

## Measures of Central tendency: مقاييس النزعة المركزية

### 1- Arithmetic mean ( $\bar{X}$ ):

#### a) Unorganized data

If  $X_1, X_2, \dots, X_n$  are values of a particular phenomenon, then the arithmetic mean  $\bar{X}$  of these values is defined as follows:

$$\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{n} = \frac{\sum_{i=1}^n X_i}{n}$$

Ex: Find the arithmetic mean for the values 7, 8, 18, 5.

sol.

since  $\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$ ,  $n=4$  then

$$\bar{X} = \frac{7+8+18+5}{4} = \frac{32}{4} = 8$$

#### b) Organized data

If  $X_1, X_2, \dots, X_k$  are the class centers of distribution table of a particular phenomenon and  $f_1, f_2, \dots, f_k$ ,  $k=1, \dots, n$  are frequencies

of those classes, then the arithmetic mean is defined as follows:

$$\bar{X} = \frac{f_1 X_1 + f_2 X_2 + \dots + f_k X_k}{f_1 + f_2 + \dots + f_k} = \frac{\sum_{i=1}^k X_i f_i}{\sum_{i=1}^k f_i}$$

EX, Find the mean of the data in the following

frequency table.

classes	Frequency	$X_i$	$X_i \cdot f_i$
10-19	2	14.5	29
20-29	4	25.5	98
30-39	5	34.5	172.5
40-49	8	44.5	356
50-59	6	54.5	327
	$\sum_{i=1}^5 f_i = 25$		$\sum_{i=1}^5 X_i f_i = 982.5$

sol: since  $f_i = \sum_{i=1}^n f_i = \sum_{i=1}^5 f_i = 25$

$X_i f_i = \sum_{i=1}^n X_i f_i = \sum_{i=1}^5 X_i f_i = 982.5$

$\bar{X} = \frac{\sum_{i=1}^n X_i f_i}{\sum_{i=1}^n f_i} = \frac{\sum_{i=1}^5 X_i f_i}{\sum_{i=1}^5 f_i} = \frac{982.5}{25} = 39.3$

#

Ex(2) The following data represent the degrees which one of students got it, and the number of weekly hours for each subject. And require to find the arithmetic mean or a rate of degrees of this student.

Degree	80	85	70	78	90	96	65
Weeks hours	3	2	4	3	2	3	2

Sol. Q-11B)

$$X_i = 80$$

$$f_i = 3$$

$$\bar{X} = \frac{\sum_{i=1}^n X_i f_i}{\sum_{i=1}^n f_i} \Rightarrow \bar{X} = \frac{\sum_{i=1}^7 X_i f_i}{\sum_{i=1}^7 f_i}$$

$$\bar{X} = \frac{3(80) + 2(85) + \dots + 2(65)}{3 + 2 + \dots + 2} = 80.15$$

Median (M)

It's a value that take the midst rank after arrange the values through studied (data) as

ascending or descending arrange.

Examples (مثالين)

1) A median of number group.

3, 4, 4, 5, 6, 8, 8, 10, 10 is 6

2) A median of number group

5, 5, 7, 9, 11, 12, 15, 18 is  $10 = \frac{9+11}{2}$

In general, A median  $V_{n,k}(R)$  is

$$R = \frac{n+1}{2}$$

Hence a median is midst value (if a number of vocabulars is odd).

And median is a mean two midst value (if a number of vocabulars is even).

Examples: If the following data represent the lengths by centimeter. find a median.

111, 114, 102, 116, 113, 106, 110

Sol: first arranged the values ascending then

get it =

(102, 106, 110, 111, 113, 114, 116) the number

data is odd then  $n = 7$

$$R = \text{median order} = \frac{n+1}{2} = \frac{7+1}{2} = 4$$

so median  $(M) = 111$ ,  $R = 4$  order

#

Ex: Find a median for the following data.

9, 8, 7, 12, 10, 13, 15, 17

sol: first arranged the vocabulary descending.

(17, 15, 13, 12, 10, 9, 8, 7) number data  
is even  $\rightarrow n = 8$

$$R = \frac{n+1}{2} = \frac{8+1}{2} = 4.5, \quad \frac{n}{2} = \frac{8}{2} = 4$$

$\therefore (M) =$  An average of two medium values  
(fourth and five rank).

$$\therefore M = \frac{10+12}{2} = 11$$

7, 8, 9, 10, 12, 13, 15, 17  
1 2 3 4 5 6 7 8

$$\frac{n}{2} + 1 = \frac{8}{2} + 1 = \frac{8+2}{2} = \frac{10}{2} = 5$$

$$M = \frac{10+12}{2} = \frac{22}{2} = 11$$