Question (1)   (15 marks)

Using the same tape, a setting-out distance was measured ten times by the same engineer under similar field conditions. The following results were obtained (in meters) :
23.287, 23.293, 23.290, 23.289, 23.294, 23.286, 23.283, 23.288, 23.291, 23.289. Calculate the most probable value for this distance ?

## Question (2)   (20 marks)

An angle measured by four observers with the following results:
The first observer = $78° 36' 05''$ with a probable error of a single observation $± 8''$ and repetition number = 12 observables , The second observer = $78° 36' 28''$ with a standard error of a single observation $± 9''$ and repetition number = 14 observables , The third observer= $78° 36' 24''$ with a probable error of the mean observation $± 3''$ and the fourth observer $78° 36' 22''$ with a standard error of the mean observation $± 4''$. Who accurate observer from the above observers and find the most probable value of the angle ?

Question (3)   (25 marks)

The elevation of point C on the chimney shown in the following figure is desired:
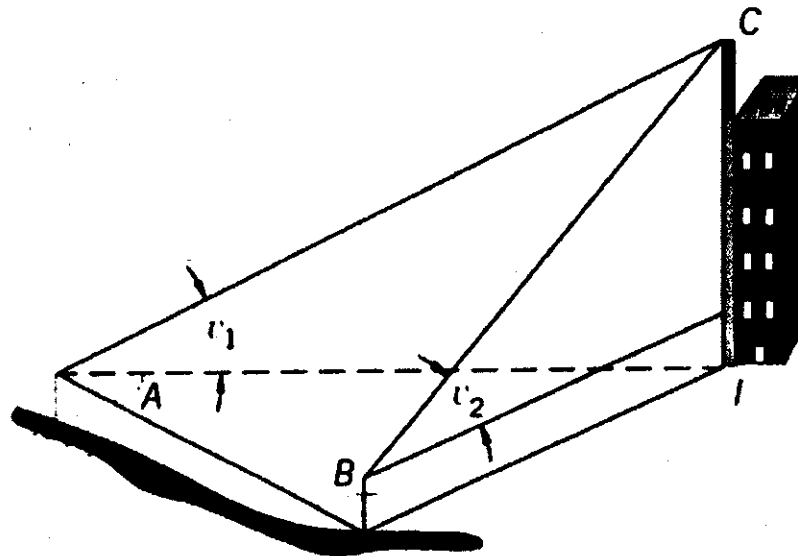
Field angles and distances are observed. Station A has an elevation of 1298.65 ± 0.006 ft. and station B has an elevation of 1301.53 ± 0.004 ft. The instrument height h_{iA} at A is 5.25 ± 0.005 ft. and the instrument height h_{iB} at B is 5.18 ± 0.005 ft The other observations and their errors are :
AB = 136.45 ± 0.018 ft, angle (A) = $44° 12' 34''$ ± 8.6", angle (B) = $39° 26' 56''$ ± 11.3", angle $(v_1) = 08° 12' 47''$ ± 4.1" and angle $(v_2) = 05° 50' 10''$ ± 5.1". What are the elevation of the chimney and the error in this computed value ?

Question (4)   (20 marks)

Find the most probable values of the angles A, B and C from the following observation equations:

$$A = 40° \ 13` \ 28.7" \quad \text{weight} = 1$$
$$B = 34° \ 46` \ 15.4" \quad \text{weight} = 1$$
$$A + B = 74° \ 59` \ 4.3" \quad \text{weight} = 2$$
$$A + B + C = 132° \ 31` \ 7.2" \quad \text{weight} = 1$$
$$B + C = 92° \ 17` \ 42.3" \quad \text{weight} = 3$$

Question (5)   (20 marks)

Assume that, we like to study the degree of correlation between two variables (x, y), for this purpose, a random sample of 10 students was chosen randomly and the weight and height of each student was recorded as follows :

x	0	1	2	3	4	5	7	8	9	10
y	36	35	30	28	24	20	13	11	8	3

Using the above data , it is required to compute the correlation coefficient between the two variables and calculate The best-fitting equation for this relationship , finally, compute from this equation the value of (y) when (x) = 6 ?

With my best wishes .... **Prof. Dr / Mohamed Ismail Doma**