

# CVEN303 ENGINEERING MEASUREMENT

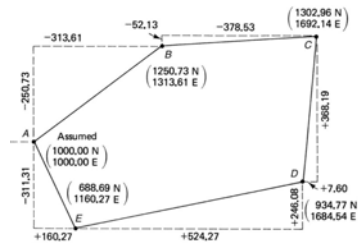
## Lecture 9 – Traverse Coordinates (Sections 7.12 – 7.15)

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Developed by Nasir G. Gharaibeh, Ph.D., P.E.  
Zachry Department of Civil Engineering  
Texas A&M University

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## Computation of Traverse X&Y Coordinates



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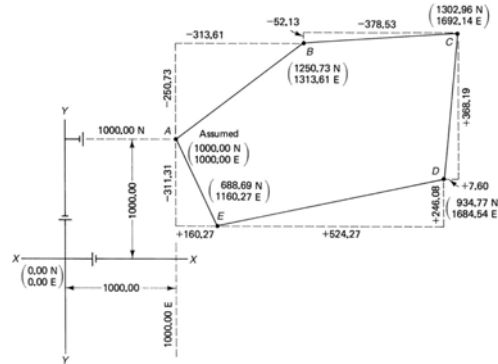
## Computation of Traverse X&Y Coordinates

$$Y_B = Y_A + \text{Latitude of AB}$$

$$X_B = X_A + \text{Departure of AB}$$

Assumptions:

- The origin of coordinates is situated far enough south and west of the traverse to make the coordinates positive quantities.
- The coordinates of at least one station must be known (or assumed)



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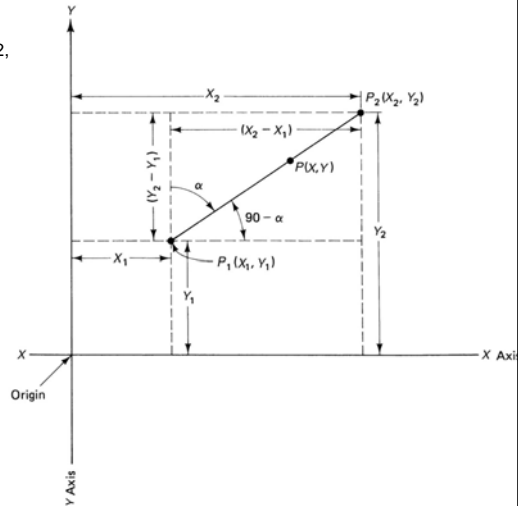
## Use of X & Y Coordinates

- Find the equation of a line
- Compute line length
- Compute area of traverse

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## Finding Equation of a Line Using X & Y Coordinates

- Given the coordinates of  $P_1$  and  $P_2$ , what is the equation of line  $P_1P_2$ ?



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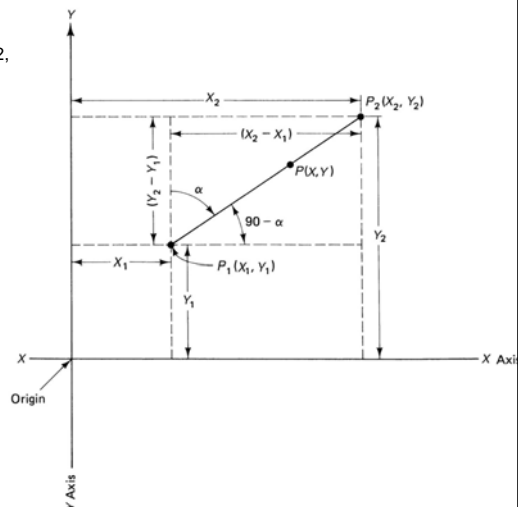
## Finding Equation of a Line Using X & Y Coordinates

- Given the coordinates of  $P_1$  and  $P_2$ , what is the equation of line  $P_1P_2$ ?

$$\frac{Y - Y_1}{Y_2 - Y_1} = \frac{X - X_1}{X_2 - X_1}$$

$$Y - Y_1 = \frac{Y_2 - Y_1}{X_2 - X_1} (X - X_1)$$

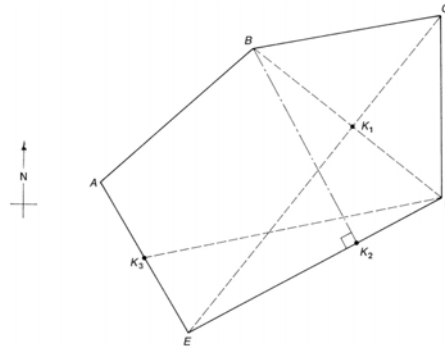
$$Y - Y_1 = \cot \alpha (X - X_1)$$



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## Finding Coordinates of New Points in the Traverse

- What are the coordinates of point  $K_1$  in this traverse?
  - Hint: note that  $K_1$  is the intersection of Lines EC and DB



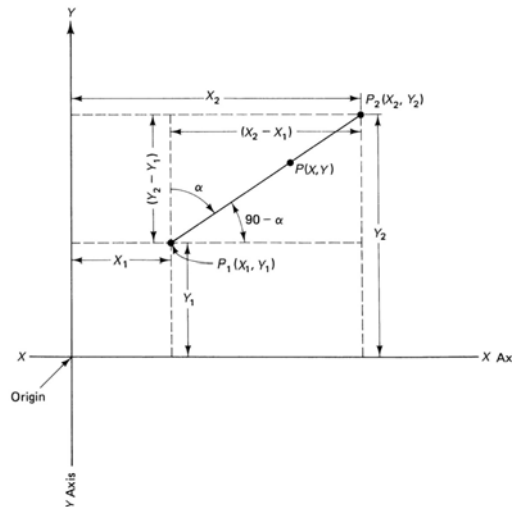
Station	Coordinates	
	North	East
A	1000,00	1000,00
B	1250,73	1313,61
C	1302,96	1692,14
D	934,77	1684,54
E	688,69	1160,27

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Answer:  $K_1$  coordinates are (1,505.44E, 1,087.33N)

## Computing Line Length from Coordinates

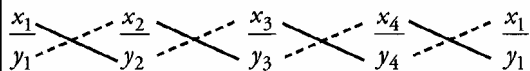
- Given the coordinates of  $P_1$  and  $P_2$ , how long is line  $P_1P_2$ ?



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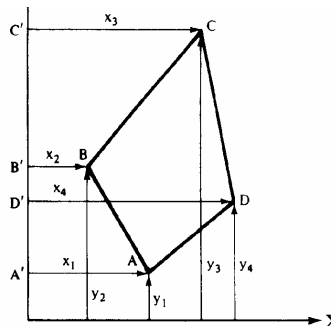
## Computing Traverse Area from Coordinates

Alternative coordinates method:



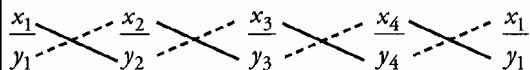
$$2A = x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1 - y_1x_2 - y_2x_3 - y_3x_4 - y_4x_1$$

$$2A = |\sum \text{solid-line products} - \sum \text{dashed-line products}|$$



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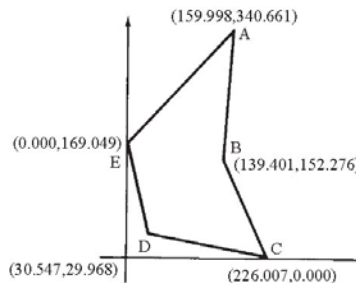
## Example Computing Traverse Area using Coordinates



$$2A = |\sum \text{solid-line products} - \sum \text{dashed-line products}|$$

Point	X	Y	$X_i * Y_{i+1}$	$Y_i * X_{i+1}$
E	0	169.049	0	27047.5
A	159.998	340.661	24363.86	47488.48
B	139.401	152.276	0	34415.44
C	226.007	0	6772.978	0
D	30.547	29.968	5163.94	0
E	0	169.049	0	0
SUM			36300.77	108951.4

Sum of Solid Line 36300.77  
 Sum of Dashed Line 108951.4  
 Area, SF 36,325  
 Area, acre 0.834



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