

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Science Education)

WARNING

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

All questions are compulsory and carry equal marks, but within a question, the marks are distributed according to its requirements.

1. Read the question carefully and answer it according to the requirements of the question.
2. Avoid irrelevant discussion/information and reproducing from books, study guide or allied material.
3. Handwritten scanned assignments are not acceptable.
4. Upload your typed (in Word or PDF format) assignments on or before the due date.
5. Your own analysis and synthesis will be appreciated.
6. Late assignments can't be uploaded to LMS.
7. Students who attempt their assignments in Urdu/Arabic may upload a scanned copy of the handwritten assignments (in PDF format) on the University LMS. The size of the file should not exceed 5MB.

Course: GENERAL MATHEMATICS AND STATISTICS (6401)

Level: BS /ADE/ B.ED (2.5/4 Years)

Semester: Spring 2026

Total Marks: 100

Passing Marks: 50

ASSIGNMENT No. 1
(Units: 1–4)

Q1. A soap manufacturing factory produces **12,000** plastic bottles daily by operating 3 specialized machines for **8** hours a day. If one of the machines suffers a mechanical breakdown and becomes completely out of order, calculate the exact number of hours per day the remaining functional machines must work to successfully fulfill an urgent order of **15,000** plastic bottles, demonstrating the step-by-step application of compound proportion.

[20 Marks]

Q2. Using the fundamental principles of Set Theory and Venn diagrams, mathematically verify **De Morgan's Laws** for two intersecting subsets, **A** and **B**, defined within a universal set **U**, by sketching the shaded region of the complement of their union against the intersection of their individual complements, and explain how the visual diagram proves the logical equivalence.

[20 Marks]

Q3. Find the complete solution set for the following system of simultaneous linear equations by applying **Cramer's Rule**, ensuring you calculate the core matrix determinants and the individual variable determinants (**D, D_x, and D_y**) to establish the final values for **x** and **y**:

$$\begin{cases} 3x - 2y = 1 \\ 4x + 5y = 23 \end{cases}$$

[20 Marks]

Q4. Using appropriate algebraic identity formulas and expansion techniques, determine the precise simplified value of the cubic expression. $8x^3 + \frac{1}{27x^3}$ given that the fundamental linear relationship is explicitly provided as $2x + \frac{1}{3x} = 6$.

[20 Marks]

Q5. Find the complete solution set for the quadratic equation $3x^2 - 11x - 4 = 0$ by applying the quadratic formula, identify the precise numerical value of its discriminant, and explicitly state the exact nature of its roots based on whether the discriminant value is real, rational, a perfect square, or imaginary.

[20 Marks]

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ASSIGNMENT No. 2 (Units: 5–9)

Q1. Using the foundational properties of triangles and parallel lines, mathematically prove that the sum of the interior angles of any Euclidean triangle is exactly equal to 180^0 (two right angles) by constructing a line parallel to one side through the opposite vertex, and explicitly detail how the alternate interior angles establish this geometric theorem.

[20 Marks]

Q2. A regional health survey recorded the following dataset representing the random blood sugar levels (*mg/dL*) of 30 adult patients:

112, 145, 120, 105, 134, 160, 115, 128, 142, 150, 138, 118, 122, 148, 155, 108, 131, 125, 119, 144, 152, 110, 129, 136, 141, 147, 123, 133, 116, 158 Construct a complete **Grouped Frequency Distribution Table** for this raw dataset using an appropriate class interval width, establishing explicit columns for Class Boundaries, Tally Marks, Frequencies, and Class Midpoints.

[20 Marks]

Q3. Calculate the precise value of the **Arithmetic Mean** and the **Median** for the grouped frequency data constructed in your frequency table from the previous step (or any given standard grouped dataset), clearly writing out the statistical formulas used for grouped populations and detailing each intermediate value, including the cumulative frequencies and class boundaries.

[20 Marks]

Q4. Using a set of individual observations representing the monthly rainfall (*in mm*) of a city over six months—**45, 60, 52, 70, 48, and 65**—calculate the exact **Standard Deviation** and **Variance** of this dataset, displaying the step-by-step deviations of each data point from the

calculated mean, squaring those deviations, and averaging them according to the population dispersion formula.

[20 Marks]

Q5. Two standard, unbiased six-sided fair dice are rolled simultaneously in a probability experiment. Determine the complete sample space of the experiment, and use the fundamental rules of classical probability to calculate the exact theoretical probability that the sum of the numbers appearing on the top faces of both dice is a prime number greater than or equal to 5.

[20 Marks]