

Ferris State University
Surveying Engineering
Surveying Computation - SURE 215
P R O B L E M N U M B E R 99
Designed by: S.R. Hashimi
Area Partitioning Problem
By A Line From A Given Point

Write your answers in the spaces provided

Given Data:

<u>POINT NO.</u>	<u>DISTANCE</u>	<u>AZIMUTH in DMS</u>	<u>NORTHING</u>	<u>EASTING</u>
1	472.351	205 19 37.3	5981.444	6535.204
2	532.052	132 30 14.7	5554.494	6333.140
3	580.064	62 15 48.8	5195.017	6725.384
4	628.876	351 36 17.8	5464.982	7238.797
5	620.838	260 11 59.0	6087.119	7146.982

A Line From Point 1 To P Is To Divide The Above Parcel Into Two Equal Parts.

Compute:

- (a). The Azimuth Of Line 1 To P = _____
- (b). The Distance Of Line 1 To P = _____
- (c). The Coordinates Of Point P: Northing = _____, Easting = _____
- (d). Check By Computing The Areas Of The Two Parcels:
- Area of Parcel 1 = _____, Area of Parcel 2 = _____

AREA PARTITIONING FROM A GIVEN POINT

TOTAL AREA (SEE ATTACHED EXCEL WORKSHEET)

$$A_{1-2-3-4-5} = 542,761.0025 \text{ SQ. FT.}$$

$$\text{DESIRED AREA} = A_{\text{DES}} = \frac{A_{1-2-3-4-5}}{2} = \frac{542,761.0025}{2} = 271,380.5 \text{ SQ. FT.}$$

DRAW LINE FROM PT #1 (FIXED POINT) TO PT #4 (SEE ATTACHED AUTOCAD DRAWING). $A_{1-2-3-4}$ IS THE INITIAL ESTIMATE OF THE DESIRED AREA. THE AREA FOR POLYGON 1-2-3-4, FROM THE ATTACHED SPREADSHEET, IS $A_{1-2-3-4} = 347,604.8627 \text{ SQ. FT.}$ THE ACTUAL AREA IS TOO LARGE FOR THE DESIRED AREA

$$A_{\text{EXCESS}} = A_{1-2-3-4} - A_{\text{DES}} = 347,604.8627 - 271,380.5 = 76,224.3614 \text{ SQ. FT.}$$

then,

$$D_{1-4} = [(X_4 - X_1)^2 + (Y_4 - Y_1)^2]^{1/2} = 872.7979'$$

$$AZ_{1-4} = \tan^{-1} \left[\frac{X_4 - X_1}{Y_4 - Y_1} \right] = \tan^{-1} \left[\frac{703.593'}{-516.462'} \right] = 126^{\circ}16'47.9''$$

$$\alpha = AZ_{4-1} - AZ_{4-3} = AZ_{1-4} - AZ_{3-4} = 64^{\circ}00'59.1''$$

AREA OF TRIANGLE: $A = \frac{1}{2}bh$, then

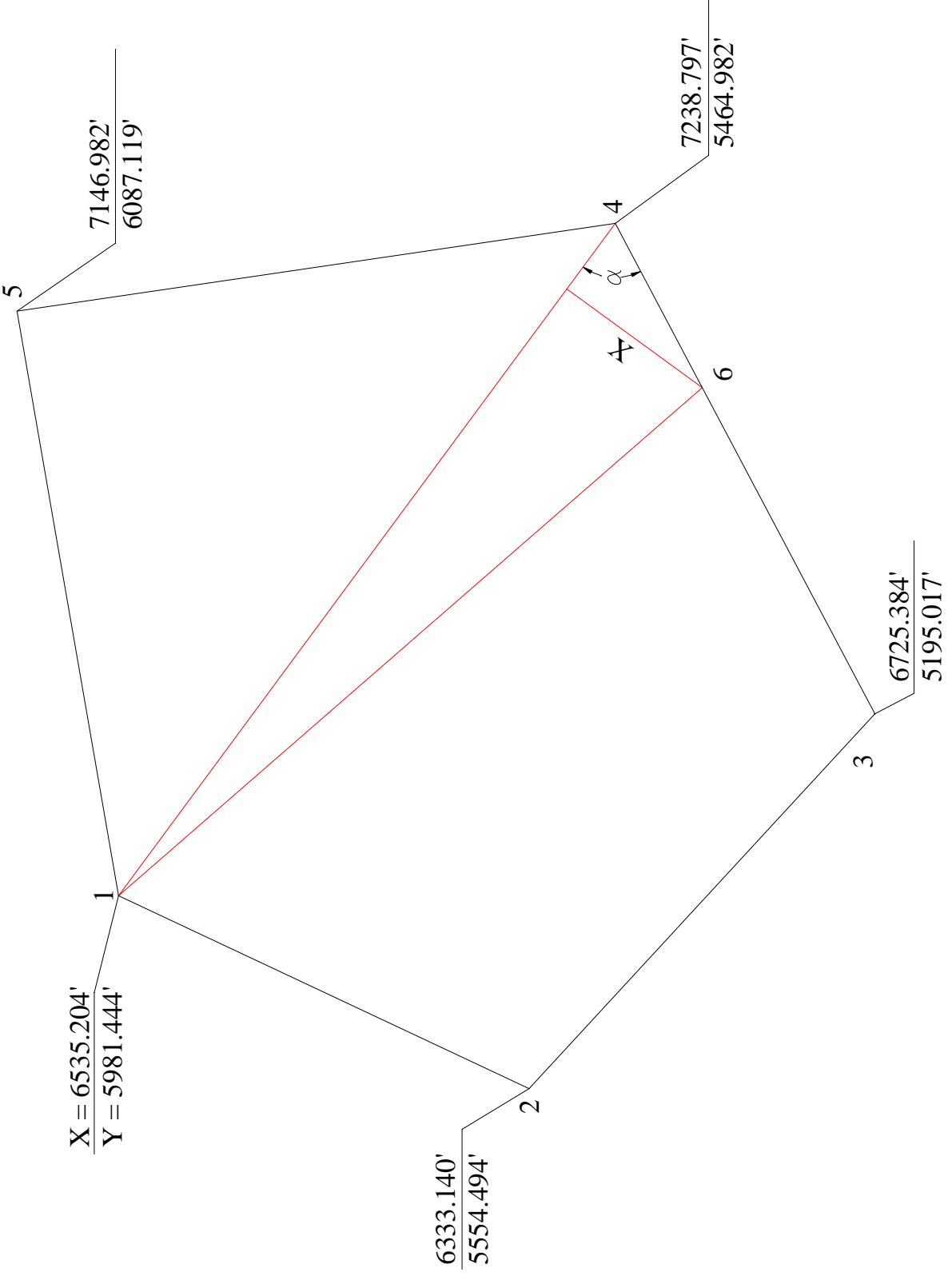
$$A_{1-4-6} = \frac{1}{2} D_{1-4} X \Rightarrow X = \frac{2A_{1-4-6}}{D_{1-4}} = \frac{2(76,224.3614)}{872.7979} = 174.6667'$$

$$\sin \alpha = \frac{X}{D_{4-6}} \Rightarrow D_{4-6} = X / \sin \alpha = 194.3074'$$

$$X_6 = X_4 + D_{4-6} \sin AZ_{4-6} = 7066.816'$$

$$Y_6 = Y_4 + D_{4-6} \cos AZ_{4-6} = 5374.550'$$

CHECK RESULTS BY
 $A_{1-2-3-6}$ & A_{6-4-5}
 (SEE SPREADSHEET)



Area for polygon 1-2-3-4-5:

Area Calculations			
Point	X	Y	
1	6535.204	5981.444	Sum #1 = 192767315.2311
2	6333.14	5554.494	Sum #2 = 191681793.2260
3	6725.384	5195.017	2 Area = 1085522.005
4	7238.797	5464.982	Area = 542761.0025
5	7146.982	6087.119	
1	6535.204	5981.444	

Area for polygon 1-2-3-4:

Area Calculations			
Point	X	Y	
1	6535.204	5981.444	Sum #1 = 149253082.7561
2	6333.14	5554.494	Sum #2 = 148557873.0307
3	6725.384	5195.017	2 Area = 695209.7254
4	7238.797	5464.982	Area = 347604.8627
1	6535.204	5981.444	

Area for polygon 1-2-3-6:

Area Calculations			
Point	X	Y	
1	6535.204	5981.444	Sum #1 = 147616198.1097
2	6333.14	5554.494	Sum #2 = 147073437.2439
3	6725.384	5195.017	2 Area = 542760.8657
6	7066.816	5374.55	Area = 271380.4
1	6535.204	5981.444	

Area for polygon 1-6-4-5:

Area Calculations			
Point	X	Y	
1	6535.204	5981.444	Sum #1 = 160556494.2534
6	7066.816	5374.55	Sum #2 = 160013733.0003
4	7238.797	5464.982	2 Area = 542761.2531
5	7146.982	6087.119	Area = 271380.6
1	6535.204	5981.444	