Statistics Question Bank

First Paper

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Contents

Chapter 1

Statistics, Variable and Concepts of Different Symbols

1.1 Creative Questions

1. **Income and expenditure (both in thousands) of some individuals are collected:**

Income (x)	20	30	25	10
Expenditure (y)	15	27	18	5

   (a) What is a discrete variable? 1

   (b) Can fractional numbers be discrete? Explain briefly. 2

   (c) Are, in the stem, $\sum_{i=1}^{n}\sum_{i=1}^{n} x_i y_j = \sum_{i=1}^{n} x_i y_i$? Show statistically. 3

   (d) Prove empirically that sum of square is unequal to square of sum of numbers. 4

2. **Call duration of 6 calls in a customer care center are**

   2, 2.5, 1.5, 5, 6, 3

   (a) What is a sample? 1

   (b) Are all quantitative variables continuous? 2

   (c) Determine $\sum_{i=1}^{7}(x_i - 3)^3$ 3

   (d) Find the values of $\sum_{i=1}^{7}(x_i - 5)^2$ and $\sum_{i=1}^{7} x_i^2 + 5$. 4
   Explain mathematically why they are unequal.

3. **Goals scored by Karim Benzema in five seasons are recorded to be the following:**

Season	La Liga (x)	Uefa Champions League (y)
2017-18	5	5
2018-19	21	4
2019-20	21	5
2020-21	23	6
2021-22	27	15

   (a) What is a quantitative variable? 1

   (b) What is the notation to denote his total number of goals? 2

   (c) Compute $\sum_{i=1}^{5}(y_i - 3)^2$

   (d) Find total number of goals using two different notations and examine whether they match. 4

4. **Below are some information**

   $x_1 = 3, x_2 = 4, x_3 = 1, x_4 = 0$
   $y_1 = 1, y_2 = 5, y_3 = 0, y_4 = 2$

   (a) What is a qualitative variable? 1

   (b) Find $\sum_{i=1}^{4} x_i^2$ 2

   (c) Prove that $\sum_{i=1}^{4}(x_i + y_i) = \sum_{i=1}^{4} x_i + \sum_{i=1}^{4} y_i$ 3

   (d) Find the value of $\sum_{i=1}^{4} x_i y_i - \sum_{i=1}^{4} x_i + 4$ 4

1.2 Short Questions

Chapter 2

Data Collection, Presentation, and Organization of Data

2.1 Creative Questions

1. **Frequency distribution of marks in statistics of a college is given in the following table.**

Marks	Number of Students Group - A	Number of Students Group - B
25-30	11	10
30-35	18	16
35-40	21	22
40-45	26	28
45-50	14	9

(a) What is data 1

(b) What are the disadvantages of secondary data? 2

(c) Calculate the arithmetic mean of Group - A 3

(d) Compute the combined mean. Is it greather than the arithmetic mean of Group - B? Explain the possible reason(s). 4

2.2 Short Questions

Chapter 3

Measures of Central Tendency

3.1 Creative Questions

1. **In the test examination, marks of 11 students in statistics are: 90, 92, 93, 49, 44, 88, 80, 58, 83, 71, 76.**

   (a) What is central tendency? 1

   (b) When is median better than arithmetic mean? Explain with an example. 2

   (c) Find the 3rd the quartile and 61st percentile from the data and explain. 3

   (d) Do quantiles depend on change of origin and scale. Prove using two examples. 4

2. **Scores of a batsman in the last 20 innings are**

   28, 30, 16, 48, 50, 86, 105, 20, 10, 36,
   12, 25, 20, 35, 65, 12, 10, 76, 55, 32

   (a) Write down the formula of weighted harmonic mean 1

   (b) Can median be a better measure of central tendency than arithmetic mean for this data? 2

   (c) Draw a stem and leaf plot from the data and explain. 3

   (d) Make a frequency distribution from the data and also find and interpret cumulative frequencies and percentages. 4

3. **In ODI cricket, two top batsmen are (as of 2nd Sept, 2022) Babar Azam and Rassie van der Dussen. Their average (arithmetic mean) scores are 59.79 and 69.32, appearing in 90 (including being not out in 12 occassions) and 33 (including being not out in 11 occassions) matches, respectively.**

(a) When is arithmetic mean inappropriate to use? 1

(b) Is arithmetic mean always suitable for comparison? 2

(c) Find the combined arithmetic mean and explain. 3

(d) How to compare two sets of data having significantly distinct ranges? 4

4. **A fridge manufacturing company observe temperatures of newly developed 8 deep fridges. The observed temperatures (in degree celsius are:**

-10, -8, -2, -4, -4, -1, -12, -3, -13

(a) What is a Decile? 1

(b) How many Deciles does a data set have? Why? 2

(c) Compute the 8th Decile from the data and explain. 3

(d) Find and compare arithmetic and geometric mean from the data. 4

5. **Given below is a series of data.**

$$5, 7, 9, \cdots, 123$$

(a) What is the summation of natural numbers up to nth value? 1

(b) Find the arithmetic mean of natural numbers from 1 up to 20. 2

(c) Find the arithmetic mean of the given series. 3

(d) Prove that arithmetic mean is greater than gemetric mean theoretically and empricially. 4

6. **Grades of a an undergraduate student with major in statistics are given**

Course	Grade	Credit
Probability	3.75	4
Simulation	3.50	3
Calculas	3.50	4
Linear Algebra	3.75	4
Econometrics	3.00	2
Programming	3.50	3

(a) Write down the formula of weighted mean. 1

(b) What is difference between weight and frequency? 2

(c) Determine the GPA of the student. 3

(d) Determine the geometric mean for the data and evaluate suitability. 4

7. **A student walks 3 hours at 5 km per hour (kph), 4 hours at 4 kph, and 2 hours at 3 kph**

(a) When is harmonic mean suitable? 1

(b) Which means could we use for the given data and why? 2

(c) Find the average speed using weighted harmonic mean. 3

(d) Find the average speed using another method and mathematically show their relationship. 4

8. **A clyclist moves around a square-shaped lake with the speeds 20, 25, 30, and 16 km per hour.**

(a) What is grouped data? 1

(b) Is arithmetic mean suitable for this data? 2

(c) Find the average speed of the cyclist. 3

(d) Can we use some other formula for finding the average? Demonstrate. 4

3.2 Short Questions

Chapter 4

Measures of Dispersion

4.1 Creative Questions

1. **Temperatures of two cold regions for five days are as below:**

   City A: 2, 1, -1, 0, 3

   City B: 3, 0, -2, 2, 3

   (a) What is standard deviation?? 1

   (b) Is standard deviation of a set of negative values negative? Justify mathematically. 2

   (c) Find Mean Deviation about mean of the values of city A. 3

   (d) Which city has more consistent weather? Verify statistically. 4

4.2 Short Questions

Chapter 5

Moments, SKewness, and Kurtosis

5.1 Creative Questions

1. **The arithmetic and geometric means of the first and third quartiles of a distribution are 10 and 8, respectively. The second quartile is 10.**

   (a) What is the formula suggested by Pearson to find skewness? 1

   (b) Which moments are useful in measuring central tendency and dispersion? 2

   (c) Find skewness from the stem using a suitable formula. 3

   (d) Which method of finding skewness od you think is the best and why? 4

2. **For a particular data set, Median = 120, Mode = 110, Standard Deviation = 4, and Coefficient of Variation (CV) = 3.2**

   (a) Why is CV used? 1

   (b) Find arithmetic mean.. 2

   (c) Find skewness according to Pearson's method (SK_P) 3

   (d) Does (SK_P) convey the proper idea about the data as to the given information? Justify. 4

1. **US Dollar exchange (to taka) in Bangladesh since 1980 to 2005 (after each 5 years) were:**
   16, 31, 36, 40, 52, 64

   (a) What are moments? 1

   (b) Which moment is equal to the variance? Show mathematically. 2

   (c) Find, from the stem, the first and second raw moments about 1. 3

   (d) Find skewness and kurtosis of and explain. 4

2. **The first four moments about 3 of a distribution are -1, 5, -10, and 120.**

   (a) What are moments used for? 1

   (b) Can the second central moment be greater than the third central moment? 2

   (c) Find the second and third moments about arithmetic mean of the distribution. 3

   (d) Find skewness and kurtosis and comment on the values. 4

3. **Marks obtained by a student in 7 subjects are**

   70, 66, 55, 45, 80, 30, 82

   (a) What is negative skewness? 1

   (b) Draw graphs of positive and negative skewness showing the locations of mean and median. 2

   (c) Determine the five number summary from the stem and explain. 3

   (d) Are the data symmetric? If not, comment on the pattern of data. 4

4. **United Nations Children's Fund (UNICEF) is an agency of the United Nations responsible for providing humanitarian and developmental aid to children worldwide. A UNICEF researcher collected heights of 7 children for a project, and the heights are**

   2.2, 2.15, 1.9, 3.1, 2.7, 3.0, 3.5

   (a) Which value are central moments estimated around? 1

   (b) Moments around origin (0) are central moments - Comment. 2

   (c) Find the first central moment. 3

   (d) Find the skewness of the data and interpret. 4

5. **A researcher wants to compare average life time of people in Bangladesh and other countries. He collected life time of 10 people in Bangladesh.**

   75, 62, 63, 72, 66, 76, 59, 77, 70, 79

   (a) What is symmetry? 1

   (b) Mathematically show the theoretical value of the first central moment. 2

   (c) Compute the 2nd, 3rd, and 4th central moments of the data. 3

   (d) Estimate skewness and kurtosis and explain. 4

5.2 Short Questions

Chapter 6

Correlation and Regression

6.1 Creative Questions

6.2 Short Questions

Chapter 7

Time Series

7.1 Creative Questions

1. **GDP (in bn. US$ PPP) of Bangladesh since 1980 to 1985 according to an estimate of International Monetary Fund: 41.2, 47.4, 52.0, 56.5, 61.0, 65.3**

   (a) What is time series data? 1

   (b) What are the components of a time series model? 2

   (c) Determine the 3-yearly moving average from the data. 3

   (d) Find trend of the data using another method (other than (c)), plot both, and comment which is better. 4

2. **Annual sales of company are as given in the following**

Year	2010	2011	2012	2013	2014	2015	2016
Profit (million)	40	45	46	53	65	70	73

   (a) What is a trend? 1

   (b) Do the data in the stem seem to have a trend? 2

   (c) Find the trend using semi-average method. 3

   (d) Find the trend using 2-yearly moving average method. Would it better if we used 3-yearly method? 4

3. **Income of a freelancer in 6 successive months (from Jan to Jun) was found to be 46.0, 49.5, 51.5, 50.6, 56.5, and 60 (in thousands BDT.).**

   (a) What is time series data? 1

   (b) What are the components of a time series model? 2

   (c) Determine the 3-monthly moving average from the data. 3

   (d) Draw the moving averages on a graph paper and interpret. 4

7.2 Short Questions

Chapter 8

Published Statistics in Bangladesh

8.1 Creative Questions

8.2 Short Questions

Conclusion

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