TY-4(28)ANS

First, calculate the total area of the quadrilateral:
The area of triangle ABD = ½(sin 93°50'23")(2909.00)(4222.70) = 6,128130.3 sq. ft.
The area of triangle DBC = ½(sin 64°08'00")(2078.16)(5850.54) = 5,470,116.8 sq. ft., for a total area of 11,598,247 sq. ft.

Let EF be the desired dividing line. Construct E' and F' perpendicular to DC and on the extension of line EF, with h = DE' = CF' being the required distance from DC.
Draw line CX with FX = EE'.

Area DEFC can be 3,866,082.3 sq. ft. or 7,732,164.7 sq. ft. I will choose the larger.
(The problem stated "…with one part being one-third of the original area…")

E'E = $h\cdot\cot(m)$, FF' = $h\cdot\cot(n)$, XF' = $h\cdot\cot(p)$ and XF' = XF +FF' = E'E + FF'

So, $h\cdot\cot(p) = h\cdot\cot(m) + h\cdot\cot(n)$, and $\cot(p) = \cot(m) + \cot(n)$ .... (1)

EF = E'F = DC – [$h\cdot\cot(m) + h\cdot\cot(n)$], therefore EF = DC – $h\cdot\cot(p)$

So that $h = \dfrac{DC - EF}{\cot(p)}$ .... (2)

The area of DEFC = $\dfrac{EF + DC}{2}\cdot h$ = 7,732,164.7

Since $h = \dfrac{DC - EF}{\cot(p)}$, $\dfrac{EF + DC}{2}\cdot\dfrac{DC - EF}{\cot(p)}$ =7,732,164.7 = $\dfrac{\overline{DC}^2 - \overline{EF}^2}{2\cot(p)}$

From which $\overline{EF}^2 = \overline{DC}^2 - 2\cot(p)\cdot(7{,}732{,}164.7)$ .... (3)

From (1) find cot (p): cot(p) = cot 73°34'24" + cot 64°08'00" = 0.779676976

Solve (3) for EF: $EF = \sqrt{5850.54^2 - 2(0.779676976)\cdot 7732164.7}$ = 4708.677

and substitute into (2) to find h: $h = \dfrac{5850.54 - 4708.68}{0.779676976}$ = 1464.53

Note: This solution method was published in the July, 1955 *The Canadian Surveyor*

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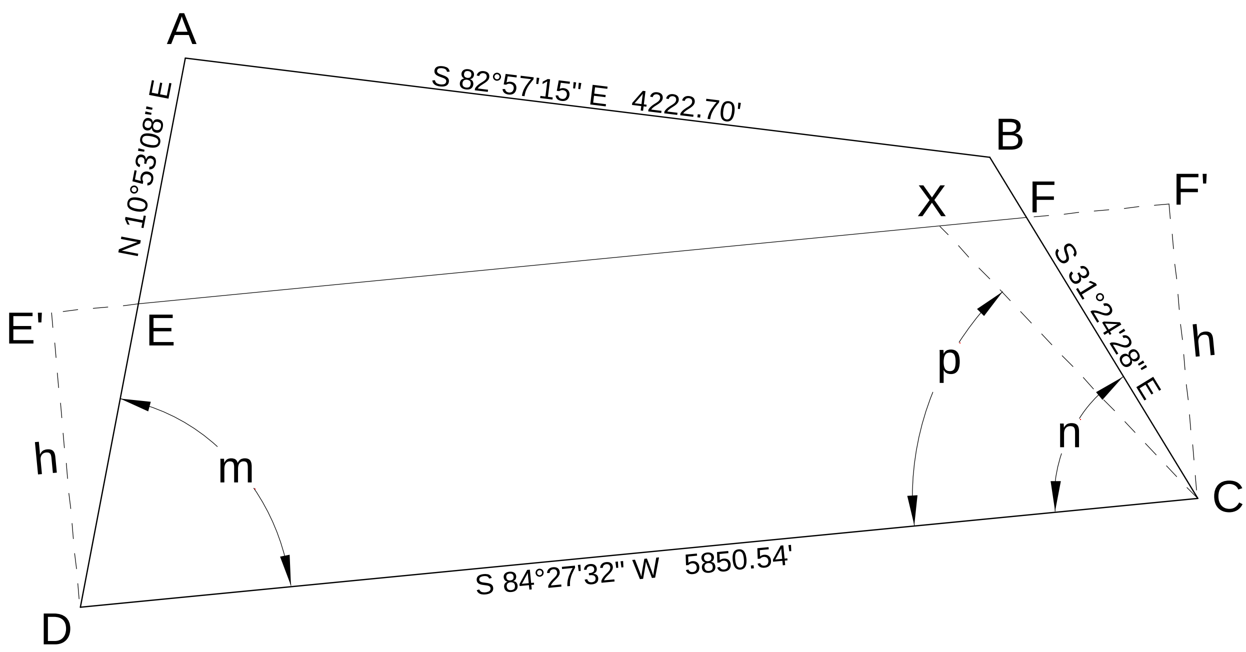

A
B
C
D
E
E'
F
F'
X
h
h
m
n
p
S 82°57'15" E 4222.70'
N 10°53'08" E
S 31°24'28" E
S 84°27'32" W 5850.54'