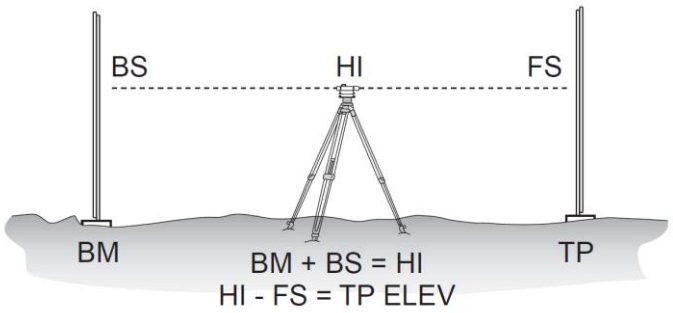
A staff reading taken on intermediate points between the backsight and foresight for additional information.

- **Turning Point (TP)**

A temporary point used to transfer the height of the instrument when shifting the instrument during a survey

Calculating Elevations in Leveling

Height of Instrument (HI) Method



In this method, the elevation of the instrument's line of sight is calculated first.
Steps:

1. Add the back sight reading (BS) to the elevation of the known point to find HI:
   - **HI = Elevation of BM + BS**
2. Subtract the foresight reading (FS) from the HI to get the elevation of the unknown point:
   - **Elevation = HI – FS**

Example:

Station	BS	IS	FS	HI	Elevation
BM	2.500			102.500	100.000
A		2.200			100.300
B			1.800		99.900

Types Of Polygons

1. Types of Polygons

◆ Based on Number of Sides (Degrees)

Polygons are classified by the number of their sides/angles (also referred to as "degrees" here):

Sides	Name	Interior Angle Sum = (n−2)×180°
3	Triangle	180°
4	Quadrilateral	360°
5	Pentagon	540°
6	Hexagon	720°
7	Heptagon	900°
8	Octagon	1080°
...	...	...
n	n-gon	(n−2)×180°

◆ Based on Geometry

- **Regular Polygon**: All sides and angles are equal (used for theoretical calculations and ideal conditions).
- **Irregular Polygon**: Sides and angles differ (common in fieldwork).

◆ Based on Connection Type

1. **Closed Polygon**: A figure where the last point connects back to the first, forming a **loop**.
    - Used in **Closed Loop Traverse** (for mapping an area completely).
2. **Open Polygon (Chain)**: Does not return to the starting point.
    - Common in **Linear surveying**.

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2. Fieldwork on Polygons in Surveying

✓ Closed Loop Traverse (Closed Polygon)

- The last station joins back to the first.
- Used for:
    - Plotting boundaries (plots, lands, parks)

- Topographic mapping
- Control surveys

Check: Sum of interior angles should be $(n-2)\times180°$(n-2) × 180°

✓ Closed Connected Traverse

- The traverse starts and ends at **two known control points**, not necessarily forming a geometric loop.
- Used in:
  - Road and pipeline surveying
  - Connecting two triangulation points

Check: Angular misclosure is adjusted; positions checked via control points.

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3. Types of Angles in Closed Circular Polygons

◆ Interior Angles

- Measured **inside** the polygon (common in land plotting).

◆ Exterior Angles

- Supplementary to interior angles:
  Exterior angle=180°−Interior angle

◆ Included Angles

- Angle between two consecutive lines (at each station).
- Critical for direction determination in traverses.

◆ Deflection Angles

- The angle between the extension of the back line and the forward line.
  - **Right Deflection** = Turning right
  - **Left Deflection** = Turning left

Field Techniques with Polygons

- **Traverse surveying** is applied using instruments like theodolites or total stations.
- **Angle measurement** at each station to determine shape and closure.
- **Linear measurement** of sides using tapes or EDM (Electronic Distance Measurement).

- **Closing Error** is checked by summing up all angles and ensuring they match theoretical values.

Example: Interior Angle Check

For a **Closed Polygon with 5 sides** (Pentagon):

Sum of Interior Angles=(5−2)×180°=540°\text{Sum of Interior Angles} = (5 - 2) × 180° = 540°

If measured angles are:

- A = 108°, B = 110°, C = 105°, D = 112°, E = 105°

Then:

- Total = 540° → No angular misclosure.
