الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

Final Exam
PCALC-II.I: Statistics I
Fall 2024

Points of attention:

- For each question, the maximum earned points are specified in the question.
- Write clearly! Answers that are not readable are not marked and don't earn marks!
- All answers should be written in English using **blue or black pens** only.
- Use the pencil only for diagrams and graphs.
- Show all the calculation steps in the given space.
- When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

Exam Duration:	2 hours
Instructor's Name:	Muhammad Javed
Exam Date:	09/01/2025
Program:	LTM

	40
	10

Student Information			
Name:		ID:	
Signature:			

Invigilator			
Initials:		☐ Student ID checked	
Time received:			

Question 1 **[7 marks]**

Answer the following questions based on the given data. The data is arranged in ascending order:

10	11	12	13	14	15	17	18	19	20	21	22	23	25
26	27	29	35	37	40	43	58	66	67	97	120	129	

a. Find the data value that corresponds to 50^{th} percentile. (2 Mark)

b. Find the percentile corresponding to 35. (1 Mark)

c. Evaluate the data for outliers (4 Marks)

Question 2 **[8 marks]**

Is there a relationship between a logistics professional's years of experience and their capital investment capacity for logistical projects? A sample of 10 logistics company owners is analyzed, with their years of experience and investment capacity (in billions of dollars) as follows:

a. Create a scatter plot to display the relationship between years of experience and investment capacity. (3 Marks)
b. Determine the value of correlation coefficient and interpret the result for the linear relationship. (2 Marks)
c. Use a linear regression model to determine the relationship between years of experience and investment capacity. Draw the regression line on the scatter plot. (2 Marks)
d. Predict the years of experience of a professional who has an investment capacity of $10 billion. (1 Mark)

Years of Experience $\boldsymbol{x}$	Investment Capacity $\boldsymbol{y}$ (billion$)
56	18
39	14
42	12
60	14
84	11
37	10
68	10
66	7
73	7
55	5

Question 3 **[7 marks]**

These data represent the cargo handling capacities (in thousand cubic yards) of the largest logistics hubs in Muscat and Dubai. By comparing these capacities, we aim to analyze the operational differences and variability between logistics hubs in these two cities.

a. Create separate boxplots for Muscat and Dubai to visualize the distribution of cargo handling capacities. (5 Marks)
b. Examine key differences in the distributions for the two cities by using properties of boxplot. (2 Marks)

Muscat	Dubai
125	311
92	274
78	105
77	102
66	56
62	46
52	
50	

Question 4 **[8 marks]**

The data below represents the number of shipments delayed (in hundreds) in 25 logistics hubs across two regions. Analyze the variability in delayed shipments to assess operational performance. Consider the data representing a sample.

a. Calculate the variance and standard deviation to understand the spread of delayed shipments across the logistics hubs. (6 Marks)

b. Explain how variance and standard deviation can inform the improvement of logistics operations. (2 Marks)

Delayed Shipments (in hundreds)	**Frequency** f
34–96	13
97–159	2
160–222	0
223–285	5
286–348	1
349–411	1
412–474	0
475–537	1
538–600	2

Question 5 **[6 marks]**

The data in the following table represents the causes of supply chain disruptions for a logistics company in 2023. Analyze the causes and identify the key areas to focus on for improving supply chain efficiency. The data includes disruptions across various segments of the supply chain.

a. Use the data provided to construct a Pareto chart representing the causes of supply chain disruptions. (4 Marks)

b. Determine which causes contribute to the majority of disruptions and recommend areas to prioritize improvements. (2 Marks)

S. No.	Reason	Number of Accident (thousand)
1	Transportation Delay	220
2	Equipment Failure	100
3	Inventory Shortage	48
4	System Downtime	38
5	Regulatory Issues	38
6	Supplier Default	22
7	Weather Disruptions	15
8	Labor Strikes	11
9	Other	8

Question 6 **[4 marks]**

The mean price of transport-featured machinery in a certain market is $40,000, and the standard deviation is $8,000. Find the price range for which at least 60% of the houses sell. Write your final answers up to 1 decimal place.

Formula sheet:

1. $$s^2 = \frac{n(\Sigma f \cdot X_m^2) - (\Sigma f \cdot X_m)^2}{n(n-1)}$$
2. $$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$$
3. $$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}$$
4. $$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}}$$
5. $Mean \pm k(standard\ deviation)$
6. $1 - \frac{1}{k^2}$
7. $c = \frac{n.p}{100}$
8. $\frac{(number\ of\ values\ below\ x)+0.5}{n} \times 100$