Solution to Problem Number 13 (Case I)

Let the central angle \( \theta = 2\phi \)

\[ 2\, R\, \phi = L, \text{ with } \phi \text{ expressed in radians} \]

\[ R\, \tan \phi = T, \text{ with } \phi \text{ expressed in degrees} \]

\[ \frac{T}{L/2} = \frac{R \tan \phi}{R} = \frac{\tan \phi}{\phi} = m \]

From trigonometry:

\[ \tan \phi = \phi + \frac{2}{15} + \frac{17}{315} + \frac{62}{2835} + \ldots \]

\[ m - 1 = \frac{\phi^2}{15} + \frac{2\phi^4}{15}, \text{ ignoring all powers above the fourth} \]

multiplying by 15/2 and rearranging, \( \phi^4 + 2.5\phi^2 - 7.5(m-1) = 0 \)

and, by utilizing the quadratic equation

\[ \phi = \frac{-2.5 \pm \sqrt{(30m - 23.75)}}{2} \]

solve for \( \phi \) and substitute above to find an approximate \( R \).

For example: with \( T = 24.80' \) and \( L = 47.61' \)

\( \phi = 0.345927533 \) or \( 19^{49'}13'' \), and \( R = 68.81' \pm \) rounding to the nearest foot and holding the tangent distance, \( R = 69' \) yields \( \phi = 19^{46'}10'' \) and \( L = 47.62' \) rounding to the nearest 10 feet, \( R = 70' \) yields \( \phi = 19^{30'}31'' \) and \( L = 47.67' \)

Solution to Problem Number 14

Construct \( AC' = BC \), parallel with \( BC \), AND \( C'D' = CD \) parallel with \( CD \) traverse from \( A \) to \( C' \) to \( D' \) and from \( A \) to \( F \) to \( E \). Inverse from \( E \) to \( D' \). The problem is now reduced to the triangle \( ED'D \) using the Law of Sines:

\[ \frac{345.67}{\sin 115^{06'}08''} = \frac{173.201}{\sin D'DE} = \frac{DD'}{\sin (64^{53'}52'' - D'DE)} \]

From which \( D'DE = 26^{59'}01'' \) AND \( DE = 54^{32'}01'' \) E

\( DD' = AB = 234.56' \)