University of Botswana
Department of civil Engineering
CGB 313 Survey Adjustment and analysis

Tutorial 2

1. The following are the observations made on the same angle:

47º26'13"	47º26'18"	47º26'09"	47º26'15"
47º26'10"	47º26'15"	47º26'18"	47º26'14"
47º26'16"	47º26'12"		

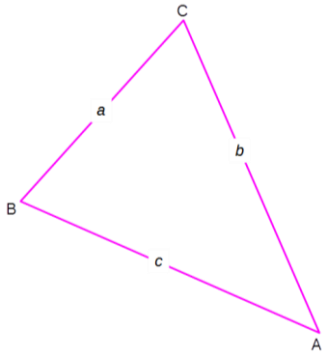
Determine

   a) Standard deviation
   b) Standard error of the mean
   c) The 95% confidence limits or 5% significance levels
2. The estimated error in each angle of an 8 sided traverse is ±5.6". What is the estimated error in the angular misclosure of the traverse?
3. Show that the standard error for the area, A, of a rectangular figure with standard errors σ_L and σ_W for sides L and W respectively is

$$\sigma = \pm LW\sqrt{\left(\frac{\sigma_L}{L}\right)^2 + \left(\frac{\sigma_W}{W}\right)^2}$$

Clue: start from $\sigma = \pm\sqrt{\left(\frac{\partial A}{\partial L}\sigma_L\right)^2 + \left(\frac{\partial A}{\partial w}\sigma_W\right)^2}$

4. In triangle ABC the horizontal lengths of side **a** and **c** and angle **B** have been measured as a = 352.76m, c= 468.21m and B = 52°17'20". The standard errors for a, c and B are ±0.036m ±0.048m and ±40" respectively. Calculate
   a. the area of the triangle and
   b. the standard error of the area.



5. The vertical angle $\boldsymbol{\alpha}$ to a point ***B*** is observed at point A as 3°00', with $\boldsymbol{s_\alpha}$ being ±1'. The slope distance ***D*** from ***A*** to ***B*** is observed as 1000.00m, with $\boldsymbol{s_D}$ being ±0.05m. Compute the horizontal distance and its standard deviation.