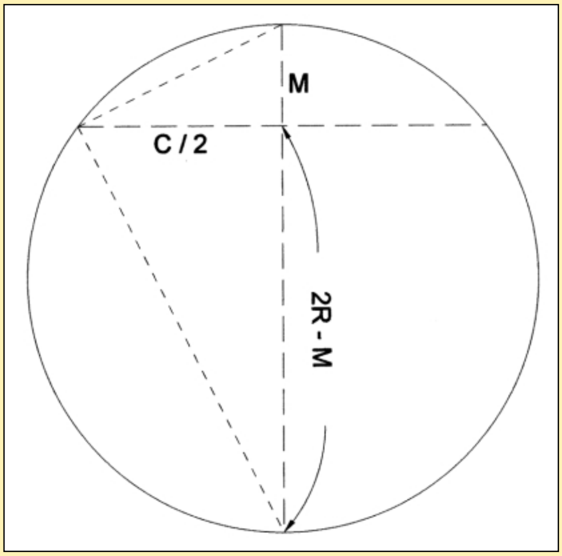
Solution to Problem Number 13 (Case I)



By Similar Triangles:

$$\frac{C/2}{2R-M} = \frac{M}{C/2}$$

$$(C/2)^2 = (2R - M)\,M = 2RM - M^2$$

$$R = \frac{(C/2)^2 + M^2}{2M}$$

Solution to Problem Number 13 (Case II)

Let the central angle $= 2\phi$

$2R\phi = L$, with ϕ expressed in radians

$R \tan\phi = T$, with ϕ expressed in degrees

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

From trigonometry:

$$\tan\phi = \phi + \frac{\phi^3}{3} + \frac{2\phi^5}{15} + \frac{17\phi^7}{315} + \frac{62\phi^9}{2835} +$$

$$m - 1 = \frac{\phi^2}{3} + \frac{2\phi^4}{15}$$, *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

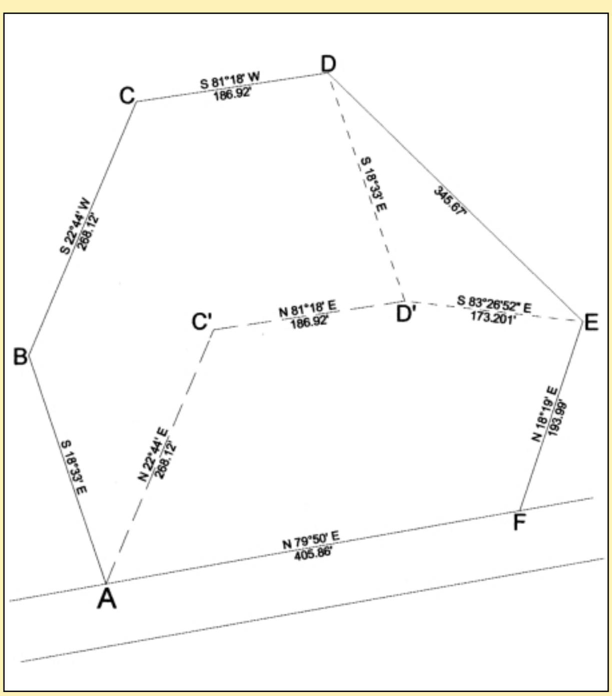
$$\phi = \frac{\sqrt{(-2.5 \pm \sqrt{(30m - 23.75)}}}{\sqrt{2}}$$

solve for ϕ 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'± rounding to the nearest foot and holding the tangent distance, R = 69' yields

ϕ = 19°46'10" and L = 47.62' rounding to the nearest 10 feet, R = 70' yields ϕ = 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 = S 45°32'01" E
DD' = AB = 234.56'