FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS/ COMPUTER SCIENCES
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Tutorial sheet 1: BIOSTATISTICS BCH38/ BIA54/INF35

1) The following table shows a frequency distribution of the lifetime of 400 CRT tested by the manufacturer

Lifetime (hours)	No. of tubes
300 - 399	14
400 - 499	46
500 - 599	50
600 - 699	76
700 - 799	68
800 - 899	62
900 - 999	48
1000 - 1099	22
1100 - 1199	14
Total	400

Use this to determine

a) Upper limit of fifth class & Lower limit of eighth class
b) Class mark of the seventh class
c) Class interval size
d) Frequency of the fourth class
e) Relative frequency of the eighth class
f) Percent of tubes with lifetime exceeding 700hrs
g) Percent of tubes with lifetimes less than or equal to 800 hrs.

2) Some weight measurements taken from 40 Lab animals gave the following readings (in grams):
161 173 150 132 144 125 149 157 146 150 140 147 136 148 152 144 168 126 138 176
163 119 154 165 146 162 142 147 135 153 140 135 138 145 135 142 150 156 145 128

a) Arrange the data to find the range;
b) Using a class interval size of nine construct
   i) A frequency distribution;
   ii) A frequency histogram;
   iii) A frequency polygon.
c) Construct another frequency distribution using a class interval size of five.
d) Comment on the differences between the two frequency distributions.

3) Assuming that the probability of male birth is 0.5, find the probability that in a family of four children there will be:
a) 1 boy; b) 2 boys; c) at least 1 boy.

4) Find the unit (standard) deviate corresponding to the value:
a) 5.00 in N(3.95, 2.25); b) -4.7 in N(1.88, 1.21)

5) Find the area under the normal curve between ;
a) d = 1.20 & d = 2.40 b) d = -1.23 & d = 1.87 c) d = -2.35 & d = -0.5 d) d = 0.0 & d = -1.96

6) The weights of a sample of rabbits from a laboratory colony gave the following results (in kg):
0.61 0.73 0.50 0.32 0.44 0.25 0.49 0.57 0.46 0.40 0.50 0.47 0.36 0.48 0.52 0.44 0.68 0.26
0.38 0.67 0.63 0.49 0.54 0.65 0.28 0.45 0.56 0.35 0.48 0.53 0.63 0.38 0.54 0.65 0.53
Calculate the mean, median, variance and standard deviation of these measurements. Also calculate the standard error and 95% confidence interval to the mean. Explain carefully the meaning of the confidence interval.

7) Samples of fish of the same age are taken from two different ponds in a fish farm, giving the following data:

	Pond 1	Pond2
Mean	50cm	47 cm
Variance	70	74
Sample size	36	36

Determine whether the fish population at that age in the two ponds differ in length.

8) The mean weight increase of a large population of laboratory rats when fed with standard diet a fortnight is known to be equal to 20 units and a standard deviation of 16 units. When 36 rats were housed in newly-installed cages, their mean weight increase was found to be 21.4 units. Determine whether this differs significantly from the previous known population mean.

9) In a Biological experiment, 4 concentrations of a certain chemical are used to enhance the growth of a certain type of plant over a specific period of time. The following growth data, in centimetres, were recorded for the plants that survived:

Concentration			
1	2	3	4
8.2	7.7	6.9	6.8
8.7	8.4	5.8	7.3
9.4	8.6	7.2	6.3
9.2	8.1	6.8	6.9
	8.0	7.4	7.1
		6.1	

Is there a significant difference in the average growth of these plants for the different concentrations of the chemical? Use 0.01 level of significance.

10) An investigation was conducted to determine the source of reduction in the yield of a certain chemical product. It was known that the loss in yield occurred in the mother liquor; that is, the material removed at the filtration stage. It was felt that different blends of the original material may result in different yield reductions at the mother liquor stage. The following are the results of the percentage reduction for 3 batches at each of the 4 preselected blends.

Blend			
1	2	3	4
25.6	25.2	20.8	31.6
24.3	28.6	26.7	29.8
27.9	24.7	22.2	34.3

a) Is there a significant difference in the average percentage reduction in yield for the different blends? Use a 0.05 level of significance.

b) Use Duncan's multiple -range test to determine which blends differ.

11) The following data represent the number of packages of 5 popular brands of cigarettes sold by a supermarket on 8 randomly selected days:

Brand				
A	B	C	D	E
21	35	45	32	45
35	12	60	53	29
32	27	33	29	31
28	41	36	42	22
14	19	31	40	36
47	23	40	23	29
25	31	43	35	42
38	20	48	42	30

Perform an ANOVA at the 0.05 level of significance, and determine whether or not the 5 brands sell, on the average, the same number of cigarettes at this supermarket. Perform a Duncan's test to determine which brands may be different in case the null hypothesis is rejected,

12) Three strains of rats were studied under 2 environmental conditions for their performance in a maze test. The error scores for the 48 rats were recorded as follows:

Environment	Strain		
	Bright	Mixed	Dull
Free	28 22 25 36 12 23 10 86	33 36 41 22 83 14 76 58	101 33 122 35 94 56 83 23
Restricted	72 48 25 91 32 93 31 19	60 35 83 99 89 126 110 118	136 38 64 87 120 153 128 140

Use a 0.01 level of significance to test the hypotheses that

a) There is no difference in error scores for different environments;

b) There is no difference in error scores for different strains;

c) The environment and strains of rats do not interact.

It helps to try as much as possible to work independently before discussing your results with others

Tutorials Sheet two BCH38/BIA54/INF35

1) The grades of a class of 9 students on a midterm report (X) and on the final examination (Y) are as follows:-

X	77	50	71	72	81	94	96	99	67
Y	82	66	78	34	47	85	99	99	68

a) Find the equation of the regression line.

b) Estimate the final examination grade of a student who received 85 on the mid term report but were ill at the time of the final exams.

2) An experiment is conducted in which 4 treatments are to be compared using 5 subjects. The following data are generated:-

	Subjects				
Treatment	1	2	3	4	5
1	12.8	10.6	11.7	10.7	11.0
2	11.7	14.2	11.8	9.9	13.8
3	11.5	14.7	13.6	10.7	15.9
4	12.6	16.5	15.4	9.6	17.1

Perform the ANOVA, separating out the treatment, subject and error sums of squares. Use a 0.05 level of significance to test the hypothesis that there is no difference between the treatment means.

3) A study was made by a retail merchant to determine the relationship between weekly advertising expenditure and sales. The following data were recorded.

Advertising cost	40	20	25	20	30	50	40	20	50	40	25	50
Sales FCFA	385	400	395	365	475	440	490	420	560	525	480	510

a) Plot a scatter diagram of the data.

b) Find the equation of the regression line to predict weekly sales from advertising expenditures.

c) Estimate the weekly sales when advertising cost are 35.

4) Compute and interpret the correlation coefficient of the following data:-

X	4	5	9	14	18	22	24
Y	16	22	11	16	7	3	17

5) Compute and interpret the correlation coefficient for the following grades of 6 students selected at random.

Maths grade	70	92	80	74	65	83
English grade	74	84	63	87	78	90

6) Consider the following data on plasma volume and blood pressure of 7 patients:-

	Patients						
	1	2	3	4	5	6	7
Plasma volume	16.4	15.0	24.8	23.1	13.5	20.2	19.4
Blood pressure	110	134	81	92	110	85	102

a) Calculate the correlation coefficient r.

b) Test for significance of the correlation.

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