MEASURES OF CENTRAL TENDENCY

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MEASURES OF CENTRAL TENDENCY

- Mean … the average observation
- Median … the value that lies in the middle after ranking all the observation
- Mode … the most frequently occurring observation

MEAN

The arithmetic average obtained by adding up all the observations and dividing by the total number of observations.

$$\bar{x} = \frac{\sum x}{n}$$

MEAN(GROUPED DATA)

For grouped data firstly we convert information of class limits in form of mid points. We assumed that the observation in each class is identical with class midpoints .The formula of mean is given below

$$\bar{x} = \frac{\sum fx}{n}$$

Where

f=frequency in each class

x=class mark of each class

n=total number of observation($\sum f$)

MEAN(CHANGE OF ORIGIN AND SCALE)

To reduce the computational labor and to save time, a change of origin and scale can be made. If x denotes the mid points ,'a' an arbitrary origin(usually chosen the class mid point) and h denotes the class interval.

Let $x_i = a + hu_i$

Then $\bar{x} = a + h\bar{u}$

COMBINED MEAN

If k subgroups of data consisting of $n_1, n_2, n_2 \ldots\ldots n_k, (n = \sum n_i)$ observations has respective mean $\bar{x}_1, \overline{x}_2, \overline{x}_3, \ldots\ldots \bar{x}_k$, then $\bar{x}_c$, the mean for all the data, is given by

$$\bar{x}_c = \frac{n_1\bar{x}_1 + n_2\bar{x}_2 + \cdots + n_k\bar{x}_k}{n_1 + n_2 + \cdots + n_k}$$

$$\bar{x}_c = \frac{\sum n_i\bar{x}_i}{n} \qquad (i = 1, 2, 3, \ldots\ldots\ldots, k)$$

MEDIAN

This measure divides a group of numbers into two parts, with half the numbers below the median and half above it.

To find the median of a group of items:

1) Rank the items.
2) If the number of items is odd, the median is the middle item in the list.
3) If the number of items is even, the median is the mean of the two middle numbers

QUESTION 1

An engineer uses a thermocouple to monitor the temperature of a stable reaction. The ordered values of 24 observations (Courtesy of Scott Sanders), in tenths of ◦C, are 1.11, 1.21, 1.21, 1.21, 1.23, 1.24, 1.25, 1.25, 1.27, 1.27, 1.28, 1.29, 1.31, 1.31, 1.31, 1.32, 1.34, 1.34, 1.35, 1.36, 1.36, 1.36, 1.36, and 1.36.

Find the Median.

MEDIAN(GROUPED DATA)

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

$where\ n = \sum f$

$l =$ lower class boundary of the median class

$h =$class interval

$f =$frequency of the median class

$c =$cumulative frequency corresponding to the group preceding median class

MODE

The mode of a data set is the value that occurs the most often. If a distribution has two modes, then it is called bimodal.

MODE(GROUPED DATA)

$$mode = l + \frac{(f_m - f_1)}{(f_m - f_1) + (f_m - f_2)} h$$

Where

l = lower class boundary of the modal class

h =class interval

f_m =frequency of the modal class

f_1 = frequency corresponding to the group preceding modal class

f_1 = frequency corresponding to the group following modal class

QUESTION 2

The frequency distribution of 80 determinations of the daily emission (in tons) of sulfur oxides from an industrial plant is given below. Find the Mean, Median and Mode.

Class Limits	Frequency
5-8.9	3
9-12.9	10
13-16.9	14
17-20.9	25
21-24.9	17
25-28.9	9
29-32.9	2
Total	80

which measure

of central tendency

best describes the data?

SUMMARY OF WHEN TO USE THE MEAN, MEDIAN AND MODE

Type of Variable	Best measure of central tendency
Nominal	Mode
Ordinal	Median, Mode
Interval/Ratio (not skewed)	Mean
Interval/Ratio (highly skewed)	Median