


National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Probability and Statistics	Course Code:	MT2005
	Program:	BSE/BSCS/BDS	Semester:	Fall 2023
	Duration:	60 Minutes	Total Marks:	40
	Paper Date:	02-10-2023	Weight	15%
	Section:	ALL SECTIONS	Page(s):	5
	Exam Type:	MID-I	Moderator	Ms. Sarah Ahmad

Student : Name: _____

Roll No _____

Section: **BDS-3 C**

Instruction/Notes:

Marks Obtained

1. It is great to have choices in life but here all the questions are compulsory. So attempt all the subsections properly (Utilize the given space for each section) *Write Roll no. on each page. You can use the last page to extend any part if needed. No extra sheets allowed to attach for marking. However, you can demand for one rough sheet but do not attach it.
2. We know, sharing is caring but here exchange of calculators is not allowed. You can only use your own scientific calculator (programmable calculators are not allowed).
3. Don't get panic. If you found any ambiguity in the data then do not ask anything to the invigilator, just make assumption and continue solving your paper.
4. Believe in yourself & do not waste your time by looking in answer sheets of your fellows and copying them.
5. Now if you regret not being prepared for this exam then Crying is allowed but do it so quietly in order to avoid disturbance.
6. If you are thinking that it's a revenge. No, it is not. It is just an exam. We want you to be a most successful person in life. All the Best!

Don't Hurry. Don't Worry. Do your Best and Let it rest. 🙏

CASE I: MULTIPLE CHOICE WARM-UP

[MARKS=05, CLO-1&2]

NOTE: Encircle the correct answer only. Overwriting/Cutting will be marked zero.

1. A student has to take 7 or more courses before she can graduate. If none of the courses are prerequisites to others, which probability method would be used to determine how many groups of three courses she can select for the next semester?
 - a) Combination Rule ✓
 - b) Permutation rule
 - c) Simple probability
 - d) Conditional probability
 - e) None of these
2. Consider the data of monthly salary of production unit managers having first and third quartile are 32 and 45 respectively with the median of 35 then distribution is
 - a) Not skewed at all
 - b) Skewed to the right ✓
 - c) Skewed to the left
 - d) Symmetric
 - e) None of these
3. Which one of these measures is unaffected by outliers?
 - a) Mean
 - b) Standard deviation
 - c) Range
 - d) Interquartile range ✓
 - e) All of these

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Page 1 of 5

0134

4. Absolute Zero exists in

- a) Nominal
- b) Ordinal
- c) Interval
- ☒ d) Ratio
- e) None of these

5. What is an average investment?

- a) 500
- b) 33.33
- ☒ c) 566.67
- d) 540
- e) None of these

Frequency Distribution of Outcomes for an Investment		
Outcome \$	Frequency	Assumptions
300	20	Pessimistic
500	60	Moderately successful
900	20	Optimistic

CASE II: PRICES OF HARD DISK BY HP AND SANDISK

[Marks=20, CLO-1]

A marketing research firm wishes to compare the prices of Hard disk charged by two companies; HP and SanDisk. The research firm, using a standardized one-week purchase plan, makes identical purchases at ten of each company's stores. The stores for each company are randomly selected, and all purchases are made during a single week. The purchase expenses obtained at the SanDisk are given below. Compute five-point summary for the prices of SanDisk. It has been observed that average purchase price at HP stores is \$114.81 with variation of $s^2 = (1.84)^2$. Compare the two companies and comment on the consistency in prices by the two companies.

SanDisk	119.25	121.32	122.34	120.14	122.19	123.71	121.72	122.42	123.63	122.44
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Arrange: 119.25, 120.14, 121.32, 121.72, 122.19, 122.34, 122.42, 122.44, 123.63, 123.71

SOLUTION:

For five-point summary for SanDisk Data:

$$\text{Min} = 119.25$$

$$\text{Max} = 123.71$$

$$Q_1 = 0.25 \times 10 = 121.32$$

$$Q_3 = 0.75 \times 10 = 122.44$$

$$\text{Median} = \frac{1}{2} \left[\frac{n}{2}^{\text{th}} \text{ value} + \frac{n}{2} + 1 \text{ value} \right]$$

$$= \frac{1}{2} \left[\frac{10}{2}^{\text{th}} + \left(\frac{10}{2} + 1 \right) \right]$$

$$= 122.265$$

SOLUTION CONTINUE CASE II:

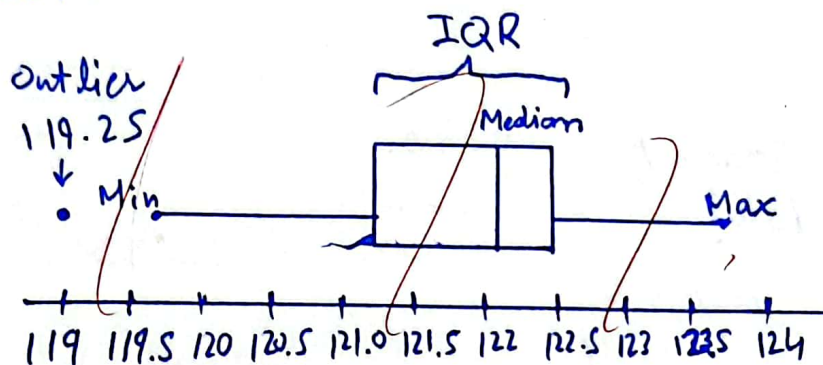
$$\text{Variance} = \frac{(\sum X^2)}{n} - (\bar{X})^2$$

$$= \frac{148652.70}{10} - (121.916)$$

$$\text{SD} = 1.326$$

$$\text{std} = 1.398$$

Box-Plot:



$$\text{Lower Bound} = Q_1 - 1.5 * (Q_3 - Q_1)$$

$$= 121.32 - 1.68$$

$$= 119.64$$

$$\text{Upper Bound} = 122.44 + 1.68$$

$$= 124.12$$

There is one outlier.

CV Comparison?
CV1? CV2?

Comment: The data of HP is more dispersed as compared to SanDisk while the average purchase of SanDisk is high.

CASE III: PREFERENCE OF GAMING PLATFORM

[Marks=10, CLO-2]

The table below obtained from a survey data of core gamers who were asked whether their preferred gaming platform was the smartphone, the console, or the PC. The gamers are split by gender.

- Find the missing values and complete the joint probability table.
- Find the probability that a core gamer chosen at random prefers using a Smartphone or is a male.
- Given that a core gamer prefers to play using a PC, find the probability that they are female.

SOLUTION:

a) "Joint Probability Table"	Male (M)	Female (F)	Total
Smartphone (R)	0.214	0.198	0.412
Console (C)	0.152	0.095	0.247
PC (P)	0.198	0.144	0.342
Total	0.564	0.437	1

4

$$\begin{aligned}
 a) \quad R(F) &= \text{Total} - M = 0.198 \\
 C(M) &= \text{Total} - F = 0.152 \\
 PC(P) &= \text{Total} = 0.342 \\
 \text{Total } F &= 0.437
 \end{aligned}$$

$$\begin{aligned}
 b) \quad \text{Probability that core gamers is male} \\
 \text{and uses phone} &= P(R/M) = \frac{0.214}{0.564} = 0.3794
 \end{aligned}$$

$$c) \quad P(P/F) = \frac{0.144}{0.437} = 0.329$$

3

CASE IV: DIGITAL COMMUNICATION CHANNEL

[Marks=05, CLO-2]

A binary digital communication channel is a system that carries data in the form of one of two types of signals, either 0's or 1's. Because of noise, a transmitted "0" is sometimes received as a "1" and a transmitted "1" is sometimes received as a "0". Assume that for a certain binary communication channel, Event "R" be the event of received symbol and Event "T" be the event of transmitted symbol, The Probability a "0" was received given a "0" was transmitted is 0.95
The Probability a "1" was received given a "1" was transmitted is 0.9
Probability a zero is transmitted is 0.4.
Determine Probability a "1" was transmitted given a "1" was received.

SOLUTION:

$$P(R_1/T_1) = 0.95$$

$$P(R_2/T_2) = 0.9$$

$$P(T_1) = 0.4$$

$$P(T_2) = 1 - P(T_1)$$
$$= 1 - 0.4$$
$$= 0.6$$

Using Bayes' Theorem:

$$P(T_2/R_2) = \frac{P(R_2/T_2) \cdot P(T_2)}{P(R_1/T_1) \cdot P(T_1) + P(R_2/T_2) \cdot P(T_2)}$$
$$= \frac{(0.9)(0.6)}{(0.95)(0.4) + (0.9)(0.6)}$$
$$= 0.58$$