

### Tutorial-III

- Find the least square straight line for the following data: (X, Y): (1, 6) (2, 4) (3, 3) (4, 5) (5, 4) (6, 2), and estimate Y at X=4 and X at Y=4. Also, find standard error of estimate  $se$ . (Ans: 3.743, 3.5, 2.341)

- Estimate the blood pressure of a women of age 45 years from the following data which shows the age X and B. P. Y os 12 women. Are the two variables ages X and B. P. Y correlated? Find correlation coefficient  $r$ .

Age X: 56 42 72 36 63 47 55 49 38 42 68 60

B.P. Y: 147 125 160 118 149 128 150 145 115 140 152 155

- The  $pH$  solution is measured eight times using the same instrument and the data obtained are as follows: 7.15, 7.20, 7.18, 7.19, 7.21, 7.20, 7.16, 7.18. Find Mean, S.D. and Variance. (Ans: 7.184, 0.01924, 0.00037)
- Let X be the height of a randomly chosen individual from population. In order to estimate the mean and variance of X, we observe a random sample  $x_1, x_2, \dots, x_7$ . Thus  $x_i$ 's are independent and individual distribution having the same distribution as X. We obtain the following values (in centimeters): 166.8, 171.4, 169.1, 178.5, 168, 157.9, 170.1. Find the values of the sample mean, sample variance and sample standard deviation for the observed sample.  
(Ans :  $\bar{x} = 168.8, s^2 = 37.7$  &  $s = 6.1$ )
- Let  $x_1, x_2, \dots, x_n$  be a random sample from a geometric ( $\hat{\theta}$ ) distribution, where  $\hat{\theta}$  is unknown. Find the maximum likelihood of  $\hat{\theta}$  based on this random sample.  
(Ans :  $n / \sum_{i=1}^n x_i$ )
- Let  $x_1, x_2, \dots, x_n$  be a random sample from a uniform ( $0, \hat{\theta}$ ) distribution, where  $\hat{\theta}$  is unknown. Find the maximum likelihood of  $\hat{\theta}$  based on this random sample.  
(Ans :  $\max(x_1, x_2, \dots, x_n)$ )
- If a study showed a sample of  $n_1 = 40$  of its bulbs has a mean lifetime of 647 hrs of continuous use with a standard deviation of 31hrs, and another study showed a sample of  $n_2 = 45$  of its bulbs with mean lifetime of 742 hrs with standard deviation of 29hrs. Construct (i)95% & (ii) 99%, confidence interval for the difference of their mean lifetime. [ $z_{\alpha/2} = 1.96, z_{\alpha/2} = 2.57$ ]
- The government awarded grants to the agricultural department of 9 universities to test the yield capabilities of two new varieties of wheat. Each variety was planted on plots of equal area at each university and the yields in kg per plot are recorded as follows:

Varieties	Universities								
	1	2	3	4	5	6	7	8	9
1	38	23	35	41	44	29	37	31	38
2	45	25	31	38	50	33	36	40	43

Find 95% confidence interval for the mean difference between the yields of the two varieties assuming the difference of yields to be approximately normally distributed. [ $t_{\alpha/2} = 2.31$  at 8 d.o.f.]

- A random sample of 10 chocolate energy bars of a certain brand has an average of 230calories with standard deviation of 15 calories, then construct 99% confidence interval for  $\sigma^2$ .

[  $\chi^2_{\alpha/2} = 21.666, \chi^2_{1-\alpha/2} = 2.088$  at 9 d.o.f.]