



EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS

THIRD EXAMINATION IN SCIENCE - 2012/2013

SECOND SEMESTER (Sep./Oct., 2015)

AM 308 - STATISTICS
(PROPER & REPEAT)

Answer all questions

Time : Two hours

The following table presents sample data relating the number of study hours spent by students outside of class during a three week period for a course in statistics and their scores in an examination given at the end of that period.

Sampled student	1	2	3	4	5	6	7	8
Study hours	20	16	34	23	27	32	18	22
Examination grade	64	61	84	70	88	92	72	77

- What kind of relationship do you expect between study hours and examination grade?
- Determine the least square linear regression line and interpret those coefficients.
- Calculate the standard error of above estimate.
- Test $H_0 : \beta = 0$ against $\beta \neq 0$ at 1% significant level.
- Construct a 90% confidence interval for estimating the mean exam grade for students who devote 30 hours to course preparation.
- Estimate the examination grade of a student who devoted 30 hours of study to the course preparation.

2. (a) A population consists of n_1 males and n_2 females. The mean heights of males and females are μ_1 and μ_2 respectively and the standard deviations of the heights are σ_1 and σ_2 respectively. Show that the mean height of the whole population is $\omega_1\mu_1 + \omega_2\mu_2$ and the variance is $\omega_1\sigma_1^2 + \omega_2\sigma_2^2 + \omega_1\omega_2(\mu_1 - \mu_2)^2$, where $\omega_1 = \frac{n_1}{n_1 + n_2}$ and $\omega_2 = \frac{n_2}{n_1 + n_2}$.
- (b) The mean annual salaries paid to 1000 employees of a company was Rs.5000. The mean annual salaries paid to male and female employees were Rs.5200 and Rs.4200 respectively. Determine the percentage of males and females employed by the company.
- (c) The daily expenditure of 170 families is given below:

Expenditure	0-10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of families	10	20	?	40	?	25	15

If the median of the distribution is 35,

- find the missing number of families of the distribution;
 - calculate the arithmetic mean of the distribution.
3. (a) Comment on the symmetry of the distribution of the set of data given below with the help of a box plot:

76 79 76 74 75 71 85 82 82 79 81.

- (b) The mean and standard deviation of two brands of light bulbs are given below:

	Brand I (hour)	Brand II (hour)
Mean	800	770
Standard Deviation	100	60

Compare the variability and state which brand of light bulb is more consistent?

(c) The marks obtained in statistics by 100 students of a university are given below:

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of Students	4	6	10	10	25	22	18	5

Draw a cumulative frequency curve and find out the median and quartiles from the curve.

(a) Show that the numerical value of the coefficient of correlation r lies between -1 and $+1$.

(b) Show that Spearman's rank correlation coefficient r_s is given by

$$r_s = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2 - 1)}$$

where n is the number of observations and d_i is the difference between ranks assigned to the i^{th} individuals.

(c) The number of goals scored for football teams and their positions in the league were recorded as follows for the top 12 teams.

Team	A	B	C	D	E	F	G	H	I	J	K	L
Goals	49	44	43	36	40	39	29	21	28	30	33	26
League Position	1	2	3	4	5	6	7	8	9	10	11	12

Calculate Spearman's rank correlation coefficient for these data. What conclusions can be drawn from this result?