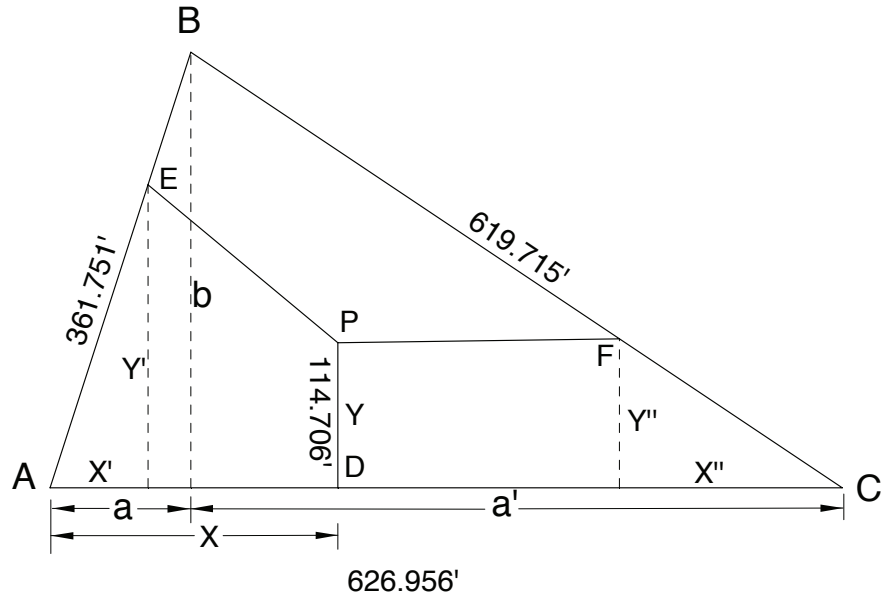


**Solution
166**

by Dave Lindell, L.S.



Construct perpendiculars b , Y' and Y'' from B , E and F , respectively, to line AC . Let the distance from A to line Y' be X' , the distance from A to line b be a , the distance from C to line Y'' be X'' , the distance from line b to C be a' , distance AD be X and distance DP be Y .

Letting point A be North 0.00, East 0.00 point C is North 0.00, East 626.956. Solving for point B by distance-distance intersection (or calculating the angles of the triangle by the Law of Cosines and traversing to B from A or C , or calculating B by bearing-bearing or azimuth-azimuth intersection) $B =$ North 344.1182, East 111.5636.

The total area of the triangle is $\frac{1}{2} (626.956)(344.1182) = 107,873.50$ sq. ft.
Area of $AEPD =$ area $DPFC = A^* = \frac{1}{3}(107,873.485) = 35,957.83$ square feet.

$$\begin{aligned} A^* &= \frac{1}{2} X' Y' + \frac{1}{2} (Y + Y')(X - X') \\ &= \frac{1}{2} X' Y' + \frac{1}{2} (XY - X'Y + XY' - X'Y') \\ &= \frac{1}{2} (XY - X'Y + XY') \end{aligned}$$

By similar triangles, $X' / Y' = a / b$, so $Y' = (X' b)/a$

$$2A^* = XY + X(X' b/a) - X'Y$$

$$2aA^* = aXY + X X' b - a X' Y$$

$$2aA^* - aXY = X'(Xb - aY)$$

$$X' = \frac{2aA^* - aXY}{Xb - aY} = \frac{2(111.5636)(35957.83) - (111.5636)(227.841)(114.706)}{(227.841)(344.1182) - (111.5636)(114.706)}$$

$$X' = 77.8494 \text{ and } Y' = (77.8494)(344.1182)/111.5636 = 240.1267$$

continued...

Solution 166 continued...

$$\text{Area DPFC} = A^* = \frac{1}{2} X'' Y'' + \frac{1}{2} (Y + Y'')(626.956 - 227.841 - X'')$$

$$2 A^* = X'' Y'' + (Y + Y'')(399.115 - X'')$$

$$\begin{aligned} 2A^* &= X'' Y'' + (399.115 Y - X'' Y + 399.115 Y'' - X'' Y'') \\ &= 399.115 (Y + Y'') - X'' Y \end{aligned}$$

$$\text{Again, } Y'' / X'' = b / a' \text{ and } Y'' = (b X'')/a'$$

$$2A^* = 399.115 Y + (399.115 b X'') / a' - YX''$$

$$\begin{aligned} X'' &= \frac{a'(2A^* - 399.115 Y)}{399.115 b - a' Y} \\ &= \frac{(515.3924)(2)(35957.83) - (515.3924)(399.115)(114.706)}{(399.115)(344.1182) - (515.3924)(114.706)} \end{aligned}$$

$$X'' = 172.1932 \text{ and } Y'' = (344.1182)(172.1932)/515.3924 = 114.9703$$

Y' and X' are the Northing and Easting, respectively, of point E, Y and X are the Northing and Easting, respectively of point P, Y'' is the Northing of point F and $626.956 - X''$ is the easting of point F.

A = North 0.00, East 0.00
B = North 344.1182, East 111.5636
C = North 0.00, East 626.956
D = North 0.00, East 227.841
E = North 240.1267, East 77.8494
F = North 114.9703, East 454.7628
P = North 114.706, East 227.841

$$AE = N 17^\circ 57' 46'' E 252.431', EB = N 17^\circ 57' 46'' E 109.320'$$

$$BF = S 56^\circ 16' 11'' E 412.667', FC = S 56^\circ 16' 11'' E 207.048'$$

$$AD = East 227.841', DC = East 399.115', DP = North 114.706'$$

$$PE = N 50^\circ 05' 53'' W 195.519' \text{ and } PF = N 89^\circ 56' 00'' E 226.922'$$

Solution
167

by Benjamin Bloch, Ph.D.

SDQ OF EXPONENTIALS

a)

n	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
x															
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	2	4	8	7	5	1	2	4	8	7	5	1	2	4
3	1	3	9	9	9	9	9	9	9	9	9	9	9	9	9
4	1	4	7	1	4	7	1	4	7	1	4	7	1	4	7
5	1	5	7	8	4	2	1	5	7	8	4	2	1	5	7
6	1	6	9	9	9	9	9	9	9	9	9	9	9	9	9
7	1	7	4	1	7	4	1	7	4	1	7	4	1	7	4
8	1	8	1	8	1	8	1	8	1	8	1	8	1	8	1
9	1	9	9	9	9	9	9	9	9	9	9	9	9	9	9
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	2	4	8	7	5	1	2	4	8	7	5	1	2	4
12	1	3	9	9	9	9	9	9	9	9	9	9	9	9	9
13	1	4	7	1	4	7	1	4	7	1	4	7	1	4	7
14	1	5	7	8	4	2	1	5	7	8	4	2	1	5	7
15	1	6	9	9	9	9	9	9	9	9	9	9	9	9	9
16	1	7	4	1	7	4	1	7	4	1	7	4	1	7	4
17	1	8	1	8	1	8	1	8	1	8	1	8	1	8	1
18	1	9	9	9	9	9	9	9	9	9	9	9	9	9	9
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	2	4	8	7	5	1	2	4	8	7	5	1	2	4
21	1	3	9	9	9	9	9	9	9	9	9	9	9	9	9
22	1	4	7	1	4	7	1	4	7	1	4	7	1	4	7

- b) The SDQ values in columns 2 through 7 are the repetitive pattern for all later columns. Thus, for value, the exponent SDQ values form a six column pattern, starting with n=2. The blank columns are to illustrate that pattern visually.
- c) The SDQ values in rows with x values of 1 through 9 and columns 2 through 7 is the repeat pattern.
- d) 9 rows by 6 columns, 54 cells in all. (The n = 0 and 1 columns are unique and obvious).