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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Health Promotion
First Year - Semester IIExamination – Oct/Nov 2017

HPT1213 – STATISTICAL METHODS IN HEALTH RESEARCH

Time: Two (02) hours

Answer ALL questions

1. a) What is the difference between ordinal and nominal variables?

(10 Marks)

b) Indicate whether the following variables are continuous or discrete.

I. Blood sugar levels of individuals.
II. Number of people living in a household.
III. Income of individuals.
IV. Age of respondent.

(20 Marks)

c) List two advantages and two disadvantages of transforming continuous variables into categorical (ordinal) before analysis?

(15 Marks)

d) Listed in the following table is the annual per capita health care expenditure of 23 countries.

Country	Annual per capita health care expenditure (in U.S.$)
Australia	1032
Austria	1093
Belgium	980
Britain	836
Canada	1683
Denmark	912
Finland	1067
France	1274
Germany	1232
Greece	371
Iceland	1353
Ireland	658
Italy	1050
Japan	1035
Luxembourg	1193
Netherlands	1135
New Zealand	820
Norway	1234
Portugal	464
Spain	644
Sweden	1361
Switzerland	1376
USA	2354

I. Rank these countries according to per capita health care expenditure.

(05 Marks)

II. Construct a histogram for the values of health care expenditure per person.

(30 Marks)

III. Describe the shape of the histogram.

(20 Marks)

2. a) Blood levels of calcium and albumin (a type of protein) of a group of patients on admission to hospital is provided below.

Calcium (mmol/l)	Albumin (g/l)
2.92	43
3.84	42
2.99	40
2.67	42
3.17	38
3.74	34
3.44	42

Calculate the following for recorded calcium levels.

I. Mean.
II. Standard deviation.
III. Median.
IV. Inter-quartile range.

(50 Marks)

b) The mean daily payment for workers at a restaurant is Rs.580.50 with a standard deviation of Rs.35.00. Assuming that the payments are normally distributed; calculate the maximum and minimum daily payment of the middle 95% of workers.

(20 Marks)

c) For a population of infants, the distribution of gestational ages at birth is approximately normal with unknown mean μ and standard deviation σ. A random sample of such infants has mean gestational age $\bar{x} = 29.6$ weeks and standard deviation $\sigma = 3.6$ weeks. Construct the 95% confidence interval for true population mean.

(30 Marks)

3. a) Describe, the two types of errors that can occur in relation to hypothesis testing.

(20 Marks)

b) The distribution of diastolic blood pressure for the population of female patients between the ages of 30 - 34 has an unknown mean μ and standard deviation $\sigma = 9.1$ mmHg. It is useful for the physicians to know whether the mean of this population is equal to the mean diastolic blood pressure of the general population of females in this age group which is 74.4 mm Hg.

I. What is the null hypothesis of the appropriate test?

(10 Marks)

II. What is the alternative hypothesis?

(10 Marks)

III. A sample of 10 female patients was selected; their mean diastolic blood pressure is $\bar{x}$ = 84 mmHg. Using this information conduct a two-sided test with $\alpha = 0.05$ level of significance. What is the *p* value of the test?

(40 Marks)

IV. What conclusion would you draw from the results of the above test?

(20 Marks)

4. a) Why is it important to create a scatter plot when investigating the relationship between two continuous random variables?

(15 Marks)

b) In a study, cholesterol and triglyceride levels of participants were recorded in the following table.

Patient	Cholesterol level (mmol/l)	Triglyceride level (mmol/l)
1	5.12	2.30
2	6.18	2.54
3	6.77	2.95
4	6.65	3.77
5	6.36	4.18
6	5.90	5.31
7	5.48	5.53
8	6.02	8.83
9	10.34	9.48
10	8.51	14.20

I. Construct scatter plot for these data.

(25 Marks)

II. Describe the relationship between cholesterol and triglycerides levels prior to the diet, as it appears on the scatter plot?

(10 Marks)

III. Compute *r*, the Pearson correlation coefficient above data

(40 Marks)

IV. What is your conclusion about the relationship between cholesterol and triglycerides based on the calculated Pearson correlation value

(10 Marks)

-END-

List of Equations

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

$$\bar{x} - 1.96\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + 1.96\frac{\sigma}{\sqrt{n}}$$

$$z = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$$

$$r = \frac{1}{n-1}\Sigma\left(\frac{x - \bar{x}}{s_x}\right)\left(\frac{y - \bar{y}}{s_y}\right)$$

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TABLE A.3
Areas in the upper tail of the standard normal distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.500	0.496	0.492	0.488	0.484	0.480	0.476	0.472	0.468	0.464
0.1	0.460	0.456	0.452	0.448	0.444	0.440	0.436	0.433	0.429	0.425
0.2	0.421	0.417	0.413	0.409	0.405	0.401	0.397	0.394	0.390	0.386
0.3	0.382	0.378	0.374	0.371	0.367	0.363	0.359	0.356	0.352	0.348
0.4	0.345	0.341	0.337	0.334	0.330	0.326	0.323	0.319	0.316	0.312
0.5	0.309	0.305	0.302	0.298	0.295	0.291	0.288	0.284	0.281	0.278
0.6	0.274	0.271	0.268	0.264	0.261	0.258	0.255	0.251	0.248	0.245
0.7	0.242	0.239	0.236	0.233	0.230	0.227	0.224	0.221	0.218	0.215
0.8	0.212	0.209	0.206	0.203	0.200	0.198	0.195	0.192	0.189	0.187
0.9	0.184	0.181	0.179	0.176	0.174	0.171	0.169	0.166	0.164	0.161
1.0	0.159	0.156	0.154	0.152	0.149	0.147	0.145	0.142	0.140	0.138
1.1	0.136	0.133	0.131	0.129	0.127	0.125	0.123	0.121	0.119	0.117
1.2	0.115	0.113	0.111	0.109	0.107	0.106	0.104	0.102	0.100	0.099
1.3	0.097	0.095	0.093	0.092	0.090	0.089	0.087	0.085	0.084	0.082
1.4	0.081	0.079	0.078	0.076	0.075	0.074	0.072	0.071	0.069	0.068
1.5	0.067	0.066	0.064	0.063	0.062	0.061	0.059	0.058	0.057	0.056
1.6	0.055	0.054	0.053	0.052	0.051	0.049	0.048	0.047	0.046	0.046
1.7	0.045	0.044	0.043	0.042	0.041	0.040	0.039	0.038	0.038	0.037
1.8	0.036	0.035	0.034	0.034	0.033	0.032	0.031	0.031	0.030	0.029
1.9	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.024	0.024	0.023
2.0	0.023	0.022	0.022	0.021	0.021	0.020	0.020	0.019	0.019	0.018
2.1	0.018	0.017	0.017	0.017	0.016	0.016	0.015	0.015	0.015	0.014
2.2	0.014	0.014	0.013	0.013	0.013	0.012	0.012	0.012	0.011	0.011
2.3	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.008
2.4	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006
2.5	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005
2.6	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
2.7	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
2.8	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
2.9	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001
3.0	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000