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Question 1st

Find averages (A.M, G.M, H.M) of the following table (s) also justify their logical relationships?

A.

Number of children per family	Number of families
1	4
2	13
3	9
4	4
5	1

B.

marks	frequency
0 – 9	2
10 – 19	31
20 – 29	73
30 – 39	85
40 – 49	28

Solution 1st "A" For Ungrouped Data

Arithmetic Mean:

Class	Frequency	fx
1	4	4
2	13	26
3	9	27
4	4	16
5	1	5

$$\overline{X} = \frac{\Sigma fx}{\Sigma f} = \frac{78}{31} = 2.516$$

Geometric Mean:

Class	Frequency	logx	flogx
1	4	0	0
2	13	0.3010	3.3913
3	9	0.4771	4.2939
4	4	0.6020	2.408
5	1	0.6989	0.6989

$$\overline{X} = antilog\ \frac{\Sigma fi\ logx}{\Sigma f} = antilog\ \frac{10.7921}{31} = antilog\ 0.3481 = 2.229$$

Harmonic Mean:

Class	Frequency	f/x
1	4	4

2	13	0.15
3	9	3
4	4	1
5	1	0.2
	Σf = 31	

$\overline{X} = \frac{31}{8.35} = 3.712$

Solution 1st "B" For Grouped Data

Arithmetic Mean:

Marks	Frequency	Med Point	logx	flogx
0 – 9	2	4.5	0.6532	1.3064
10 – 19	31	14.5	1.1613	36.0003
20 – 29	73	24.5	1.3891	101.4043
30 – 39	85	34.5	1.5378	130.713
40 – 49	28	64.5	1.8095	320.09
	Σf = 219			

$$\text{fx} = \frac{\Sigma\text{fx}}{\Sigma\text{f}}$$

$$\text{fx} = \frac{6985.5}{219} = 31.89$$

Geometric Mean:

Marks	Frequency	Med Point	Fx
0 – 9	2	4.5	9
10 – 19	31	14.5	449.5
20 – 29	73	24.5	1788.5
30 – 39	85	34.5	2932.5
40 – 49	28	64.5	1806
	Σf = 219		Σfx = 6985.5

$\overline{X} = antilog \frac{\Sigma f\ logx}{\Sigma f} = antilog \frac{320.09}{219} = antilog\ 1.4615$

Harmonic Mean:

Marks	Frequency	Med Point	f/x
0 – 9	2	4.5	0.44
10 – 19	31	14.5	2.131
20 – 29	73	24.5	2.97
30 – 39	85	34.5	2.46
40 – 49	28	64.5	0.43
	Σf = 219		Σf/x = 8.43

$$\overline{X} = \frac{\Sigma f}{\Sigma f/x} = \frac{219}{8.43} = 25.97$$

Question 2nd

Find Median & Mode of the following tables

A.

Number of children per family	Number of families
1	4
2	13
3	9
4	4
5	1

B.

marks	frequency
0 – 9	2
10 – 19	31
20 – 29	73
30 – 39	85
40 – 49	28

Solution 1st "A" Mode for Ungrouped Data.

Number of children per family	Number of families
1	4
2	13
3	9
4	4
5	1

Data is One Modal and its 4

Solution 1st "B" Mode for Grouped Data.

marks	frequency
0 – 9	2
10 – 19	31
20 – 29	73
30 – 39	85
40 – 49	28

$$\text{Mode} = l + \frac{fm - f1}{(fm - f1)(fm - f2)} \times \frac{\iota}{h}$$

$$= 29.5 + \frac{85-73}{(85-73)(85-28)} \times 9$$

$$= 29.5 + \frac{12}{(85-73)(85-28)} \times 9$$

$$= 29.5 \times \frac{12}{12 \times 57} \times 9$$

$$= 29.5 \times \frac{12}{684} \times 9$$

$$= 29.5 \times (0.0175 \times 9)$$

$$= 29.5\ 0.1575$$

$$= 29.65 \sim 30$$

Solution 1st "A" Median for Ungrouped Data.

Number of children per family	Number of families
1	4
2	13
3	9
4	4
5	1

$$\frac{n+1}{2} = \frac{5+1}{2} = \frac{6}{2} = 3$$

Solution 1st "B" Median for Grouped Data.

marks	frequency
0 – 9	2
10 – 19	31
20 – 29	73
30 – 39	85
40 – 49	28

$$\frac{n+1}{2} = \frac{219+1}{2} = \frac{220}{2} = 110$$

$$M = l + \frac{h}{f}\left(\frac{n}{2} - c\right)$$

$$= 29.5 + \frac{9}{85}\left(\frac{219}{2} - 106\right)$$

$$= 29.5 + 0.1059\ (109.5 - 106)$$

$$= 29.5 + 0.1059\ (3.5)$$

$$= 29.5 + 0.3706$$

$$= 29.87$$

Question 3rd

a. Find Semi Quartile Range & Semi Inter Quartile Range of Q2(a)

Solution 3rd "A" Sami Quartile Range & Semi Inter Quartile Range

Class	Frequency	Cumulative Frequency
1	4	4
2	13	17
3	9	26
4	4	30
5	1	31

Q_1 size of $\left(\frac{n+1}{2}\right)$ the items: Q_3 Size of $\left(\frac{3n+1}{4}\right)$ the items:

$$\frac{5+1}{4} = \frac{6}{4} = 1.5 \qquad \left(\frac{(3\times5)+1}{4}\right) = \frac{16}{4} = 4$$

Q_1 = 1.5 **Q_3 = 4**

SIQ = Q3 – Q1

$$\mathbf{= 4 - 1.5 = 2.5}$$

SIQ = 2.5

b. Find Variance and Co-efficient of variance of Q2(a)

Solution 3rd "B" Variance & Co-efficient of Variance

n	x	X^2
1	4	16
2	13	169
3	9	81
4	4	16
5	1	1
	$\Sigma x=31$	$\Sigma x^2=283$

For Ungrouped Data: Variance

$$\text{Variance} = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2$$

$$= \frac{283}{5} - \left(\frac{31}{5}\right)^2$$

$$= 56.6 - (6.2)^2$$

$$= 56.6 - 38.44$$

$$= 18.16$$

For Ungrouped Data Standard Deviation:

$$\text{Standard Deviation} = \sqrt{18.16}$$

$$= 4.261$$

Co-efficient of Variance:

$$\text{C.V} = \frac{\textit{Standard Deviation}}{\textit{Arithmetic Mean}}$$

$$\text{A.M} = \frac{\Sigma x}{n} = \frac{31}{5} = 6.2$$

$$= \frac{4.261}{6.2}$$

$$\text{C.V} = 0.687$$

Question 3rd

Question no 4-part A: Write down the short notes on the followings:

 Range

 Quartile Range

 Semi Inter Quartile Range

 Variance

 Standard Deviation

 Coefficient of Variation

Answer:

Range:

Values can occur between the smallest and largest values in a set of observed values or data points. Given a set of values, or data points, the range is determined by subtracting the smallest value from the largest value.

On a typical test, there is a range between 0 and 100. The range of possible test values is the largest value (100) minus the smallest value (0): 100–0=100. Thus, the possible value range for a typical exam is 100.

Quartile Range: A quartile is a type of quantile which divides the number of data points into four more or less equal parts, or quarters. The first quartile (Q1) is defined as the middle number between the smallest number and the median of the data set. It is also known as the lower quartile or the 25th empirical quartile and it marks where 25% of the data is below or to the left of it (if data is ordered on a timeline from smallest to largest). The second quartile (Q2) is the median of a data set and 50% of the data lies below this point. The third quartile (Q3) is the middle value between the median and the highest value of the data set. It is also known as the upper quartile or the 75th empirical quartile and 75% of the data lies below this point. Due to the fact that the data needs to be ordered from smallest to largest to compute quartiles, quartiles are a form of Order statistic.

Semi Inter Quartile Range: The semi-interquartile range is one-half the difference between the first and third quartiles. It is half the distance needed to cover half the scores. The semi-interquartile range is affected very little by extreme scores. This makes it a good measure of spread for skewed distributions. It is obtained by evaluating Q3−Q12. Since half the scores in a distribution lie between Q3 and Q1, the semi-interquartile range is 1/2 the distance needed to cover 1/2 the scores. In a symmetric distribution, an interval stretching from one semi-interquartile range below the median to one semi-interquartile above the median will contain 1/2 of the scores. This will not be true for a skewed distribution, however.

The semi-interquartile range is little affected by extreme scores, so it is a good measure of spread for skewed distributions. However, it is more subject to sampling fluctuation in normal distributions than is the standard deviation and therefore not often used for data that are approximately normally distributed.

Variance: Variance (σ^2) in statistics is a measurement of the spread between numbers in a data set. That is, it measures how far each number in the set is from the mean and therefore from every other number in the set.

Variance is calculated by taking the differences between each number in the data set and the mean, then squaring the differences to make them positive, and finally dividing the sum of the squares by the number of values in the data set.

Standard deviation: Standard deviation is the measure of dispersion of a set of data from its mean. It measures the absolute variability of a distribution; the higher the dispersion or variability, the greater is the standard deviation and greater will be the magnitude of the deviation of the value from their mean.

Standard deviation is a statistical measurement in finance that, when applied to the annual rate of return of an investment, sheds light on the historical volatility of that investment. The greater the standard deviation of securities, the greater the variance between each price and the mean, which shows a larger price range. For example, a volatile stock has a high standard deviation, while the deviation of a stable blue-chip stock is usually rather low.

Calculate Standard Deviation
Standard deviation is calculated as:

1. The mean value is calculated by adding all the data points and dividing by the number of data points.
2. The variance for each data point is calculated, first by subtracting the value of the data point from the mean. Each of those resulting values is then squared and the results summed. The result is then divided by the number of data points less one.
3. The square root of the variance—result from no. 2—is then taken to find the standard deviation.

Coefficient of Variation: The **coefficient of variation** (CV) refers to a statistical measure of the distribution of data points in a data series around the mean. It represents the ratio of the standard deviation to the mean. The coefficient of variation is a helpful statistic in comparing the degree of variation from one data series to the other, although the means are considerably different from each other.
As expressed by Investopedia, the CV enables the determination of assumed volatility as compared to the amount of return expected from an investment. Putting it simple, a lower ratio of standard deviation to mean return indicates a better risk-return trade off.

Formula for Coefficient of Variation

Being calculated as the ratio of standard deviation to the mean, the coefficient of variation is computed using the following formula:

Coefficient of Variation = Standard Deviation / Expected Return