Canopus

MYMENSINGH GIRLS' CADET COLLEGE
PRETEST EXAMINATION - 2025
CLASS: XII
STATISTICS (CREATIVE)
SECOND PAPER
[According to the Syllabus of 2026]
TIME – 2 hours & 35 minutes
FULL MARKS – 50

Subject Code: | **1** | **3** | 0 |

[**N.B.** – The figures of the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any **FIVE** questions taking at least two questions from each group]

Group - A

1. **An unbiased coin is tossed 10 times.**

   (a) If a coin is flung 3 times, how many outcomes are generated? 1

   (b) If a coin is flung n times, show how many outcomes are generated. 2

   (c) What is the probability of getting a) at least 3 heads, b) at most 3 heads? 3

   (d) Are these probabilities equal? a) Getting at least 2 heads & b) Getting at least 2 tails. Also justify logically. 4

2. **A continuos random variable X follows the following probability density function (pdf).**

$$f(x) = 6x(1-x); 0 \leq x \leq 1$$

   (a) Give an example of a continous random variable. 1

   (b) Examine whether the given function is a pdf. 2

   (c) If $P(X > a) = P(X < a)$, find the value of a. 3

   (d) Should $P(0.5 \leq X \leq 1)$ be equal to 0.5? 4

3. **The probability distributions of monthly sales (in units) of two brands of laptops, Brand L (X) and Brand M (Y), are given below:**

Sales (units)	50	100	150	200	250
P(X)	0.08	0.22	p	0.30	0.12
P(Y)	0.10	0.25	0.35	0.20	0.10

   (a) What is Expected Value in probability? 1

   (b) Can Expected Value be negative? Justify with an example. 2

   (c) Find p from the table. 3

   (d) Which brand has higher expected sales? Compare variability using standard deviation. 4

4. **Sampling is one of the essential steps in the analysis of observational studies. It eliminates the necessity of working with the entire population, thereby minimizing cost and time required to draw conclusions.**

   (a) What is an infinite population? 1

   (b) Distinguish between statistic and parameter with examples. 2

   (c) Outline the steps in a sample survey. 3

   (d) Illustrate the remainder approach with an example. 4

Group - B

5. **The electric kettles produced by a certain manufacturer are 12% defective on average. The company supplies 20 kettles in a packet. A retailer bought 1000 packets.**

   (a) What is denoted by X in Binomial distribution? 1

   (b) How does the probability mass function (PMF) of a binomial distribution change with increasing n? 2

   (c) What is the probability that no. of defective kettles is at most 2? 3

(d) In how many packtes, there are exactly 3 defective kettles? 4

6. **The standard deviation of a Poisson distribution is 2.**

(a) What is the mean of Poisson distribution? 1

(b) In a a Poisson distribution, P(2) = P(3). What is its mean? 2

(c) Find $P(X \geq 2)$ 3

(d) If P(a) = P(a+1), what is the value of a? 4

7. **The mean and standard deviations of a normal variate are 25 and 5, respectively.**

(a) What is the mean of a normnal variate? 1

(b) What is the relationship between the Poission and Normal distribution? 2

(c) Find the value of $P(20 \leq X \leq 40)$. 3

(d) Examine: $P(X > 20) = P(X < 20)$. Also, provide your intuitive reasoning. 4

8. **Price and Quantity Data for Three Essential Commodities in 2021 and 2022 are given below.**

Commodity	(2021)		(2022)	
	Price	Quantity	Price	Quantity
Rice	\$2.5	100	\$3.0	90
Wheat	\$2.0	120	\$2.4	110
Sugar	\$1.8	80	\$2.2	85

(a) What is a price index? 1

(b) How is Fisher's Ideal Index constructed? 2

(c) From the given data, determine Laspeyres' price index number. 3

(d) Compare inflation using Paasche and Laspeyres price indices. 4

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Group - A

1. **Hamida has recently graduated from the University of Dhaka. She applies to two firms - EduCube & Digic- for a Data Analyst job. The probability of hiring by EduCube is 0.8 and by Digic is 0.4. The probability that none hires is 0.5.**

   (a) What is a sample space? 1

   (b) Explain how to find $P(\bar{A} \cap B)$ using Venn Diagram. 2

   (c) Find the probability of hiirng by Digic but not by EduCube. 3

   (d) Find the probability that no firm will reject her. 4

2. **The joint probability function of two random variables X and Y is given by:**

$$P(X, Y) = \frac{x + y + 1}{42}; \quad x = 0, 1, 2; \quad y = 0, 1, 2, 3$$

   (a) How can calculate $P(X > 3)$ using the concept of complementary probability? 1

   (b) What is the relationship between joint and marginal probability? Illustrate mathematically. 2

   (c) Calculate the marginal probability $P(Y)$. 3

   (d) Determine $P(Y|X = 1)$ and $P(Y|X = 0)$. 4

3. **The probability density function (pdf) of a continuous random variable is given below:**

$$f(x) = \frac{1}{30}(k + 2x); 2 < x < 5$$

   (a) What is a random variable? 1

   (b) Is probability a discrete variable? Explain in brief. 2

   (c) Find the value of k. 3

   (d) Determine the expectation and variance. 4

4. **A sample survey is often preferred over a census because it significantly reduces the cost, time, and logistical complexity of data collection. By studying a representative subset of the population, researchers can obtain accurate and reliable estimates without needing to survey every individual.**

   (a) What is a finite population? 1

   (b) Distinguish between sapling frame and sampling unit. 2

   (c) Outline the drawbacks of a census. 3

   (d) Illustrate the quotient approach with an example. 4

Group - B

5. **A smartphone company finds that 9% of its phones have minor defects. Each shipment contains 35 phones. A retailer purchases 500 shipments.**

   (a) What is a Bernoulli trial? 1

   (b) What happens if $n = 1$ in Binomial distribution? 2

   (c) What is the probability that a randomly selected shipment has at most 3 defective phones? 3

(d) In how many shipments can we expect to find between 4 and 7 defective phones (inclusive)? 5

6. **Between 1000hrs and 1700 hrs, the average number of phonce calls per minute received by a power distribution company is 2.5.**

   (a) Give an example where Poisson distribution is applicable. 1

   (b) Find the relationship between expectationa and standard deviation of Poisson distribution. 2

   (c) Find the probability that the number of calls is between 1 and 3 (inclusive). 3

   (d) What is the probability that the number of calls received is greater than the average? 4

7. **The IQ scores of 800 adults are normally distributed with a mean of 100 and a standard deviation of 15.**

   (a) Describe the shape of the normal distribution. 1

   (b) Which value(s) have the highest probability in a normal distribution? 2

   (c) Find the probability that a randomly chosen adult has an IQ score above 130. 3

   (d) How many adults are expected to have IQ scores between 70 and 130? 4

8. **Price and Quantity Data for Three Commodities in the year 2010 and 2011 are given below.**

Commodity	(2010)		(2011)	
	Price	Quantity	Price	Quantity
A	\$10	10	\$25	15
B	\$15	20	\$30	25
C	\$20	30	\$35	35

Table 1: Price and Quantity Data for Three Commodities

   (a) What is an index number? 1

   (b) How is the Marshall-Edgeworth Index formed? 2

   (c) From the given data, determine Paasche's quantity index number 3

   (d) Analyze, using the cost of living index, whether price of daily necessities has increased. 4

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