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UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES
DEPARTMENT OF PHARMACY
FIRST BPHARM PART II EXAMINATION – JANUARY 2019
PH 1262 BIostatISTICS I (SEQ)

TIME: TWO HOURS

INSTRUCTIONS

- There are four (04) questions in this SEQ paper.
- Answer **all questions** in the booklet provided.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.



01. A high-volume drug screen was designed to find compounds that would reduce low-density lipoproteins (LDL) cholesterol in guinea pig. The treatment group of guinea pig was fed a special diet mixed with a drug compound over a specified period of time. The placebo group was fed the same diet for the same period of time but without the drug compound. Following are the plasma LDL levels for the two groups:

Placebo																			
64	49	54	64	97	66	76	44	71	89	70	72	55	60	62	46	77	86	71	

Treatment									
40	31	50	48	152	44	74	38	81	64

- 1.1. How much difference do you find between the means of the two groups? (15 marks)
- 1.2. How much difference do you find between the median of the two groups? (15 marks)
- 1.3. Explain why the means of LDL in the two groups are close and the medians are not. (10 marks)
- 1.4. Compare the standard deviations of the two groups. Explain why the standard deviation of the treatment group is much larger. (15 marks)
- 1.5. How large is 152 relative to its group? (10 marks)
- 1.6. Without 152, is there a large difference between the placebo group and treatment group means? (20 marks)
- 1.7. Was the drug effective in reducing the levels of low-density lipoproteins? Explain your answer. (15 marks)

02.

2.1 The probability that a patient is allergic to penicillin is 0.20. If this drug is administered to three (03) patients,

2.1.1 Find the probability that all three of them are allergic to it. (25 marks)

2.1.2 Find the probability that at least one of them is not allergic to it. (25 marks)

2.2 The following table contains data from a study describing the relationship between lung cancer and smoking. Let "S" denotes the event that a person who smokes, and "C" denotes the event that a person who has lung cancer and let us consider the relative frequencies of the events as their probabilities.

	S	\bar{S}
C	483	76
\bar{C}	982	1412

2.2.1 Determine the probability that a randomly chosen person has lung cancer provided that he/she smokes or does not smoke. (20 marks)

2.2.2 Calculate the *relative risk* of smoking given by the following ratio. (30 marks)

$$\frac{P(\text{has lung cancer} | \text{smokes})}{P(\text{has lung cancer} | \text{does not smoke})}$$

03.

3.1 On an average, 8 fatal traffic accidents per day occur at a certain country. What is the probability that in any given day at this country.

3.1.1 Exactly 5 fatal accidents will occur? (20 marks)

3.1.2 Fewer than 3 fatal accidents will occur? (20 marks)

3.1.3 At least 2 fatal accidents will occur? (20 marks)

3.2 Suppose that 6 in 10 fatal traffic accidents are due mainly to a speed violation. Among 8 fatal accidents,

3.2.1 Find the probability that 6 fatal accidents will be due mainly to a speed violation. (20 marks)

3.2.2 Find the mean and standard deviation of the number that speed violation. (20 marks)

04.

Cholesterol is a fatty substance that is an important part of the outer lining (membrane) of cells in the body of animals. Its normal range for an adult is 120–240 mg/dl. The Food and Nutrition Institute of a certain country found that the total cholesterol level for adults has a mean of 159.2 mg/dl and 84.1% of adults have a cholesterol level below 200 mg/dl. Suppose that the total cholesterol level is normally distributed.

4.1 Show that the standard deviation of this distribution is 40.8 mg/dl. (30 marks)

4.2 What are the 1st and 3rd quartiles (the 25% and 75% values) of this distribution? (20 marks)

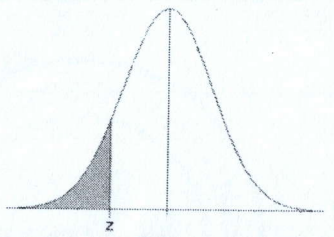
4.3 An adult is at moderate risk if cholesterol level is more than one but less than two standard deviations above the mean. What percentage of the population is at moderate risk according to this criterion? (20 marks)

4.4 An adult is thought to be at high risk if his cholesterol level is more than two standard deviations above the mean. What percentage of the population is at high risk? (15 marks)

4.5 An adult has low risk if cholesterol level is one standard deviation or more below the mean. What percentage of the population is at low risk? (15 marks)

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Standard Normal Cumulative Probability Table



Cumulative probabilities for NEGATIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641