**Quantitative Techniques for Business 1**

**Answer scheme**

1. What is a statistical survey?

Survey or investigation is statistical when it is conducted by using statistical methods.

1. What do you mean by coefficient of variation?

The coefficient of variation (CV) is the ratio of the standard deviation to the mean. The higher the coefficient of variation, the greater the level of dispersion around the mean.

1. What is Random Sampling?

Random sampling is a part of the sampling technique in which each sample has an equal probability of being chosen.

1. What are statistical units?

One in terms of which the investigator counts or measures the variables or attributes selected for enumeration, analysis and interpretation.

1. Define Tabulation.

The process of placing classified data into tabular form is known as tabulation. A table is a symmetric arrangement of statistical data in rows and columns. Rows are horizontal arrangements whereas columns are vertical arrangements.

1. Define Statistics in the singular and plural sense.

The word statistics is used both as singular and as plural. The singular statisticsis the science of collection, presentation, analysis and interpretation of numerical data. The plural statistics refers to numerical facts or observations collected with a definite purpose.

1. What are quartiles?

Quartiles are the values that divide a list of numbers into quarters. The first quartile (Q1) is defined as the middle number between the smallest number and the median of the data set. The second quartile (Q2) is the median of the data. The third quartile (Q3) is the middle value between the median and the highest value of the data set.

1. What is combined mean? How is it computed?

A combined mean is **a mean of two or more separate groups**.

X= x 1 + x 2 /N1+ N2

1. Define Geometric Mean.

 The geometric mean is defined as the [*n*th root](https://en.wikipedia.org/wiki/Nth_root)of the [product](https://en.wikipedia.org/wiki/Product_(mathematics)) of *n* numbers, i.e., for a set of numbers *x*1, *x*2, ..., *xn*, Ascertain the value of median if mean is 30 and mode is 28

1. Ascertain the value of median if mean is 30 and mode is 28

Median=28.6

1. What is Skewness. What are the different types of skewness.

Sets of data that are not symmetric are said to be asymmetric. The measure of how asymmetric a distribution can be is called skewness.

Positively skewed

Negatively skewed

1. Find Q3 from the following series: 10, 12, 27, 18, 8, 20

Q3 = value of 3(N+1/4)th item

Ascending order = 8,10,12,18,20,27

= 3 (6+1)/ 4 = 5.25th item

5th item + 0.5 (6th item – 5th item)

20+ 0.5(27-20) = **23.5**

**Section B(10 X 2 =marks)**

*Answer any 6 questions. Each question carries 5 marks.*

13.List out the differences between primary data and secondary data.

Answer : **Primary data is raw information collected by researchers for a specific purpose.** Secondary data is information obtained by studying the reports of other researchers.

When researchers conduct primary research, they are collecting data in response to a specific question, or in accordance with a specific objective. They may conduct surveys or focus groups. They may run experiments, or record direct observations about a test subject. They may hold interviews and ask questions about the specific issues their study is designed to address. When researchers conduct secondary research, however, they do not collect any original data of their own but rely instead on the survey results, interview recordings or experimental outcomes collected by others.

The advantages of collecting primary data is that it is easy to tailor the study to a specific end. The researchers can focus only on the issues which pertain to the study. They can also control the quality of the study, and know that their findings are accurate. The disadvantage of primary research is that it is costly and time consuming. The main advantages of secondary research are that it is quick and relatively inexpensive.

#### 14.Explain the functions of statistics.

Answer : 1. To Present Facts in Definite Form:

2. Precision to the Facts:

3. Comparisons:

4. Formulation and Testing of Hypothesis:

5. Forecasting:

6. Policy Making:

7. It Enlarges Knowledge:

8. To Measure Uncertainty:

15.Explain how Lorenz Curve is used to study dispersion.

Answer: Graphic method of measuring dispersion or variability in a distribution.

Procedure:

1.The size of the items and the frequencies are to be cumulated

2.Percentage calculation for cumulated values of size and frequencies.

3.Plot the cumulated percentage values of variables (Y-axis) against the percentage of the corresponding cumulated frequencies(X-axis)

4.Join these points with a smooth freehand curve and this curve is known as Lorenz curve.

5. Diagonal line – line of equal distribution. .

16. Find the missing frequency if mean is 28. Also find median.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Marks | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
| No: of students | 12 | 18 | 27 | ? | 17 | 6 |

Ans:

|  |  |  |  |
| --- | --- | --- | --- |
| Class | `X | F | Fx |
| 0-10 | 5 | 12 | 60 |
| 10-20 | 15 | 18 | 270 |
| 20-30 | 25 | 27 | 675 |
| 30-40 | 35 | X | 35X |
| 40-50 | 45 | 17 | 765 |
| 50-60 | 55 | 6 | 330 |
|  |  | N=80+X | ∑fx= 2100+35X |

Mean= ∑fx/N 28 = 2100+35x/80+x

28(80+x) = 2100+35x

2240+28x= 2100+35x

2240-2100= 35x-28x

140= 7x; 7x = 140

X= 140/7 = 20

Frequency class = 30-40 = 20

Calculation of median

|  |  |  |
| --- | --- | --- |
| X | F | CF |
| 0-10 | 12 | 12 |
| 10-20 | 18 | 30 |
| 20-30 | 27 | 57 |
| 30-40 | 20 | 77 |
| 40-50` | 17 | 94 |
| 50-60 | 6 | 100 |

M = size of N/2 th item = 100/2 = 50

Median lies in the class 20-30

M= L1 + L2-L1/f (m-c) 20+ 10/27 (20)

M= 20+7.41 = **27.41**

17.Essential characteristics of an ideal average.

Answer : **Simplicity, Representation, Rigidly Defined, Algebraic Treatment, Clear and Stable definition, Absolute Number**

18.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | 25 |  | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| frequency | 50 |  | 70 | 80 | 180 | 70 | 30 | 20 | 10 |

Mode = highest frequency class **40**

19.Mean and standard deviation of 100 items was found to be 60 and 5 respectively. Later on it was discovered that a correct item 50 was wrongly copied as 30. Find the correct mean and standard deviation.

Answer : Corrected mean= 60.20

Corrected ∑ X square = 364100

Corrected mean= 60.20

Corrected SD=4.118

20.Calculate mean deviation from mean and its coefficient:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Age (above) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| No: of patients | 200 | 180 | 150 | 100 | 50 | 30 | 10 | 0 |

Answer : Mean=31yrs

MD=13yrs

Coefficient of MD = 0.419

21.Calculate beta coefficient of skewness and kurtosis from the following : 2, 3, 7, 8, 10.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **X** | **(X-A)d** | **d2** | **d3** | **d4** |
| 2 | -5 | 25 | -125 | 625 |
| 3 | -4 | 16 | -64 | 256 |
| **7 (A)** | 0 | 0 | 0 | 0 |
| 8 | 1 | 1 | 1 | 1 |
| 10 | 3 | 9 | 27 | 81 |
|  | ∑d= 5 | ∑ **d2 =51** | ∑ **d3= -161** | ∑ **d4=963** |

1. **µ’1=** ∑d /N= -5/5= -1
2. **µ’2=** ∑ **d2 /N = 51/5 =10.2**
3. **µ’2 =** ∑ **d3/N = -161/5 = -32.2**
4. **µ’3=** ∑ **d4 /n = 963/5 = 192.6**

Calculation of central moments

1. **µ1 = µ’1- µ’1 = (-1) – (-1)= 0**
2. **µ2 = µ’2 – (µ’1)2 = 10.2- (-1)2 = 9.2**
3. **µ3= µ’3- 3 µ’2 \* µ’1 + 2 (µ’1)3= 3.6**
4. **µ’4 = µ’4 – 4 µ’3\* µ’1 + 6 µ’2(µ’1)2 – 3(µ’1)4 = 122**

Calculation of co-efficient of skewness and kurtosis

1. β= µ32/ µ23 = -3.62/9.23 = 12.96/778.688= 0.017
2. Jf fishers co-efficient of skewness = +- √ **µ32/ µ23**

√0.0166 = **-0.129**

**Method 2**

Jf= **µ3/ SD3 -3.6/27.9 =** -0.129

SD = √ **µ2 =** √9.2= 3.033 and SD3 = 27.9

1. β2 = **µ4/ µ22= 122/9.22 = 122/84.64 = 1.441**

**Section C**

22.Techniques of data collection:

i) census method

ii) Sampling method

1. Random Sampling

* Simple random sampling
* Complex random sampling
* Stratified sampling
* Systematic sampling
* Multistage sampling
* Cluster sampling

1. Non- random sampling

* Convenience sampling
* Judgement sampling
* Quota sampling
* Snowball sampling
* Sequential sampling
* Multiphase sampling

23.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks less than | No: of students | ∆1 | ∆2 | *∆3* | ∆4 |
| 20 | 5 |  |  |  |  |
| 40 | 31 | 26 |  |  |  |
| 60 | 116 | 85 | 59 |  |  |
| 80 | 170 | 54 | -31 | -90 |  |
| 100 | 200 | 30 | -24 | 7 | 97 |

X = 48-20/ 20 = 1.4

Y48 = 5 +36.4 + 16.52 + 5.04 + 2.1728

=65.1328

No: of students getting less than 48% = 65

No: of students getting less than 60 % = 116

Therefore, no: of students getting B grade (above 48% but less than 60%) = 116 -65 =51.

24.

i) Coefficient of Variation

Town A= 5.71 Town B = 4.84

Greater variability in Town A

ii) Total income

Town A =1,05,000

Town B = 93,000

Town A mobilises more income

iii) Combined std deviation = 11.017

25.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Value | m | f | d | d’ | f d’ |
| 0-10 | 5 | 4 | -30 | -3 | -12 |
| 10-20 | 15 | 12 | -20 | -2 | -24 |
| 20-30 | 25 | 24 | -10 | -1 | -24 |
| 30-40 | 35 | 36 | 0 | 0 | 0 |
| 40-50 | 45 | 20 | 10 | 1 | 20 |
| 50-60 | 55 | 16 | 20 | 2 | 32 |
| 60-70 | 65 | 8 | 30 | 3 | 24 |
| 70-80 | 75 | 5 | 40 | 4 | 20 |
|  |  | N= 125 |  |  | ∑f d’ = 36 |

Mean = 35 + 36/125 \*10 = 37.88