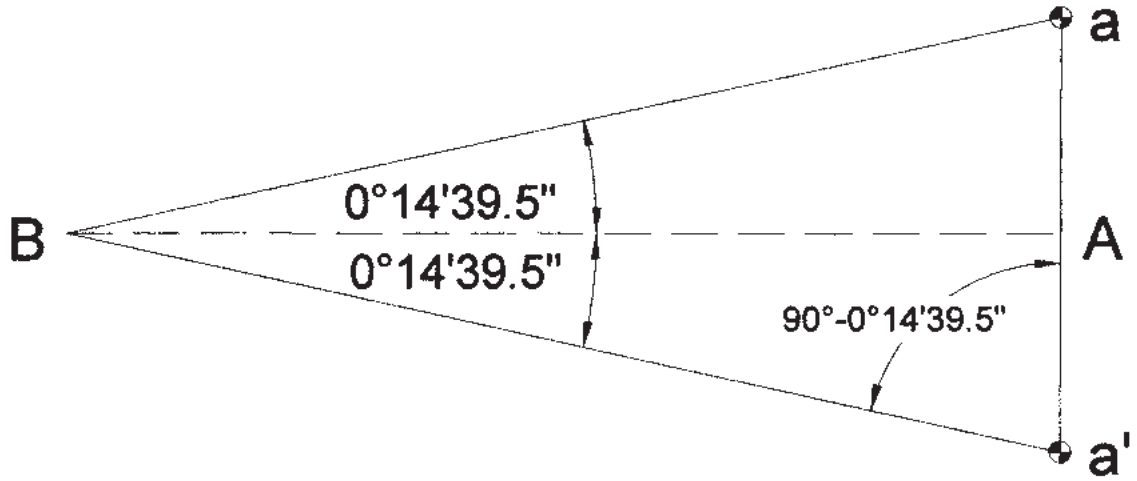
Solution to Problem 55



AB = Aa x tan (90° - 0° 14'39.5")
Aa = 1 meter
AB = tan 89° 45'20.5" = 234.52 meters

Solution to Problem 56

SOLUTION TO PROBLEM NO. 56

The distance AB is also Aa x $\cot \frac{\alpha}{2}$, where α is the measured angle.

Differentiating AB with respect to α,

$$dAB = -(Aa)(\tfrac{1}{2})(\csc^2 \alpha/2)\, d\alpha$$

$$Aa = 1 \text{ and } \csc^2(\alpha/2) = \frac{1}{\sin^2(\alpha/2)}$$

$$\pm 0.0001\, AB = -\frac{1}{2 \sin^2(\alpha/2)}\, d\alpha$$, where $d\alpha$ is 0.0000048481368 radians

$$\pm\frac{\cot(\alpha/2)}{10{,}000} = -\frac{0.0000048481368}{2 \sin^2(\alpha/2)}$$

$$\sin^2(\alpha/2)\cot(\alpha/2) = -/+0.024240684$$ (if α is too large by one second, AB will be too small, and *vice versa*)

$$\sin(\alpha/2)\cos(\alpha/2) = -/+0.024240684 = \frac{\sin \alpha}{2}$$

from which α = 0.024243059 radians or 1°23'20.5"

and AB = 41.24 metres