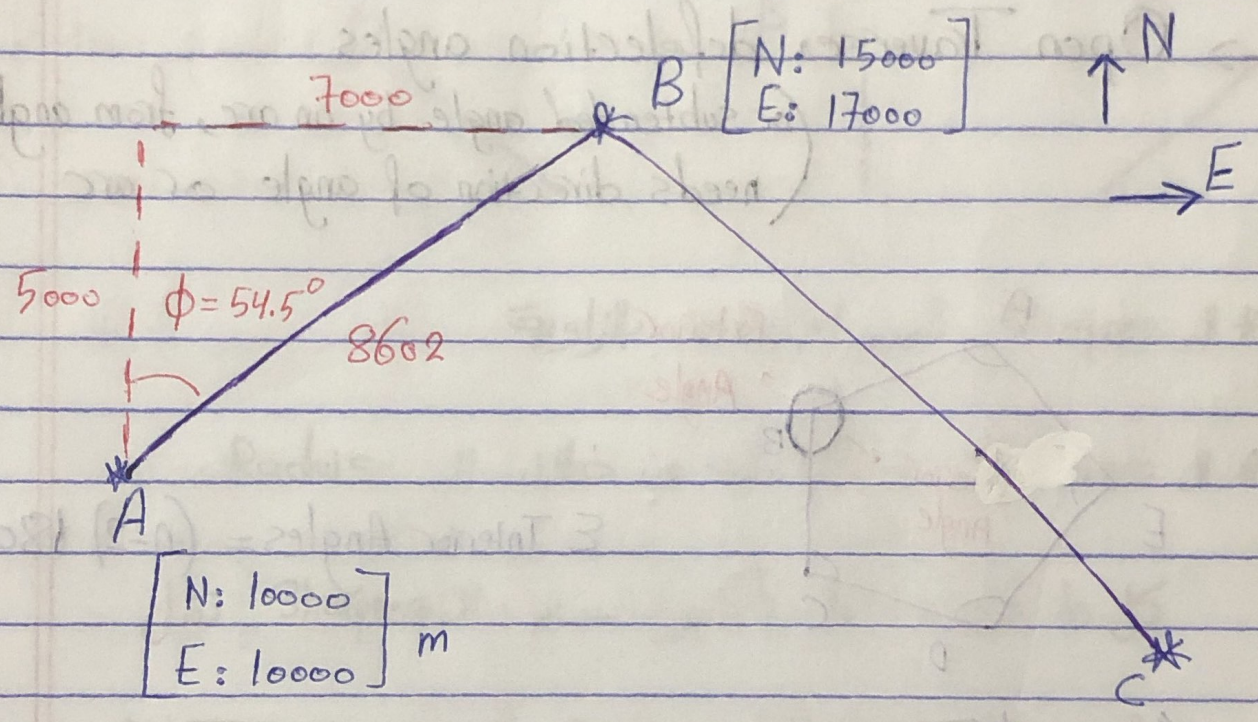
Lecture #5

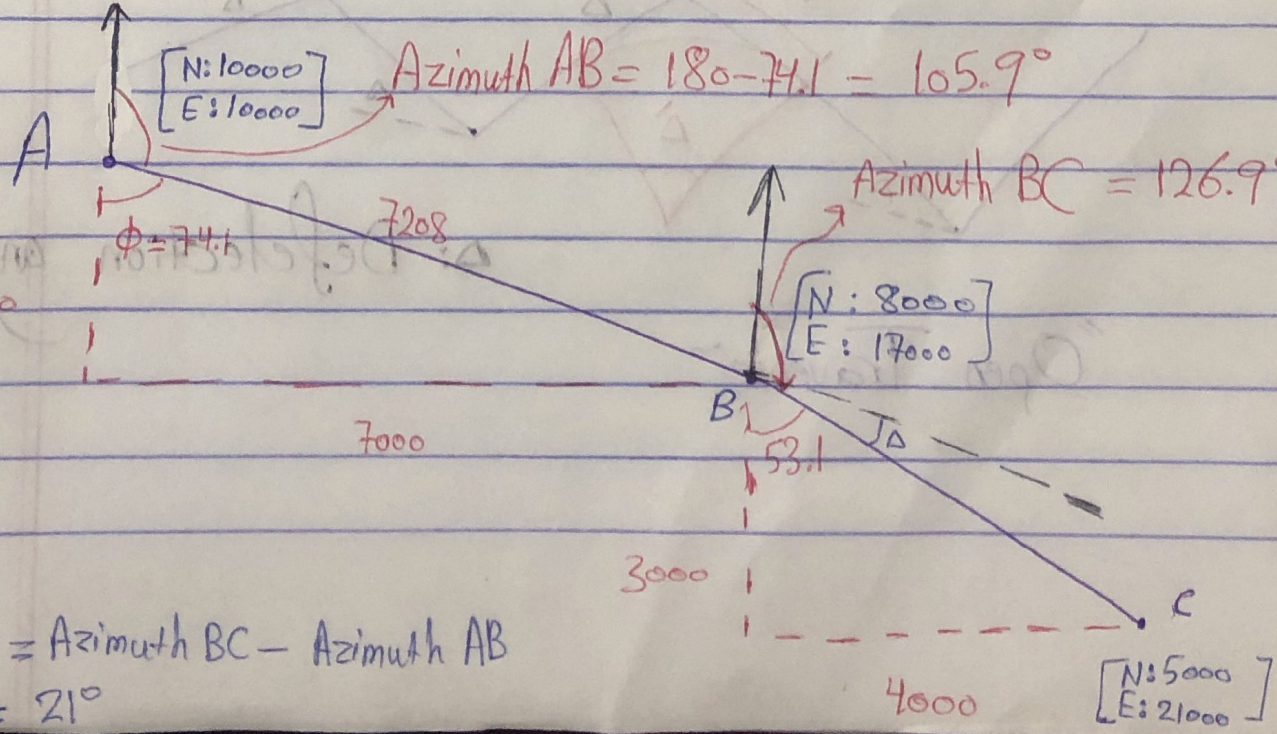
* Horizontal Alignment:

Coordinates - azimuth and distance - circular curves



Azimuth AB = 54.5°

(انحراف الخط عن الشمال N)



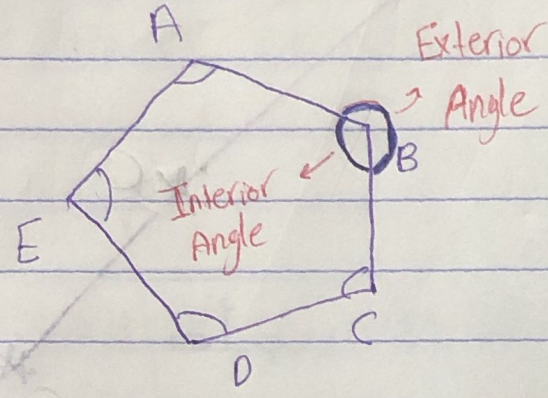
* Δ = Azimuth BC - Azimuth AB

= 21°

* From Surveying there are two types of angles:

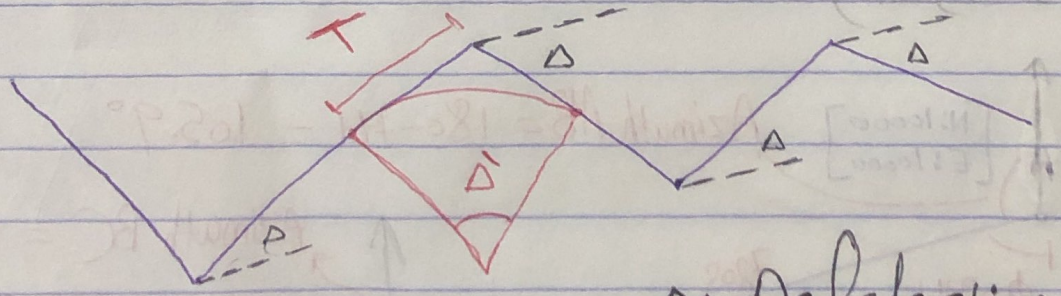
→ Closed Traverse: interior or exterior angles

→ Open Traverse: defelection angles
(or subtended angle by an arc, from angle, this needs direction of angle or arc)



Σ Interior Angles = (n-2) 180

"Closed Traverse"

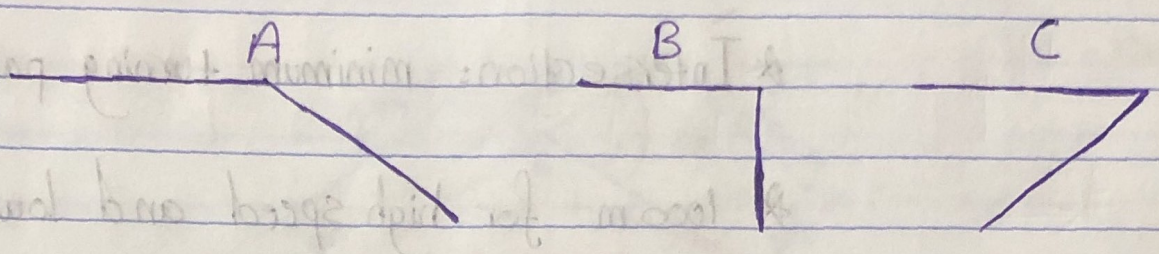


Δ: Defelection angles

"Open Traverse"

* Sharpness of curve:

Q: Who is the most sharpness curve of:



* الـ Sharpness ليس له علاقة بالزاوية

* الـ Sharpness نتحكم عليه من خلال الـ Radius

كل ما كانت R أكبر ← الـ Sharpness تقل

* The large of R → The smoother of the curve
(The less sharpness " " ")

* Minimum Raduis:

① Highway : * way link : 25 m (30 km/h , $e_{max} = 0.1$)

* Intersection: minimum turning path of vehicle

* 1000 m for high speed and low e (or no e)

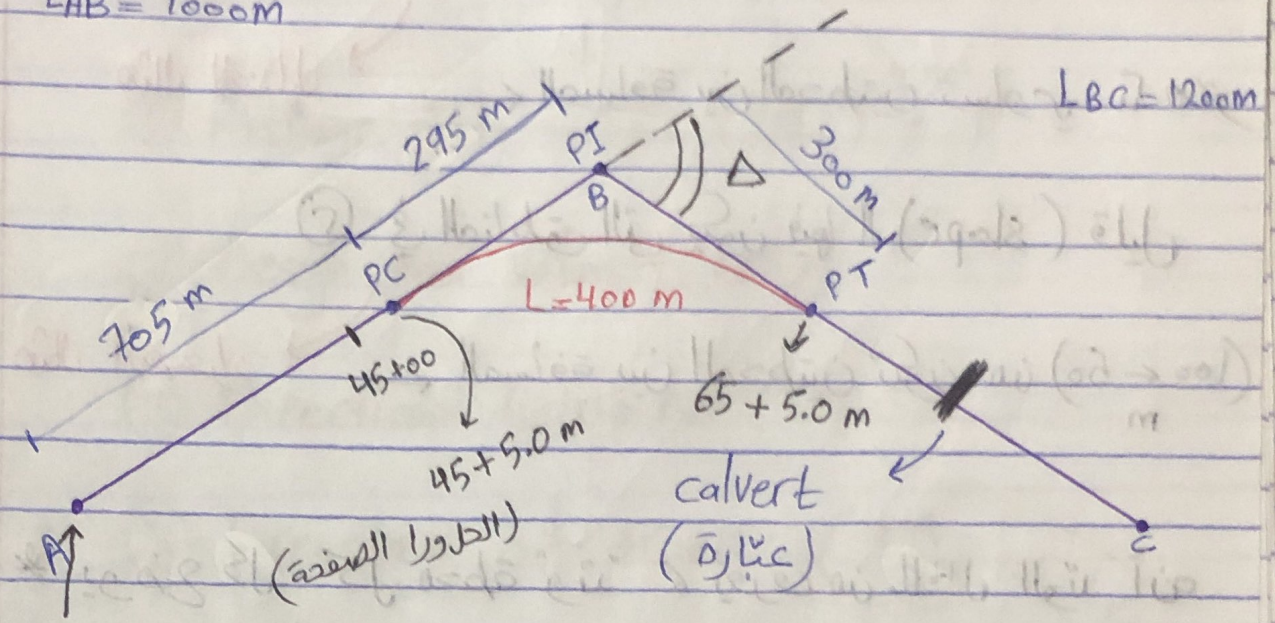
* يوجد maximum R ← لما يكون الشارع (R = ∞) يكون خط مستقيم

② Rail Road : * TGV : ≈ 4000 m , min. 3200 m

* Min. for urban secondary or yard tracks, Montreal 52 m (rubber tires)

* function of train car length and distance between train car truck → ~ 18 m

* Stations (most common and default for this course):
100 ft, 20 m



* length between 2 stations (In USA) = 100 ft
= 100'

' : ft
" : Inch

* length between 2 stations [In palestine (mountains)]
= 20 m

← يعني كل ٢٠ متر بكون عندي درجة

* في الصحراء تصل المسافة بين المحطتين إلى ١٠٠ متر

* خلاصة: ① في المناطق التي يكون فيها الـ (slope) كثير ← المسافة بين المحطتين تساوي ٢٠ متر (مثال الجبال)

② في المناطق التي يكون فيها الـ (slope) قليل ← المسافة بين المحطتين تكون من (50 ← 100) m (مثال الصحراء)

* يوضع عند كل محطة "وتد" يُعرف من خلاله أنه يوجد محطة

* عند كل محطة نضع قديش عنّا cut أو fill

* $\frac{705\ m}{20\ m} = 35.25$

← أول محطة رمزنالها بـ (0+00)

45+5.0 m: يعني عند PC تكون المحطة

(0.25*20) ←

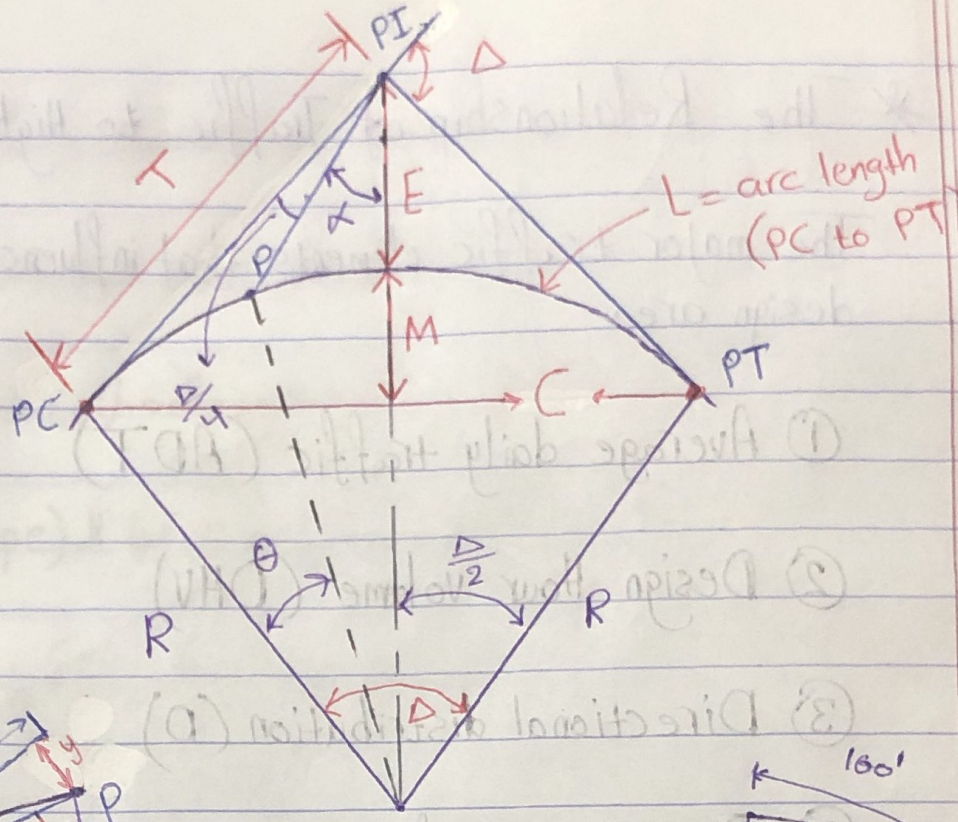
* Station 82 + X

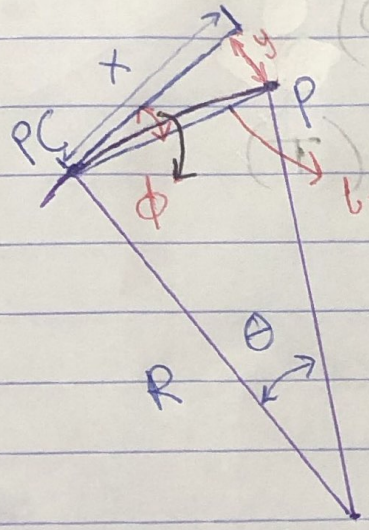
↳ (0.0 → 19.99) m

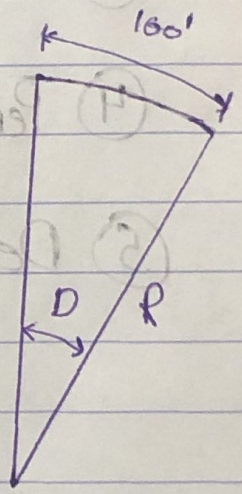
* The Relationship of Traffic to Highway Design:

The major traffic elements that influence highway design are:

1. Average daily traffic (ADT)
2. Design Hour volume (DHV)
3. Directional distribution (D)
4. Percentage of trucks (T)
5. Design speed (V)







D = central angle for 100' arc

Where: PC: Point of curvature (Beginning of curve)

PT: Point of tangency (End of curve)

PI: Point of intersection

Δ: Defelection (central) angle

L: ~~Len~~ length of curve (PC to PT)

b: // // arc (PC to P)

θ: central angle for arc length l

T: Tangent length (PC to PI and PT to PI)

: Defelection angle at PI between tangent and line from PI to P

: Defelection angle at PC between tangent and chord for P

X: tangent distance from PC to P

Y: tangent offset P

D: Degree of curvature

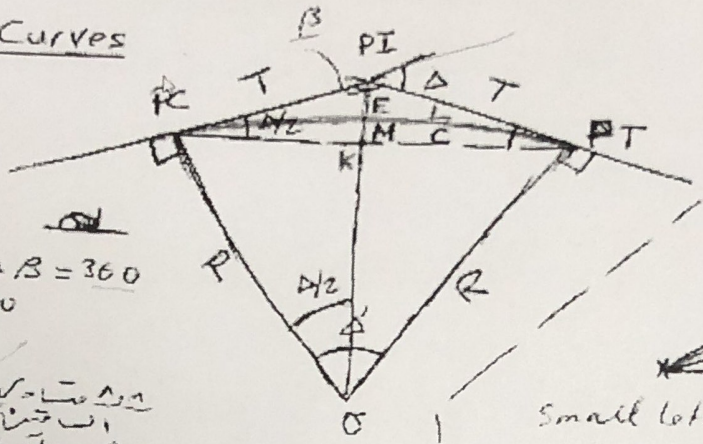
R: Raduis of curve

E: External distance

M: middle ordinate

C: Chord length

Circular Curves



$\Delta + \beta = 180$

$\Delta' + 90 + 90 + \beta = 360$

$\Delta' + \beta = 180$

$\therefore \Delta' = \Delta$

PC, PI, PT, I

180 =

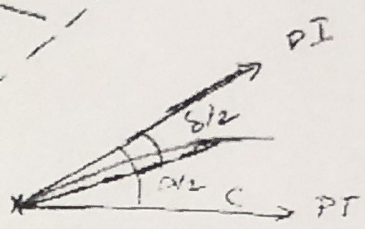
$\therefore \Delta/2$ —

In $\triangle$ PI, PT, O :

$\tan \Delta/2 = T/R$

$\therefore T = R \tan \Delta/R$

laying out Circular curves



Small letter for l, c, s

Given any length of arc l

$l_1 = \frac{R\pi}{180} S_1$

Solve $S_1 = \frac{180 l_1}{\pi R}$