



UNIVERSITY OF PERADENIYA, SRI LANKA
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பேராதனைப் பல்கலைக்கழகம், இலங்கை

CENTRE FOR DISTANCE AND CONTINUING EDUCATION
UNIVERSITY OF PERADENIYA
Bachelor of Arts (External New Syllabus) Examination 2023

SUPE-107: Introduction to Statistics

Instructions:

1. Answer only **Five questions**.

Time allocated: **Three (03) hours**.

2. Calculator is allowed, Statistics tables are given.

Marks allocated: **100 Marks** only.

1. I. "Statistics are numerical statements of facts but all facts numerically state are not statistics" Comment upon the statement and state briefly which numerical statements of facts are not statistics. 15 Marks
- II. Describe how a survey into economic conditions of a village should be planed and conducted. 10 Marks
2. I. Distinguished between primary and secondary data. What precautions should be taken in using secondary data? 8 Marks
- II. Describe the difference methods of collecting data indicating the merits and demerits of each of them. 10 Marks
- III. What is a questionnaire? What are the essential characteristics of a good questionnaire? 7 Marks
3. 50 students a class obtained the following marks (out of 60) in the Economics paper of the 100 level Bachelor of Arts Examination.
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|----|----|----|----|----|----|----|----|----|----|
| 21 | 20 | 55 | 39 | 48 | 46 | 36 | 54 | 42 | 30 |
| 29 | 42 | 32 | 40 | 34 | 31 | 35 | 37 | 52 | 44 |
| 39 | 45 | 37 | 33 | 51 | 53 | 52 | 46 | 43 | 47 |
| 41 | 26 | 52 | 48 | 25 | 34 | 37 | 33 | 36 | 27 |
| 54 | 36 | 41 | 33 | 23 | 39 | 38 | 44 | 45 | 38 |
- i. Using a suitable method, tabulate the above data. 5 Marks
- ii. Calculate the Mean, Median and Mode for the above data. 9 Marks
- iii. Calculate the Variation and standard deviation of the above data. 4 Marks
- iv. What do you understand by the coefficient of variation (CV)? When comparing two data sets in relation to measures of central tendency and dispersion, why is CV considered a better measure than the other measures? 7 Marks

4. i. Using your own example, explain the concept of complement of an event in probability theory 5 Marks
- ii. One card is drawn from a standard pack of 52 cards. Calculate the probability that the card will,
- (a). be an Ace 2 Marks
- (b). not be an Ace 2 Marks
- iii. Consider the experiment of rolling a die. Let A be the event 'getting a prime number', B be the event 'getting an odd number'. Write the sets representing the events
- (a). B or B (i.e. $A \cup B$) A 2 Marks
- (b). A and B (i.e. $A \cap B$) 2 Marks
- (c). A but not B 2 Marks
- (d). Not A 2 Marks
- iv. A doctor is called to see a sick child. The doctor has prior information that 90% of sick children in that neighborhood have the Flu (denoted as F), while the other 10% are sick with Measles (denoted as M). Assume for simplicity that $F \cup M = \Omega$, i.e., that there no other maladies in that neighbourhood. A well-known symptom of measles is a rash (denoted as R). $P(R|M) = 0.95$. However, occasionally children with flu also develop rash, so that $P(R|F) = 0.08$. Upon examining the child, if the doctor finds a rash, what is the probability that the child has measles? 8 Marks
5. i. State the name and important characteristics of the following distributions.
- (a). $X \sim Bin(12, 0.5)$
- (b). $X \sim N(36, 16)$ 4 Marks
- ii. A manufacturer of metal pistons finds that on the average, 12% of his pistons are rejected because they are either oversize or undersize. What is the probability that a batch of 10 pistons will contain
- (a). no more than 2 rejects? 3 Marks
- (b). at least 2 rejects? 3 Marks
- iii. If a committee has 5 members, find the probability of having more male members than female members given that the probability of having a male or a female member is equal 5 Marks
- iv. Suppose that life insurance company insures the lives of 1000 women age 60. According to a study result, the probability of all considered 60 age women dying in a given year to be 0.005. Find probability that company will have to pay exactly for 5 persons during a given year ($x = 5$). 5 Marks
- v. What do you mean by Normal Probability Distribution? Explain the Characteristics of this distribution 5 Marks
6. i. What do you understand by a continuous probability distribution?

- Give some examples for it 5 Marks
- ii. The Random variable of X indicates the per day sales amount of sugar (in Kg) in a particular shop. It has a normal distribution with a 70 kg mean and a 9 kg variance.
- (a). Find the probability of selling sugar that is more than 75 kg on a given day. 4 Marks
- (b). Find the probability of selling sugar that is less than 75 kg on a given day. 3 Marks
- iii. What do you mean by a sampling distribution? List out the features of the sampling distribution. 5 Marks
- iv. An automobile battery manufacturer claims that its midgrade battery has a mean life of 50 months with a standard deviation of 6 months. Suppose the distribution of battery lives of this particular brand is approximately normal.
- (a). On the assumption that the manufacturer's claims are true, find the probability that a randomly selected battery of this type will last less than 48 months 4 Marks
- (b). On the same assumption, find the probability that the mean of a random sample of 36 such batteries will be less than 48 months. 4 Marks
7. i. What do you understand by interval estimate? How will you determine the confidence interval for the mean of a normal population? 6 Marks
- ii. There is an argument that children are affected by the amount of time that they are on mobile phone. A survey was conducted among 12 Sri Lankan children, in which they were asked to record the number of hours they are on the mobile phone per week. The population standard deviation and the sample mean of using mobile phone was given to be $S = 8$ and $\bar{X} = 66.3$ respectively. Estimate the mean time of mobile phone watch per week per child with 95% confidence level 6 Marks
- iii. What is meant by hypothesis testing? State the general procedure for testing a hypothesis. 6 Marks
- iv. A monthly income investment scheme exists that promises variable monthly returns. An investor will invest in it only if they are assured of an average \$180 monthly income. The investor has a sample of 300 months' returns which has a mean of \$190 and a standard deviation of \$ 81. Should they invest in this scheme? Explain. 7 Marks

TABLE A.2

t Distribution: Critical Values of t

Degrees of freedom	Two-tailed test: One-tailed test:	Significance level					
		10% 5%	5% 2.5%	2% 1%	1% 0.5%	0.2% 0.1%	0.1% 0.05%
1		6.314	12.706	31.821	63.657	318.309	636.619
2		2.920	4.303	6.965	9.925	22.327	31.599
3		2.353	3.182	4.541	5.841	10.215	12.924
4		2.132	2.776	3.747	4.604	7.173	8.610
5		2.015	2.571	3.365	4.032	5.893	6.869
6		1.943	2.447	3.143	3.707	5.208	5.959
7		1.894	2.365	2.998	3.499	4.785	5.408
8		1.860	2.306	2.896	3.355	4.501	5.041
9		1.833	2.262	2.821	3.250	4.297	4.781
10		1.812	2.228	2.764	3.169	4.144	4.587
11		1.796	2.201	2.718	3.106	4.025	4.437
12		1.782	2.179	2.681	3.055	3.930	4.318
13		1.771	2.160	2.650	3.012	3.852	4.221
14		1.761	2.145	2.624	2.977	3.787	4.140
15		1.753	2.131	2.602	2.947	3.733	4.073
16		1.746	2.120	2.583	2.921	3.686	4.015
17		1.740	2.110	2.567	2.898	3.646	3.965
18		1.734	2.101	2.552	2.878	3.610	3.922
19		1.729	2.093	2.539	2.861	3.579	3.883
20		1.725	2.086	2.528	2.845	3.552	3.850
21		1.721	2.080	2.518	2.831	3.527	3.819
22		1.717	2.074	2.508	2.819	3.505	3.792
23		1.714	2.069	2.500	2.807	3.485	3.768
24		1.711	2.064	2.492	2.797	3.467	3.745
25		1.708	2.060	2.485	2.787	3.450	3.725
26		1.706	2.056	2.479	2.779	3.435	3.707
27		1.703	2.052	2.473	2.771	3.421	3.690
28		1.701	2.048	2.467	2.763	3.408	3.674
29		1.699	2.045	2.462	2.756	3.396	3.659
30		1.697	2.042	2.457	2.750	3.385	3.646
32		1.694	2.037	2.449	2.738	3.365	3.622
34		1.691	2.032	2.441	2.728	3.348	3.601
36		1.688	2.028	2.434	2.719	3.333	3.582
38		1.686	2.024	2.429	2.712	3.319	3.566
40		1.684	2.021	2.423	2.704	3.307	3.551
42		1.682	2.018	2.418	2.698	3.296	3.538
44		1.680	2.015	2.414	2.692	3.286	3.526
46		1.679	2.013	2.410	2.687	3.277	3.515
48		1.677	2.011	2.407	2.682	3.269	3.505
50		1.676	2.009	2.403	2.678	3.261	3.496
60		1.671	2.000	2.390	2.660	3.232	3.460
70		1.667	1.994	2.381	2.648	3.211	3.435
80		1.664	1.990	2.374	2.639	3.195	3.416
90		1.662	1.987	2.368	2.632	3.183	3.402
100		1.660	1.984	2.364	2.626	3.174	3.390
120		1.658	1.980	2.358	2.617	3.160	3.373
150		1.655	1.976	2.351	2.609	3.145	3.357
200		1.653	1.972	2.345	2.601	3.131	3.340
300		1.650	1.968	2.339	2.592	3.118	3.323
400		1.649	1.966	2.336	2.588	3.111	3.315
500		1.648	1.965	2.334	2.586	3.107	3.310
600		1.647	1.964	2.333	2.584	3.104	3.307
∞		1.645	1.960	2.326	2.576	3.090	3.291

