

**The Open University of Sri Lanka**  
**B.Sc. in Information Technology Degree Programme**  
**ADU4231 – Probability and Statistics**  
**Final Examination - 2024/2025**



**Duration: Two hours**

**Date: 14/11/2025**

**Time: 9.30 a.m. – 11.30 a.m.**

**Answer FOUR questions ONLY. Non-programmable calculators are permitted.**

1. A production manager is interested in estimating the mean weight of a micro chip, measured to the nearest milligram. The following table was constructed from the data collected.

Weight (mg)	Cumulative frequency
10-19	12
20-29	52
30-39	107
40-49	118
50-59	140
60-69	150

- (i) Clearly describe the population and the variable of interest in this study.
  - (ii) Classify the data collected in this study as discrete or continuous.
  - (iii) State whether the data collected in this study is nominal, ordinal, interval, or ratio.
  - (iv) What is the sample size used in this study?
  - (v) Construct a suitable graphical summary that can be used to graphically illustrate the data presented in the table.
  - (vi) Using the graphical summary, find the median and the first quartile of the data.
2. The following data shows the number of touchdown passes (TD passes) thrown by each of the 31 teams in the National Football League in 2000.
- 37, 33, 33, 32, 29, 28, 28, 23, 22, 22, 22, 21, 21, 21, 20, 20, 19, 19, 18, 18, 18, 18, 16, 15, 14, 14, 14, 12, 12, 9, 6
- (a) Find the
    - (i) Mean
    - (ii) Median
    - (iii) Mode

(iv) Inter Quartile Range (IQR)

for touchdown passes (TD passes) thrown by a randomly selected player.

(b) Prepare the frequency table by choosing a suitable class width and create the histogram.

3. Hand-free phone kits are supplied to a retail show owner by a producer in boxes of 50 hand-free sets each. Ten boxes are supplied every week. Suppose the numbers of poor-quality hand-free phone kits in different boxes are independent. On each supply, the retail shop owner check and counts the number of poor-quality hand-free phone kits in each box. Let the random variable  $X$  denote the count of poor-quality hand-free phone kits in a box and the probability mass function of  $X$  be as follows.

$X$	0	1	2	3	4	5
$P(X = x)$	0.85	$k$	0.04	0.02	0.02	0.01

- Find the value of  $k$ .
- Find the expected value of  $X$  and interpret it in relation to this study.
- Find the standard deviation of  $X$  and interpret it in relation to this study.
- Estimate the expected number of boxes with no poor-quality hand-free phone kits in one week supply.
- Find the probability that none of the boxes in a supply on a randomly chosen week will have poor-quality hand-free phone kits.

4.

- The output voltage of a power supply is normally distributed with mean 5 V and standard deviation 0.02 V. the lower and upper specifications for voltage are 4.95 V and 5.05 V, respectively. What is the probability that a power supply selected at random will conform to the specifications on voltage?
- If  $X$  is normally distributed with mean  $\mu$  and standard deviation 4, and given that the probability that  $X$  is less than 32 is 0.0228, find the value of  $\mu$
- Suppose that a quiz consists of 10 MCQ questions. Each question has four choices and only one is the correct answer. A student hasn't studied for the exam and will just randomly guess the answers to each question. Suppose that the questions are released one by one and immediately after the attempt to the question the answer will be marked as correct or incorrect. What is the portability that first wrong answer occurred at the second question?

5.

- (a) In a particular school, Computer Science mark of a randomly selected student in grade ten is denoted by  $X$ . From the past experience, it is known that  $X \sim N(\mu, \sigma^2)$ ;  $\mu = 50$  and  $\sigma = 13$ .
- (i) Find the probability that Computer Science mark of a randomly selected student in grade ten score more than 75.
  - (ii) Find the proportion of students in grade ten fall into the range of Computer Science mark 40 to 75.
  - (iii) Find the computer science mark of the lowest 30% of the students.
- (b) A restaurant kitchen has a food mixing machine  $A$ . The average number of times  $A$  breaks down per week is 0.4. Find the probability that the total number of breakdowns for a period of four weeks exceeds 4. You may assume that breakdowns are immediately repaired and put back to work.

6.

- (a) Suppose that a sample of  $n = 15$  nails of the same type are obtained at random from an ongoing production process in which 10% of all such nails produced are not on to the required specification.
- (i) What is the probability that in such a sample, 2 nails will not be on to the required specification?
  - (ii) What is the probability that in such a sample, 12 or higher nails will be on to the required specification?
- (b) A group of students has carried out a study to identify the factors affecting the unemployment rate in a country. They have collected information on the following variables.
- $V_1$ : Number of unemployed persons  
 $V_2$ : Level of education (1: below G.C.E. (O/L); 2: G.C.E.(O/L); 3: G.C.E.(A/L) or above)  
 $V_3$ : Having at least one professional qualification (No; Yes)  
 $V_4$ : Family monthly income (in rupees)  
 $V_5$ : Gender (0-Male; 1-Female)
- i). Classify the variables as qualitative and quantitative.
  - ii). Classify the quantitative variables as discrete or continuous.
  - iii). Classify the data as nominal, ordinal, interval, or ratio.

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997