

MATHEMATICS

Level One

Trig Heights #2

Setting: One of the many varied tasks that a surveyor might be asked to do is to find the heights and position of a number of points. One of the techniques for heighting is to set a total station (a measurement instrument) up over a point of known height, measure the instrument height above the point, and then measure the vertical angle and distance to a target (set up at a known height over the point to be positioned). The position and the height of this second point can then be determined by using simple geometry and trigonometry.

Task One: The following observations were taken from Station A to Station B and from Station B to Station A

At Station A

Height of Instrument	=1.530m
Height of Target	=1.414m
Vertical Angle (from zenith)	= $92^{\circ}36'30''$
Slope Distance	= 1489.54
Elevation at A	= 123.915m

At Station B

Height of Instrument	=1.408m
Height of Target	=1.530m
Vertical Angle (from zenith)	= $87^{\circ}23'28''$
Slope Distance	=1489.52

- 1) Using the above information draw two diagrams representing the information.
- 2) Why are the vertical angles different from the two stations?
- 3) Calculate the change in height from A to B.
- 4) Calculate the change in height from B to A.
- 5) Any difference in answers from A to B and B to A is called a misclose. How big is your misclose?
- 6) Average the two changes in height.
- 7) Use the average to calculate the final elevation of B.
- 8) Calculate the horizontal distance from A to B and then from B to A. (Is there a misclose? If so, how big is it?)
- 9) Assume Coordinates of A are 785965mN and 325864mE and bearing to B was $160^{\circ}43'53''$ and an average distance of 1489.54m. What are the new coordinates of point B?