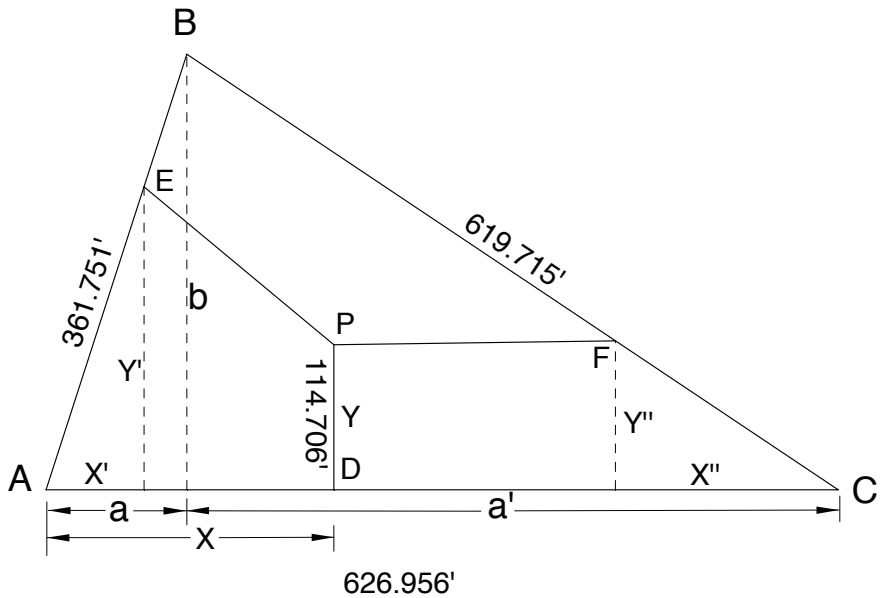
Solution
166

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 ½ (626.956)(344.1182) = 107,873.50 sq. ft. Area of AEPD = area DPFC = A* = 1/3(107,873.485) = 35,957.83 square feet.

$$A^* = \tfrac{1}{2} X' Y' + \tfrac{1}{2} (Y + Y')(X - X')$$
$$= \tfrac{1}{2} X'Y' + \tfrac{1}{2} (XY - X'Y + XY' - X'Y')$$
$$= \tfrac{1}{2} (X Y - X' Y + XY')$$

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

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

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

$$2aA^* - a X Y = X' (X b - a Y)$$

$$X' = \frac{2 a A^* - a X Y}{X b - a Y} = \frac{2(111.5636)(35957.83) - (111.5636)(227.841)(114.706)}{(227.841)(344.1182) - (111.5636)(114.706)}$$

$X' = 77.8494$ and $Y' = (77.8494)(344.1182)/111.5636 = 240.1267$

continued...

Solution 166 continued...

Area DPFC = A* = ½ X" Y" + ½ (Y + Y")(626.956 – 227.841 – X")

2 A* = X" Y" + (Y + Y")(399.115 – X")

2A* = X" Y" + (399.115 Y – X" Y + 399.115 Y" – X" Y")

= 399.115 (Y + Y") – X" Y

Again, Y" / X" = b / a' and Y" =(b X")/a'

2A* = 399.115 Y + (399.115 b X") / a' – YX"

$$x'' = \frac{a'(2A^* - 399.115\ Y)}{399.115\ b - a'\ Y}$$

$$= \frac{(515.3924)(2)(35957.83) - (515.3924)(399.115)(114.706)}{(399.115)(344.1182) - (515.3924)(114.706)}$$

X" = 172.1932 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°57'46" E 252.431', EB = N 17°57'46" E 109.320'

BF = S 56°16'11" E 412.667', FC = S 56°16'11" E 207.048'

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

PE = N 50°05'53" W 195.519' and PF = N 89°56'00" E 226.922'

Solution
167

by Benjamin Bloch, Ph.D.

a)

SDQ OF EXPONENTIALS

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).