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CORE CONCEPT OF

BUSINESS MATHMATICS & STATISTICS

1. What is the Coefficient of variation (C.V.)?
2. Briefly illustrate the Skewness?
3. What is the Symmetrical distribution?
4. Illustrate the Type of Skewness.
5. What do you mean by Asymmetrical distribution?
6. Describe the Positively Skewed distribution.
7. Point out the Negatively Skewed distribution.

Coefficient of Variation

Coefficient of variation calculates the standard deviation from a set of observation as Percentage of the arithmetic mean.

C.V. = S.D.*100/mean

C.V. = σ*100/$\bar{x}$

Skewness

Skewness in a set of data relates to the shape of the histogram which could be drawn from the data. The Literal meaning of the word Skewness is 'lack of symmetry'. If frequency distribution on either side of the central value is not symmetrical, it will be called skewness.

Definition-

1) "Skewness is the tendency of a distribution to depart from normal in the balance of its two sides." – Blair
2) "A distribution is said to be skewed when the mean and median fall at different points in the distribution, and balance is shifted to one side or the other."-Garrett

Types of Skewness

1) Symmetrical distribution
2) Asymmetrical distribution

A) **Symmetrical distribution-** in this distribution frequencies increase and decrease in a regular order, the spread of frequencies will be the same on both side of the centre point. In this distribution the value of Mean, Median and Mode are equal.

B) **Asymmetrical distribution-**In this distribution there is no uniformity or regularity in the order of increase and decrease of frequencies. This distribution may be two types-

1) **Positively Skewed distribution-** A distribution on which more than half of the area under the normal curve is to the right side of the mode is a positively skewed distribution. In this distribution mean is greater than the median and median is greater than the mode **($\bar{x}$>M>Z).**
2) **Negatively Skewed distribution-** A distribution on which more than half of the area under the normal curve is to the left side of the mode is a negatively skewed distribution. In this distribution mean is less than the median and median is less than the mode **($\bar{x}$<M<Z).**

Measures of Skewness

1) Karl Pearson coefficient of Skewness (J_k)= $\left[\bar{x} - \frac{Z}{\sigma}\right]$ **or (**Mean-Mode)/S.D.
2) Bowley's coefficient of Skewness(J_Q)= $\frac{Q3+Q1-2M}{Q3-Q1}$

Example 13- Calculate Karl Pearson's Coefficient of skewness:-

Wages (More than)	5	15	25	35	45	55	65	75	85
No. of Workers	120	105	96	85	72	58	32	12	0

Solution 13: - A=50

C.I.	f	x	dx(x-A)	fdx	(fdx)2
5-15	15	10	-40	-600	24000
15-25	9	20	-30	-270	8100
25-35	11	30	-20	-220	4400
35-45	13	40	-10	-130	1300
45-55	14	50	0	0	0
55-65	26	60	10	260	2600
65-75	20	70	20	400	8000

75-85	12	80	30	360	10800
	120		**-40**	**-200**	**59200**

1) S.D= $\sqrt{\frac{\Sigma f dx2}{N} - \left(\frac{\Sigma fdx}{N}\right)^2}$ (2) $\bar{x}$ =A+$\left(\frac{\Sigma fdx}{N}\right)$ (3) Mode-Z=$L1 + \left[\frac{f1-f0}{2*f1-f0-f2}\right] * i$

S.D= $\sqrt{\frac{59200}{120} - \left(\frac{-200}{120}\right)^2}$ $\bar{x}$ =50+$\left(\frac{-200}{120}\right)$ Z=55 $+ \left[\frac{26-14}{2*26-14-20}\right] * 10$

S.D= $\sqrt{493.33 - (1.67)^2}$ $\bar{x}$ =50+(-1.67) Z=55 $+ \left[\frac{12}{52-34}\right] * 10$

S.D= $\sqrt{493.33 - 2.79}$ $\bar{x}$ =50-1.67 Z=55 $+ \left[\frac{120}{18}\right]$ =55+6.67

S.D.= $\sqrt{490.54}$ $\bar{x}$ **=48.33** **Z=61.67**

S.D.=22.15

$(J_k) = \left[\bar{x} - \frac{Z}{\sigma}\right]$ $=\left[\mathbf{48.33} - \frac{\mathbf{61.67}}{22.15}\right]$

$\mathbf{J_k} = \left[\frac{\mathbf{-13.34}}{22.15}\right]$

J_K=-0.602 Ans

Example 14: - Calculate Bowley's coefficient of Skewness (J_Q).

x	32-40	40-48	48-56	56-64	64-72
f	2	3	4	8	3

Solution- 14:

x	**f**	**c.f.**
32-40	2	2
40-48	3	5
48-56	4	9
56-64	8	17
64-72	3	20
	20	

m =N/2 items =20/2=10 items

Median-- M= $L1 + \left[\frac{m-cfo}{f}\right] * i$

$= 56 + \left[\frac{10-9}{8}\right] * 8$

$= 56 + \left[\frac{1}{8}\right] * 8$

$=56 + 1$

M=57

First Quartile (Q_1) = $L1 + \left[\frac{q1-cfo}{f}\right] * i$ q_1= (N*1)/4 items = 20/4=5item

Q1= $40 + \left[\frac{5-5}{3}\right] * 8$

$= 40 + \left[\frac{0}{3}\right] * 8$

$= 40 + 0$

Q1= 40

Third Quartile (Q_3)= $L1 + \left[\frac{q3-cfo}{f}\right] * i$ q_3= (N*3)/4 = (20*3)/4 = 60/4= 15 items

Q_3= $56 + \left[\frac{15-9}{8}\right] * 8$

$= 56 + [15 - 1.13] * 8$

$= 56 + [13.87] * 8$

= 56+110.96

Q_3 = 166.96

Bowley's Skewness (J_Q) = $\left[\frac{Q3+Q1-2M}{Q3-Q1}\right]$

$= \left[\frac{166.96+40-2*57}{166.66-40}\right]$

$= \left[\frac{206.66-114}{126.66}\right]$ J_Q= $\left[\frac{92.66}{126.66}\right]$ **J_Q= 0.73**