

TIMPANOGOS  
N=749457.16  
E=1959556.29  
(POINT B)

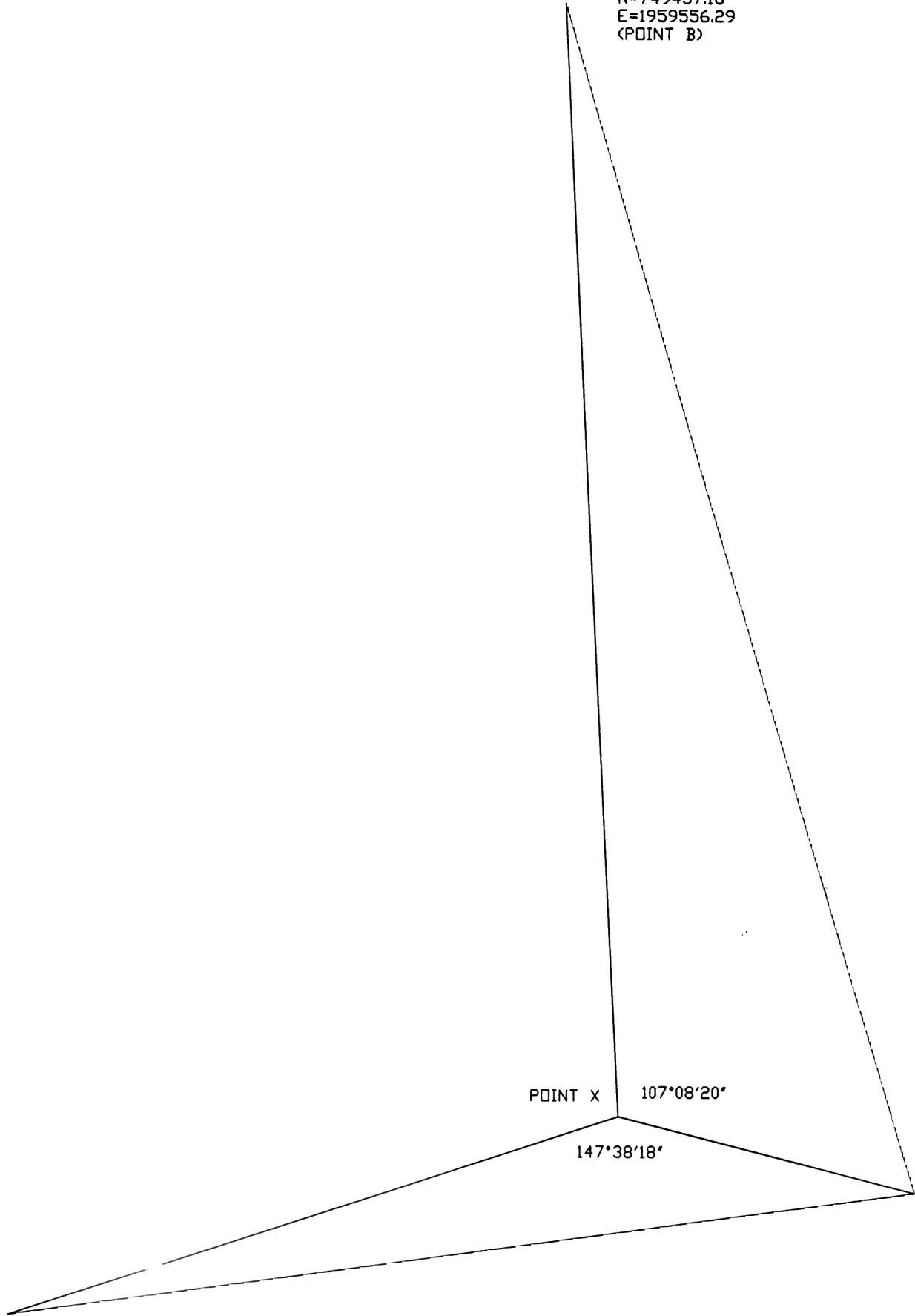
POINT X

107°08'20"

147°38'18"

SPANISH FORK PEAK  
N=639086.95  
E=1992464.62  
(POINT C)

WEST MOUNTAIN 2  
N=627398.99  
E=1907973.57  
(POINT D)



$$749457.16 \quad X_1 = 107.1388889 \cdot \text{deg}$$

$$1959556.29 \quad X_2 = 147.6383333 \cdot \text{deg}$$

$$N_C = 639086.95$$

$$1992464.62$$

$$627398.99$$

$$E_D = 1907973.57$$

STEP INVERSE BETWEEN KNOWN POINTS

$$\text{Lat}_{CB} = N_B - N_C \quad \text{Lat}_{CB} = 110370.210$$

$$\text{Dep}_{CB} = E_B - E_C \quad \text{Dep}_{CB} = -32908.330$$

$$\text{Lat}_{CD} = N_D - N_C \quad \text{Lat}_{CD} = -11687.960$$

$$\text{Dep}_{CD} = E_D - E_C \quad \text{Dep}_{CD} = -84491.050$$

$$CB = \sqrt{\text{Dep}_{CB}^2 + \text{Lat}_{CB}^2} \quad CB = 115171.791$$

$$CD = \sqrt{\text{Dep}_{CD}^2 + \text{Lat}_{CD}^2} \quad CD = 85295.638$$

$$\text{Brng}_{CB} = \text{atan} \left( \frac{\text{Dep}_{CB}}{\text{Lat}_{CB}} \right) \quad \text{Brng}_{CB} = -16.602642 \cdot \text{deg} = \text{N } 16\text{deg}36'09.5'' \text{ W}$$

$$\text{Az}_{CB} = 360 \cdot \text{deg} - \text{Brng}_{CB} \quad \text{Az}_{CB} = 343.3973582 \cdot \text{deg} = 343\text{deg}23'50.5''$$

$$\text{Brng}_{CD} = \text{atan} \left( \frac{\text{Dep}_{CD}}{\text{Lat}_{CD}} \right) \quad \text{Brng}_{CD} = 82.1240473 \cdot \text{deg} = \text{S } 82\text{deg}07'26.6'' \text{ W}$$

$$\text{Az}_{CD} = 180 \cdot \text{deg} - \text{Brng}_{CD} \quad \text{Az}_{CD} = 262.1240473 \cdot \text{deg} = 262\text{deg}07'26.6''$$

STEP 2: CALCULATE ANGLE C

$$C = 180 \cdot \text{deg} - \text{Brng}_{CD} - \text{Brng}_{CB} \quad C = 81.2733108 \cdot \text{deg} = 81\text{deg}16'23.9''$$

STEP 3: CALCULATE B+D

$$BD = 360 \cdot \text{deg} - C - X_1 - X_2 \quad BD = 23.9494670 \cdot \text{deg} = 23\text{deg}56'58.1''$$

STEP 4: CALCULATE B AND D

$$B = \text{atan} \frac{CD \cdot \sin X_1 \cdot \sin(BD)}{CB \cdot \sin X_2 + CD \cdot \sin X_1 \cdot \cos(BD)} \quad B = 13.6602037 \cdot \text{deg} = 13\text{deg}39'36.7''$$

$$D = \text{atan} \frac{CB \cdot \sin X_2 \cdot \sin(BD)}{CD \cdot \sin X_1 + CB \cdot \sin X_2 \cdot \cos(BD)} \quad D = 10.2892633 \cdot \text{deg} = 10\text{deg}17'21.3''$$

$$B + D = 23.9494670 \cdot \text{deg} \quad \text{checks}$$

STEP 5: CALCULATE AZIMUTHS BX AND DX

$$\text{Az}_{BX} = \text{Az}_{CB} - 180 \cdot \text{deg} - B \quad \text{Az}_{BX} = 177.0575619 \cdot \text{deg} = 177\text{deg}03'27.2''$$

$$\text{Az}_{DX} = \text{Az}_{CD} - 180 \cdot \text{deg} - D \quad \text{Az}_{DX} = 71.8347841 \cdot \text{deg} = 71\text{deg}50'05.2''$$

STEP 6: CALCULATE DISTANCE BX AND DX

$$\begin{aligned} &180 \cdot \text{deg} - X_1 - B \quad C_1 = 59.2009074 \cdot \text{deg} = 59\text{deg}12'03.3'' \\ \text{BX} &= CB \cdot \frac{\sin C_1}{\sin X_1} \quad \text{BX} = 103526.147 \end{aligned}$$

$$\begin{aligned} &180 \cdot \text{deg} - X_2 - D \quad C_2 = 22.0724034 \cdot \text{deg} = 22\text{deg}04'20.7'' \\ \text{DX} &= CD \cdot \frac{\sin C_2}{\sin X_2} \quad \text{DX} = 59881.392 \end{aligned}$$

STEP 7: CALCULATE LAT AND DEP BX AND DX

$$\text{Lat}_{BX} = \cos \text{Az}_{BX} \cdot BX \quad \text{Lat}_{BX} = -103389.659$$

$$\text{Dep}_{BX} = \sin \text{Az}_{BX} \cdot BX \quad \text{Dep}_{BX} = 5314.273$$

$$\text{Lat}_{DX} = \cos \text{Az}_{DX} \cdot DX \quad \text{Lat}_{DX} = 18668.511$$

$$\text{Dep}_{DX} = \sin \text{Az}_{DX} \cdot DX \quad \text{Dep}_{DX} = 56896.993$$

STEP 8: CALCULATE COORDINATES OF X

$$\text{From B:} \quad N_{BX} = N_B + \text{Lat}_{BX} \quad N_{BX} = 646067.501$$

$$E_{BX} = E_B + \text{Dep}_{BX} \quad E_{BX} = 1964870.563$$

$$\text{From D:} \quad N_{DX} = N_D + \text{Lat}_{DX} \quad N_{DX} = 646067.501$$

$$E_{DX} = E_D + \text{Dep}_{DX} \quad E_{DX} = 1964870.563$$