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UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE

ALLIED HEALTH SCIENCES DEGREE PROGRAMME

FIRST BPHARM PART II EXAMINATION - JANUARY 2017

PH 1262 BIOSTATISTICS I (SEQ)

TIME: TWO HOURS

INSTRUCTIONS

- **Answer all Questions in the given booklets.**
- No paper should be removed from the examination hall.
- Marks will be deducted for illegible hand writing.
- Do not use any correction fluid.
- Calculators are allowed.

1.

1.1. Suppose a large teaching hospital and a community hospital are located in your area. The records of the outcome of the surgery of the two hospitals in the last year are given below,

	Died	Survived	Total
Teaching Hospital	90	2110	2200
Community Hospital	23	677	700

where the outcome is "survived" if the patient lives at least six weeks after the surgery.

1.1.1. Calculate the proportion of patients who survived after surgery at each of the hospitals.

1.1.2. Which hospital do you choose for your surgery? Justify your answer.

1.2. In a study using identical twins, one twin was given a drug and then given an intelligence test while under the influence of the drug. The other twin was given the same intelligence test under normal drug-free conditions. Here are their test scores:

Twin A (no drug)	83	74	67	64	70	67	81	64	72
Twin B (drug)	78	74	63	66	68	63	77	65	70

1.2.1. Find the mean value and the standard deviation for the difference scores (Twin A-Twin B).

1.2.2. Find the five number summary values and IQR for the difference scores.

1.2.3. Sketch a boxplot of the difference scores.

1.2.4. Discuss the shape of the distribution of the difference scores.

(25 marks)

2.

2.1. Define the terms sensitivity, specificity and predictive value positive (PV^+) of a screening test.

2.1.1. A drug company has developed a new pregnancy-test kit to be used in outpatients. . The company tested the kit on 100 women who are known to be pregnant, for whom 95 test results were positive. The company also tested the kit using 100 women who are known to be not pregnant, of whom 99 test results were negative.

2.1.1.1. What is the sensitivity of the test?

2.1.1.2. What is the specificity of the test?

2.1.2. The company expects that of the women who will use the pregnancy-test kit, 10% will actually be pregnant. What is the PV^+ of the test?

(25 marks)

3.

3.1. A local drug store owner knows that, on average, 10 people per hour would enter his store.

3.1.1. Find the probability that in a given one hour period more than 3 people would enter the store.

3.1.2. Find the probability that in a given 30-minutes period nobody enters the store.

3.1.3. Find the probability that in a given 30-minutes period more than 3 people would enter the store.

(15 marks)

3.2. During a manufacturing process 15 units are randomly selected each day from the production line to check the percent defective. From historical information it is known that the probability of a defective unit is 0.05. Any time that two or more defectives are found in the sample of 15, the process is stopped. This procedure is used to provide a signal in case the probability of a defective has increased.

3.2.1. What is the probability that on any given day the production process will be stopped?

3.2.2. Suppose that the probability of a defective has increased to 0.07. What is the probability that on any given day the production process will not be stopped?

(10 marks)

4. Among diabetics, the fasting blood glucose level "X" can be assumed to be approximately normally distributed with the mean of 106 milligrams per 100 milliliters and the standard deviation of 8 milligrams per 100 milliliters.

4.1. Sketch a graph of the density for X. Indicate on this graph the probability that a randomly selected diabetic will have a blood glucose level between 90 and 122 mg/100 ml. Find this probability.

4.2. Find the probability that a randomly selected diabetic will have a blood glucose level lower than or equal to 120 mg/100 ml.

4.3. What is the third quartile of the distribution of blood glucose level?

4.4. What is the probability that a randomly selected diabetic will have a blood glucose level between 80 and 100 mg/100 ml or between 110 and 120 mg/100 ml?

(25 marks)

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