

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. /B.Ed. Degree Programme, Continuing Education Programme

APPLIED MATHEMATICS-LEVEL 03

ADU3201/ADU3218/ADE3201 - Basic Statistics

FINAL EXAMINATION 2025/2026



Duration: Two Hours.

Date: 26.11.2025

Time: 1.30 p.m- 3.30 p.m

Instructions

- This question paper consists of two parts: Part *A* and Part *B*. Part *A* is **compulsory**. Part *B* consists of five (05) essay type questions of which **three (03) are to be answered**.

Part A (Question 1 compulsory)

1. In a study, to examine the water usage of households in a particular region, a researcher recorded data on the following variables:

W_1 : number of residents in the household

W_2 : water source coded as

1: tap water 2: well 3: community supply

W_3 : monthly water bill (in LKR)

W_4 : number of bathrooms

W_5 : level of water-saving practices coded as

1: high 2: moderate 3: low

- (a) Classify the variables as qualitative or quantitative.
- (b) Classify the quantitative variables as discrete or continuous.
- (c) Classify the scale of measurements of the above variables as nominal, ordinal, interval, or ratio.
- (d) State whether each of the following statements is true or false. In each case, give reasons for your answer.
 - (i) A bar chart is appropriate to highlight the distribution of households based on water source (W_2).
 - (ii) A histogram is suitable to examine whether the monthly water bill (W_3) data are normally distributed.

- (iii) A pie chart is appropriate to represent the proportion of households in different water-saving levels (W_5).

Part B (Answer 3 questions only)

2.

- (a) A small bookstore tracks the number of books sold each day over a 20-day period.

The data is summarized in the following table:

Number of Books Sold (x)	Frequency (f)
0-5	5
6-10	7
11-15	4
16-20	3
21-25	1

- (i) Estimate the mean number of books sold per day and interpret it in relation to this study.
- (ii) Find the relative cumulative frequency corresponding to the third class interval and explain what it measures in relation to this study.
- (b) A teacher collected the mathematics test marks of 15 students:

Marks: 8, 15, 45, 52, 60, 62, 65, 68, 70, 72, 74, 78, 80, 85, 88

Using the data above:

- (i) Determine the five-number summary for the data.
- (ii) Use the five-number summary to present the data in a **suitable graphical form**.
- (iii) Clearly state all the findings from the graphical summary constructed in part (ii).
3. A mobile phone insurance company keeps track of all phone damage incidents. From past records:
- 85% of all phone damage incidents are filed as insurance claims.
 - Out of the filed claims, 25% involve major damage (screen completely broken, water damage, etc.).

- Out of the incidents that are not filed as claims, only 3% involve major damage.

Assume future incidents follow the same pattern. Let,

- A = incident is filed as an insurance claim
- B = incident has major damage

Answer the following:

- What is the probability that the next phone damage incident will involve major damage?
- If an incident involves major damage, what is the probability that it was filed as an insurance claim?
- What is the probability that the next incident will NOT be filed as a claim AND will NOT involve major damage?
- Are events A and B independent? Justify your answer.
- Are events A and B exhaustive? Justify your answer.

4. A stationery box contains:

5 blue pens **7 black pens** **9 red pens**

Two pens are selected at random without replacement. Find the probability of the following events:

- Both selected pens are red pens.
 - None of the selected pens are blue pens.
 - At least one of the selected pens is a blue pen.
 - The two selected pens are of different colours.
 - Exactly one of the selected pens is a black pen.
5. A factory produces two types of products: Product P and Product Q in a 70:30 ratio.
It is known that:

- 5% of Product P is defective
- 8% of Product Q is defective

- (i) A randomly selected product is found to be defective. What is the probability that this defective product is Product P ?
- (ii) What is the probability that a randomly selected product from the factory is defective?
- (iii) If a product is not defective, what is the probability that it is Product Q ?
- (iv) A customer randomly buys one product. What is the probability that the product is Product P and non-defective?
- (v) If the factory increases the production of Product Q to 40%, while defect rates of each product remain the same, what will be the new overall defect rate?

6. A delivery company sends out four sizes of packages each day:

- Small (1 kg)
- Medium (2 kg)
- Large (3 kg)
- Extra-Large (4 kg)

Because customers order bigger packages more often, the chance that a driver picks a package of weight x kg is proportional to x^2 . That means the probability of a package has weight x kg is: $P(X=x) = cx^2$, $x=1,2,3,4$

X	1	2	3	4
$P(X)$	c	$4c$	$9c$	$16c$

The company wants to understand what a “typical package” looks like. They ask:

- (i) What is the value of c ?
- (ii) What is the expected (average) package weight?
- (iii) Drivers earn bonus points equal to $2x+3$. What is the expected bonus ($E(2x+3)$)?
- (iv) Find the variance and standard deviation of the package weights.
