

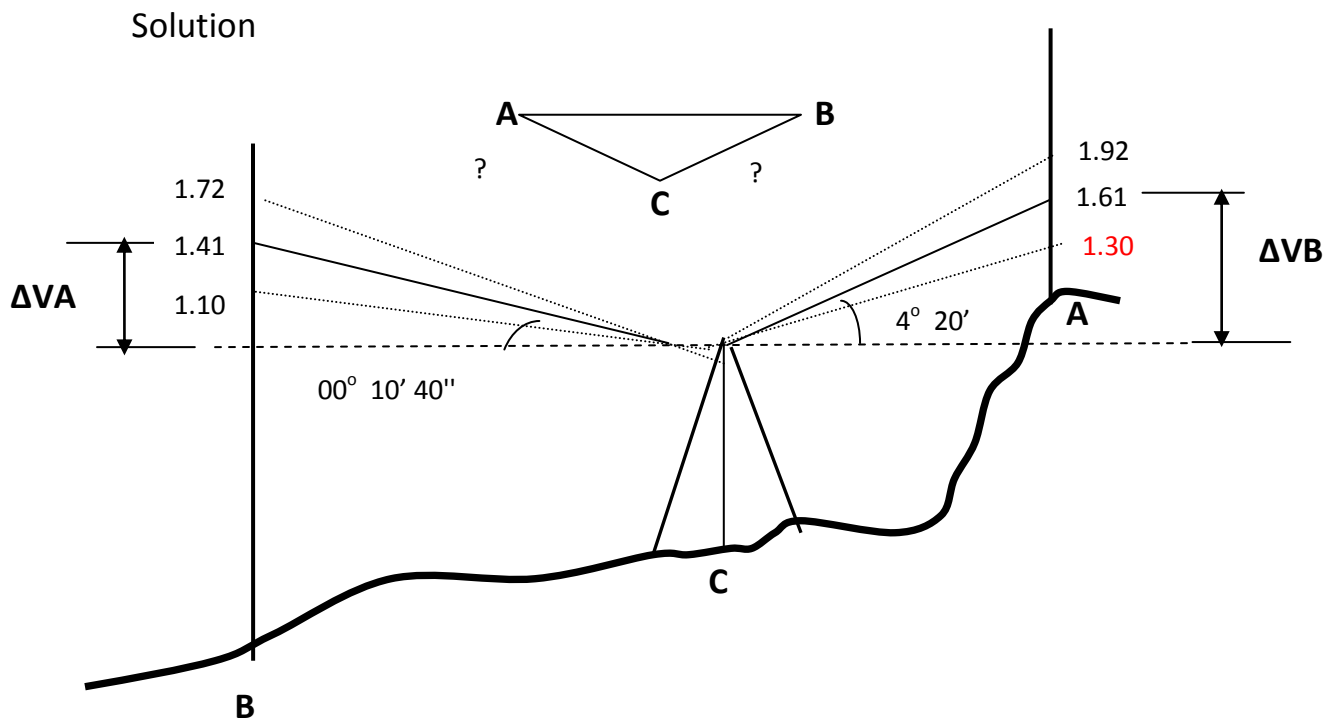
Sheet #4b

Model Answer for Problem 5

- To determine the gradient between two points A and B a tachemeter was set up at another station C and the following observations were taken, keeping the staff vertically:

Point	Vertical angle	Staff readings
A	+04 20' 00"	1.300, 1.610, 1.920
B	+00 10' 40"	1.100, 1.410, 1.720

If the horizontal angle ACB 35 20' 00". Determine the average gradient between A and B. (K =100 and e =0).



Key Answer - Surveying II - CE 371

Assume that the tacheometric constant is K and the additional constant is e

Horizontal distance $H_{CB} = K R \cos^2 (a1) + e. \cos (a1)$

Observing to point A

$R = - u - l$

$R = 1.92 - 1.30 = 0.62 \text{ m}$

Observing to point B

$R = - u - l$

$R = 1.72 - 1.10 = 0.62 \text{ m}$

$\cos (a1) = \cos 04^\circ 20' = \dots$

$\cos (a2) = \cos 00^\circ 10' 40'' = \dots$

Horizontal distance $H_{CB} = K R \cos^2 (a1) + e. \cos (a1)$

$H_{CB} = 0.62 x (\dots)^2 K + 0 \dots \dots \dots (1)$

Horizontal distance $H_{AC} = K R \cos^2 (a2) + e. \cos (a2)$

$H_{AB} = 0.62 x (\dots)^2 K + 0 \dots \dots \dots (2)$

$\Delta V_B = H_{CB} \tan (04^\circ 20')$

$\Delta V_A = H_{CA} \tan (00^\circ 10' 40'')$

$Elev_B = Elev_C + h_{iC} + V_B - r_B$

$Elev_A = Elev_C + h_{iC} + V_A - r_A$

Difference in elevation between B and A = $Elev_B - Elev_A$

Difference in elevation between B and A = Solve the above equations

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$$\text{Gradient} = \tan^{-1} \frac{\text{diff.in elevation}}{HAB}$$

$$H_{AB} = H_{CB} + H_{CA}$$

