SOLUTION TO PROBLEM NO. 71

LINE C-E = R x sin ϕ = 2640, SO sin ϕ = $\dfrac{2640}{R}$

ARC LENGTH M-E = 2640.5 = R x ϕ (IN RADIANS), SO ϕ = $\dfrac{2640.5}{R}$

$\dfrac{\sin \phi}{\phi} = \dfrac{2640 / R}{2640.5 / R}$ = 0.999810642

FROM TRIGONOMETRY, $\sin \phi = \phi - \dfrac{\phi^3}{3!} + \dfrac{\phi^5}{5!} - \dfrac{\phi^7}{7!} + ...$

$0.999810642 = 1 - \dfrac{\phi^2}{6} + \dfrac{\phi^4}{120} - ...,$ FROM WHICH

$\phi^4 - 20 \phi^2 + 0.02272297 = 0$ AFTER DROPPING ALL TERMS ABOVE ϕ^4

USING THE QUADRATIC EQUATION TO SOLVE FOR ϕ^2 AND THEN TAKING THE SQUARE ROOT OF THE RESULT YIELDS A GOOD APPROXIMATION:

ϕ = 0.033707759 RADIANS OR 1°55'52.7"

FROM WHICH R= 2640.5 / 0.033707759 = 78,335.08'

MAKING C-M = 78,335.08 − 78,335.08 cos 1°55'52.7" = 44.5'