

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

(Department of Mathematics and Statistics)

WARNING

1. PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.
2. SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN "AIOU PLAGIARISM POLICY".

Course: Statistics & Probability (3447)

Semester: Autumn, 2013

Level: BS (CS)

Total Marks: 100

Pass Marks: 40

ASSIGNMENT No. 1

(Units: 1–5)

Note: Attempt all questions and each question carries equal marks.

- Q. 1 Following data represent the life (in months) of 20 UPS fitted to a PIMS hospital on February, 25, 2005:

85	75	66	43	40
88	80	56	56	67
89	83	65	53	75
87	83	52	44	48

- a) Construct a frequency distribution with classes 40–49, 50–59, etc.
- b) Compute the sample mean from the frequency distribution, and interpret.
- c) Compute the sample mean from the raw data.
- d) Compare parts (b) and (c) and comment on your answer. **(20)**

- Q. 2 Here are the high temperature (in Fahrenheit) readings during the May, 2013 in Rawalpindi.

84	86	78	69	94	95	94	98	89	87	88
89	92	99	102	94	92	96	89	88	87	88
84	82	88	94	97	99	102	105			

Compute and interpret the:

- a) Mean and median for this data
- b) Standard deviation and variance
- c) Interquartile range
- d) 70th percentile **(20)**

- Q. 3
- a) Define and explain mutually exclusive, not mutually exclusive, independent and dependent events.
 - b) Explain with examples the terms: permutation and combination.
 - c) A bag contains 5 white and 7 black balls. If three balls are drawn from the bag, what is the probability that;
 - i) All are white
 - ii) Two white and one black
 - iii) All are of the same color **(20)**

- Q. 4 a) The probability that a married man watches a certain television show is 0.4 and the probability that a married woman watches the show is 0.5. The probability that a man watches the show, given that his wife does, is 0.7. Find the probability that:
- a married couple watches the show;
 - a wife watches the show given that her husband does;
 - at least 1 person of a married couple will watch the show.
- b) A town has 2 fire engines operating independently. The probability that a specific engine is available when needed is 0.96.
- What is the probability that neither is available when needed?
 - What is the probability that a fire engine is available when needed? **(20)**
- Q. 5 a) A random sample of 100 recorded deaths in the Afghanistan during the past year showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is great than 70 years? Use a 0.05 level of significance.
- b) An electric firm manufactures light bulbs that have a lifetime that is approximately normally distributed with a means of 800 hours and a standard deviation of 40 hours. Test the hypothesis that $\mu = 800$ hours against the alternative $\mu \neq 800$ hours if a random sample of 30 bulbs has an average life of 788 hours. Use a 0.10 level of significance. **(20)**

ASSIGNMENT No. 2

Total Marks: 100

(Units: 6–9)

Pass Marks: 40

Note: Attempt all questions and each question carries equal marks.

- Q. 1 a) A school wishes to estimate the average weight of the students in the 6th grade. The standard deviation of the population is known to be 15 lbs. A random sample of 8 values is selected; the values in lbs are 8.5, 9.6, 10.7, 10.9, 11.5, 11.6, 12.8 and 9.3. Compute the 90% and 95% confidence interval for the population mean.
- b) An examination was given to two groups of 40 female and 50 male students, respectively. The female mean grade was 74 and S.D. of 8, while the male mean grade was 76 with S.D. of 7. Find the 95% confidence interval for the difference in population mean grade between male and female students i.e. $\mu_1 - \mu_2$. **(20)**
- Q. 2 a) To estimate the average weekly income of unskilled workers in a large city an investigator collected weekly income data from a random sample of 25 unskilled workers. The sample mean and S.D. are found to be Rs. 927 and Rs. 15 respectively. Test the hypothesis that the average income (weekly) of the workers is less than Rs. 1025. Use 5% level of significance.
- b) Metro discount store has always prided itself on customer service. The store hopes that all metro stores are providing the same level of service from coast to coast, so they have surveyed some customers. In the Karachi region, a random sample of 97 customers yielded an average overall satisfaction rating of 8.8 out of 10 and the sample standard deviation was 0.7. In the Lahore region, a random sample of 84 customers resulted in an average rating of 9.0 and the sample

standard deviation was 0.6. Can Metro conclude, at $\alpha = 0.05$, that the levels of customer satisfaction in the two markets are significantly different? **(20)**

- Q. 3 a) Define and explain Statistical Process Control. Define various control charts.
 b) A quality control effort is being attempted for a process where large steel plates are being manufactured and surface defects are of concern. The goal is to set up a quality control chart for the number of defects per plate. The data are as follows:

Sample Plate	Number of Defects	Sample Plate	Number of Defects
1	4	11	1
2	2	12	2
3	1	13	2
4	3	14	3
5	0	15	1
6	4	16	4
7	5	17	3
8	3	18	2
9	2	19	1
10	2	20	3

Set up the appropriate control chart, using this sample information. Does the process appear to be in control? **(20)**

- Q. 4 a) The following table shows the likings of three colors pink, white and blue in a sample of 200 males and females.

Colors	Sex	
	Males	Females
Pink	20	40
White	40	20
Blue	60	20

Test whether is there any relation between sex and color. Use $\alpha = 0.05$.

- b) Fauji Fertilizer Company is making fertilizer of three types. Yield of wheat (in kg/acre) after using each fertilizer (5 kg) during last 6 years as follow: **(20)**

Urea	52	57	59	54	58	59
Phosphorus	42	45	49	41	43	45
Nitrogen	79	78	77	74	73	76

Using ANOVA technique, Is there any significant difference in these fertilizers?

- Q. 5 Sprite soft drink company is studying the effect of its latest advertising campaign. People chosen at random were called and asked how many cans of Sprite they had bought in the past week and how many Sprite advertisement they had either read or seen in the past week. **(20)**

X (number of ads)	3	7	4	2	0	4	1	2
Y (Cans purchased)	11	18	9	4	7	6	3	8

- i) Fit and interpret the equation $Y = a + bX$
 ii) Also test the regression coefficient i.e., $b = 0$

3447 Statistics & Probability

Credit Hours: 4 (4 + 0)

Recommended Book:

Statistics for Management by Richard I. Levin, David S. Robin 7th Edition

Course Outlines:

Unit-1 Statistical Data

Grouping and Displaying Data (Data Arrangement, Examples of Raw Data, Data Array and frequency Distribution, Graphing Frequency Distribution)
Measure of Central Tendency and Dispersion (Arithmetic Mean, Weighted Mean, Geometric Mean, Median, Mode Dispersion, Ranges, Relative Dispersion, Exploratory Data Analysis)

Unit-2 Probability

Basic Terminology in Probability, Three Types of Probability, Probability Rules, Statistical Independence, Statistical Dependence

Unit-3 Special Distributions

Random Variables, Expected Value, Binomial Distribution, Poisson Distribution, Normal Distribution, Choosing the Correct Distribution

Unit-4 Statistical Inference

Sampling and Sampling Distributions, Estimation

Unit-5 Inference about Proportion

Hypothesis Testing Procedure, Power of Hypothesis Test, Hypothesis Testing of Proportions

Unit-6 Inference about Means

Hypothesis Test of Mean, Hypothesis Testing for Differences between Means and Proportion, Tests for Differences between Means (Larges & Small Sample Sizes)

Unit-7 Quality and Quality Control

Statistical Process Control, Control Charts for Process Means, Variability and Attributes, Total Quality Management, Acceptance Sampling

Unit-8 Chi-Square & Analysis of Variance

Chi-Square as Tests of Independence, Goodness of Fit and Distribution Shapes, Analysis of Variance

Unit-9 Simple Linear Regression and Correlation

Estimation using the Regression Line, Correlation Analysis

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