Statistics Notes

B.Tech. CSE

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1 Measures of Central Tendency

1. Mean
2. Median
3. Mode

1.1 Mean

It is the ratio of sum of all the observations to the total number of observations. let $x_1, x_2, \ldots, x_n$ be all the observations. then:

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

1.1.1 Properties of Mean

- The sum of deviation of observations from mean is always zero
- the sum of square of deviations of observations is minimum as compared to any other measure.
- suppose there are two sequences:

	Series 1	Series 2
Number of observations	n_1	n_2
mean of the observations	$\overline{x}_1$	$\overline{x}_2$

then

$$\overline{x} = \frac{n_1 x_1 + n_2 x_2}{n_1 + n_2}$$

Problem 1

If there are 5 and 8 number of observations of 2 series with mean 15 and 18, find the combined mean

Solution:
We can get the solution by taking the weighted mean of the two sequences.
so the required mean is :

$$\frac{5 \times 15 + 8 \times 18}{5 + 8}$$
$$= \frac{75 + 144}{13}$$
$$= \frac{219}{13}$$

$$= 16.846154$$

Problem 2

Class	frequency
0-10	3
10-20	5
20-30	7
30-40	4
40-50	1

Solution:
change of origin:

Class	frequency	X	d=X-A	f·d
0-10	3	5	-20	
10-20	5	15	-10	
20-30	7	25	0	
30-40	4	35	10	
40-50	1	45	20	

$$\overline{x} = A + \frac{\sum fd}{n}$$

change of scale

Class	frequency	X	d=X/n	f·d
0-10	3	1	-20	
10-20	5	3	-10	
20-30	7	5	0	
30-40	4	7	10	
40-50	1	9	20	

$$\overline{x} = A + \frac{\sum fd}{n}$$

1.2 Median

Steps to find Median in case of Discrete and continuous data:

1. Arrangement of data
2. if n is odd then the median is the $\frac{n+1}{2}$th term
3. if n is even then the median is the mean of the $\frac{n}{2}$th term and $\frac{n}{2} + 1$th term

Problem 3

find the median for the data :

1. 9,9,10,10,12,13,15
2. 9,9,10,10,12,13,14,15

Solution:

1. 9,9,10,10,12,13,15 has 7 elements. Therefore our median will be the 4th term in the arranged order
   $\therefore Median = 10$
2. 9,9,10,10,12,13,14,15 has 8 elements. Therefore our median will be the mean of the 4th and 5th terms.
   $\therefore Median = \frac{10+12}{2} = 11$

Problem 4

Finding the median of discrete data.

X	f	cf(cumulative frequency)
1	5	5
2	8	13
3	9	22
4	**12**	**34**
5	6	40
6	7	47
7	4	51
Total	51	

find the value of x which has cumulative frequency just greater than $\frac{n}{2}$

In case of continuous data:

$$Median = l + \frac{\left(\frac{n}{2} - cf\right)}{f}$$

where cf is the cumulative frequency and f is the frequency of the chosen class

fundamentals of mathematical statistics by SC Gupta and VK Kapoor Probability and statistics by walpaul

1.3 Mode