



UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

FIRST BPHARM PART II EXAMINATION - NOVEMBER 2021

PH 1262 - BIOSTATISTICS I

TWO HOURS

INSTRUCTIONS

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

1.

1.1. Briefly explain what summary measures are used to construct a box-and-whisker plot.

1.2. The following data give the time (in minutes) that each of 24 patients show the side-effects for a certain drug:

36	43	28	52	41	59	47	61
24	55	63	73	32	25	35	49
31	22	61	42	58	65	98	34

1.2.1. Prepare a stem-and-leaf plot.

1.2.2. Write down the five-number summary.

1.3. Describe the effect on the mean, median, interquartile range and standard deviation, when

1.3.1. a constant b is added to each observation in a set of data,

1.3.2. each observation is multiplied by a constant a in a set of data.

(25 marks)

2. Consider a family with a mother, father and two children of ages 7 and 5 years respectively. Suppose that an influenza epidemic strikes the city where the above family live. In 20% of families the mother has influenza; In 20% of families the father has influenza; and in 4% of families both mother and father have influenza.

Let $A_1 = \{\text{mother has influenza}\}$ and $A_2 = \{\text{father has influenza}\}$.

2.1. Write $P(A_1)$, $P(A_2)$ and $P(A_1 \cap A_2)$.

2.2. Find $P(A_1 \cup A_2)$.

2.3. Let X be the random variable representing the number of adults with influenza in a family.

2.3.1. Show that the possible values for X are 0, 1 and 2.

- 2.3.2. Find the probability distribution of X .
- 2.3.3. Calculate the mean and the standard deviation of X .

(25 marks)

3.

3.1. On the average, two students per hour report for treatment to the first-aid room of a large elementary school.

3.1.1. What is the probability that during a given hour three students come to the first-aid room for treatment?

3.1.2. What is the probability that during a given hour two or fewer students will report to the first-aid room?

3.1.3. What is the probability that during a given hour between three and five students, inclusive, will report to the first-aid room?

(15 marks)

3.2. A generic drug is a medication created to be the same as an existing approved brand-name drug. The generic drug is usually equally effective and less expensive. In a certain country, 70% of all prescriptions are written using generic drugs. Suppose 300 prescriptions were randomly selected. Let X be the number of prescriptions with generic drug.

3.2.1. Write down the distribution of random variable X .

3.2.2. Find mean and standard deviation of X .

3.2.3. Find the approximate probability that at least 220 prescriptions were written using a generic drug.

(10 marks)

4. Assume that the birth weights are normally distributed with a mean of 3000g and a standard deviation 500g.

4.1. Find the probability of low-birth weight child, where low-birth weight is defined as less than or equal (\leq) to 2500g.

4.2. Find the probability of very low-birth weight child, where very low-birth weight is defined as less than or equal (\leq) to 2000g.

4.3. Assuming that successive deliveries by the same woman have the same probability of being low-birth weight, what is the probability that a woman with exactly 3 deliveries will have 2 or more low-birth weight deliveries?

(25 marks)