

Answers to "Test Yourself" No. 5

Trigonometric Leveling With Answers

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With a total station instrument, a zenith angle of $93^{\circ}10'27''$ is measured to a target whose vertical distance above Point X is 4.92 feet. The slope distance from the instrument to the target is 3162.48 feet. The elevation of Point X is 326.98 feet. With the instrument at the same location, a vertical angle (elevation angle) of $6^{\circ}37'37''$ is measured to a target set at 5.96 feet vertically above Point Q. The slope distance from the instrument to this target is 4721.68 feet. Ignoring the effects of curvature and refraction, compute the elevation of Point Q. Now compute the elevation, taking into account curvature and refraction. Use the relationship, $c \ \& \ r = 0.574K^2$.

The no curvature and refraction solution/equation would be:

$$\text{Elev. Q} = 326.98 + 4.92 + (3162.48)(\sin 3^{\circ}10'27'') + (4721.68)(\sin 6^{\circ}37'37'') - 5.96$$

$$\text{Elev. Q} = 1045.95$$

The curvature and refraction solution/equation would be:

$$\text{Elev. Q} = 326.98 + 4.92 + (3162.48)(\sin 3^{\circ}10'27'') -$$

$$0.574 \left[\frac{(3162.48)(\cos 3^{\circ}10'27'')}{5280} \right]^2 + 0.574 \left[\frac{(4721.68)(\cos 6^{\circ}37'37'')}{5280} \right]^2$$

$$+ (4721.68)(\sin 6^{\circ}37'37'') - 5.96$$

$$\text{Elev. Q} = 1046.20$$