MARUDHAR KESARI JAIN COLLEGE FOR WOMEN, VANIYAMBADI

PG & RESEARCH DEPARTMENT OF MATHEMATICS

CLASS   **:**   **I – B.A. ECONOMICS**

SUBJECT CODE   **:**   **23UEC12**

SUBJECT NAME   **:**   **STATISTICS FOR ECONOMICS –I**

SYLLABUS

UNIT- III

Measures of Central Tendency

       Measures of Central Tendency- Requisites of a Good Average – Arithmetic Mean, Median, and Mode – Relative Merits and Demerits.

MEAN, MEDIAN, MODE :-

Def : Arithmetic mean (individual Type - I
Series)

Arithmetic mean is the total of the values of the items divided by their number.

Methods of finding Arithmetic mean :-

1. Direct method :

$$\bar{x} = \frac{\Sigma x}{N}$$

where, $\bar{x}$ = mean

Σx = Sum of variables

N = no. of. observations

2. Shortcut method :-

$$\bar{x} = A \pm \frac{\Sigma d}{N} \qquad d = x - A$$

where, A = Assumed mean

Σd = sum of deviations

N = no. of observations

Problems :-

1. calculate mean from the following data 48, 50, 60, 22, 26.

$$\bar{X} = \frac{\Sigma x}{N}$$

$$= \frac{48 + 50 + 60 + 22 + 26}{5}$$

$$= \frac{206}{5} = 41.2$$

2. calculate mean from the following data

R. No :	1	2	3	4	5	6	7	8	9	10
Marks :	40	50	55	78	58	60	73	35	43	48

Soln :-

R. No	Marks
1	40
2	50
3	55

4	78
5	58
6	60
7	73
8	35
9	43
10	48
	$\Sigma x = 540$

Here, $N = 10$

$$\bar{x} = \frac{\Sigma x}{N}$$

$$= \frac{540}{10}$$

$$\bar{x} = 54$$

3. The expenditure of 10 families in rupees are given below

Family : A B C D E F G H I J

Expenditure: 30 70 10 75 500 8 42 250 40 36

calculate the Airthmetic mean.

Soln :-

Family	Expenditure
A	30
B	70
C	10
D	75

E	500
F	8
G	42
H	250
I	40
J	36

$$\Sigma \mathcal{L} = 1061$$

$$\bar{x} = \frac{\Sigma x}{N}$$

Here, $N = 10$

$$= \frac{1061}{10}$$

$$= 106.1$$

4. The monthly income of 12 families in a town is given below

S. No :	1	2	3	4	5	6	7	8	9
Income :	280	180	96	98	104	85	80	94	100

	10	11	12
	75	600	200

Soln:

S. No	Income
1	280
2	180
3	96
4	98
5	104
6	85
7	80
8	94
9	100
10	75
11	600
12	200
	$\Sigma x = 1992$

Here, N = 12

$$\bar{x} = \frac{\Sigma x}{N}$$

$$= \frac{1992}{12}$$

$$= 166$$

Type-II Discrete Series :-

The formula for finding A.M is

$$A.M = \bar{x} = \frac{\Sigma fx}{N} \quad (or) \quad \bar{X} = \frac{\Sigma fx}{\Sigma f}$$

Here, $(N = \Sigma f)$

Problems :-

1. calculate the mean no. of. persons per house.

No. of. persons per house	2	3	4	5	6	Total
No. of. houses	10	25	30	25	10	100

Soln :-

Let x - no. of. persons per house

f - no. of. houses

x	f	fx
2	10	20
3	25	75
4	30	120
5	25	125
6	10	60
	N=100	$\Sigma fx = 400$

mean:

$$\bar{X} = \frac{\Sigma fx}{N}$$

$$= \frac{1100}{100}$$

$$= 11$$

2. calculate the A.M for the following data.

Age in yrs	8	10	12	15	18
no. of. workers	5	7	12	6	10

soln:

Let x = Age in yrs , f = no. of. workers

x	f	fx
8	5	040
10	7	070
12	12	144
15	6	90
18	10	180
	$\Sigma f = 40$	$\Sigma fx = 524$

$$\bar{X} = \frac{\Sigma fx}{N}$$

$$= \frac{524}{40}$$

$$= 13.1 \text{ years}$$

calculate mean from the following data.

value : 1 2 3 4 5 6 7 8

Frequency : 21 30 28 40 26 34 40 9

9 10

15 57

soln :-

x	f	fx
1	21	21
2	30	60
3	28	84
4	40	160
5	26	130
6	34	204
7	40	280
8	9	72
9	15	135
10	57	570
$\Sigma f = 300$		$\Sigma fx = 1716$

Mean :-

$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{1716}{300}$$

$$\bar{x} = 5.72$$

Type - IV continuous Series

In continuous Series frequency distribution the mean can be calculated by any of the following methods.

i) Direct method

ii) Shortcut method

iii) Step - deviation method

i) Direct method :-

The formula for A.M is

$$\bar{x} = \frac{\Sigma fm}{N}$$

where, $N = \Sigma f$

m = mid point

ii) Shortcut method :-

The Formula for arithmetic mean is

$$\bar{X} = A \pm \frac{\Sigma fd}{\Sigma f} \qquad (N = \Sigma f)$$

where, A = Assumed mean

Σfd = Sum of total deviation

N = Total frequency

iii) Step deviation method :-

$$\bar{X} = A \pm \frac{\Sigma fd'}{N} \times C$$

Problem 1 →

From the following find out the mean profit.

Profit per shop	Frequency No. of shops
100 - 200	10
200 - 300	18
300 - 400	20

400 - 500		26
500 - 600		30
600 - 700		28
700 - 800		18

Soln :-

$$\frac{100+200}{2} = \frac{300}{2} = 150$$

Profit Rs.	Mid point (m)	No. of shops (f)	fm
100 - 200	150	10	1500
200 - 300	250	18	4500
300 - 400	350	20	7000
400 - 500	450	26	11,700
500 - 600	550	30	16,500
600 - 700	650	28	18,200
700 - 800	750	18	13,500
		$\Sigma f = 150$	$\Sigma fm = 72,900$

Direct method :-

$$\overline{x} = \frac{\Sigma fm}{N}$$

$$= \frac{72900}{150}$$

$$= 486$$

Shortcut method :-

$$\bar{x} = A \pm \frac{\Sigma fd}{\Sigma f}$$

$\frac{100+200}{2}$ $150 - 450 = -300$

Profits	m	d = m-A	f	fd
100 - 200	150	-300	10	-3000
200 - 300	250	-200	18	-3600
300 - 400	350	-100	20	-2000
400 - 500	450 (A)	0	26	0
500 - 600	550	100	30	3000
600 - 700	650	200	28	5600
700 - 800	750	300	18	5400
			$\Sigma f = 150$	$\Sigma fd = 5400$

$$\bar{x} = A \pm \frac{\Sigma fd}{N}$$

$$= 450 + \frac{5400}{150}$$

$$= 486$$

Step deviation method :

$$\bar{X} = A \pm \frac{\Sigma f d'}{N} \times C$$

Profits	m	$d' = \dfrac{m - A}{100}$	f	fd'
100 - 200	150	-3	10	-30
200 - 300	250	-2	18	-36
300 - 400	350 (A)	-1	20	-20
400 - 500	(450)	0	26	0
500 - 600	550	1	30	30
600 - 700	650	2	28	56
700 - 800	750	3	18	54
			$\Sigma f = 150$	$\Sigma f d' = 54$

$A = \dfrac{100 + 200}{2}$ $\qquad C = \dfrac{150 - 450}{100}$

$$\bar{X} = A \pm \frac{\Sigma f d'}{N} \times C$$

$$= 450 + \frac{54}{150} \times 100$$

$$= 486$$

Problem 2 →

Value	300-350	350-400	400-450	450-500
Frequency	15	10	10	5

Soln:- 381.25

Direct method :-

value	frequency	mid point	fm
300-350	15	325	4875
350-400	10	375	3750
400-450	10	425	4250
450-500	5	475	2375
	$\Sigma f = 40$		$\Sigma fm = 15,250$

$$\bar{X} = \frac{\Sigma fm}{N}$$

$$= \frac{15,250}{40}$$

$$= 381.25$$

Shortcut method:-

value	m	$d = m - A$	f	fd
300 - 350	325	-50	15	-750
350 - 400	375 (A)	0	10	0
400 - 450	425	50	10	500
450 - 500	475	100	5	500
			$\Sigma f = 40$	$\Sigma fd = 250$

$$\bar{x} = A \pm \frac{\Sigma fd}{N}$$

$$= 375 + \frac{250}{40}$$

$$= 381.25$$

Step - deviation method:-

$$\bar{x} = A \pm \frac{\Sigma fd'}{N} \times c$$

values	m	$d^1 = \dfrac{m - A}{100}$	f	fd^1
300 – 350	325	– 0.5	15	– 7.5
350 – 400	(375) A	0	10	0
400 – 450	425	0.5	10	5
450 – 500	475	1	5	5
			$\Sigma f = 40$	$\Sigma fd^1 = 2.5$

$$\bar{X} = A \pm \frac{\Sigma fd^1}{N} \times c$$

$$= 375 + \frac{2.5}{40} \times 50$$

$$= 375 + 0.06 \times 50$$

$$= 375 + 3$$

$$= 378$$

Type - IV continuous Series less than cumulative frequency

Problems :-

1. calculate the mean height

Height below	150	155	160	165	170	175	180
No. of. Soldiers	0	23	77	152	266	419	472

	185
	500

Soln :-

Height below	No. of. Soldiers	Height (cms)	No. of. (f) Soldiers
150	0	150 - 155	23 - 0 = 23
155	23	155 - 160	77 - 23 = 54
160	77	160 - 165	152 - 77 = 75
165	152	165 - 170	266 - 152 = 114
170	266	170 - 175	419 - 266 = 153
175	419	175 - 180	472 - 419 = 53
180	472	180 - 185	500 - 472 = 28
185	500	185 - 190	$\Sigma f = 500$

Mid value (m)	$d' = \dfrac{m-A}{c}$	fd'
152.5	-3	-69
157.5	-2	-108
162.5	-1	-75
167.5 A	0	0
172.5	1	153
177.5	2	106
182.5	3	84
		$\Sigma fd' = 91$

Note above columns: $\dfrac{150+155}{2}$, $\dfrac{152.5-167.5}{5}$

$$\text{Mean } \bar{x} = A \pm \frac{\Sigma fd'}{\Sigma f} \times c$$

$$= 167.5 + \frac{91}{500} \times 5$$

$$= 167.5 + 0.91$$

$$\bar{x} = 168.41 \text{ cm}$$

2.

calculate Arithmetic mean:

Height below	10	20	30	40	50	60	70
No. of. soldiers	0	12	23	32	45	62	73

41.16

soln :-

Height below	No. of. soldiers	Height (cms)	No. of. soldiers (f)
10	0	10 - 20	12 - 0 = 12
20	12	20 - 30	23 - 12 = 11
30	23	30 - 40	32 - 23 = 9
40	32	40 - 50	45 - 32 = 13
50	45	50 - 60	62 - 45 = 17
60	62	60 - 70	73 - 62 = 11
70	73		
			Σf = 73

mid value (m) $\xrightarrow{\frac{10+20}{2}}$	$d' = \dfrac{m-A}{\boxed{C}}$ $\xrightarrow{\frac{15-45}{10}}$	fd'
15	-3	-36
25	-2	-22
35	-1	-9
(45) ^{A}	0	0
55	1	17
65	2	22
		$\Sigma fd' = -28$

$$\bar{X} = A \pm \frac{\Sigma fd'}{\Sigma f} \times C$$

$$= 45 - \frac{28}{73} \times 10$$

$$= 41.16$$

Type - V continuous Series more than
cumulative frequency

Problem :-

1. calculate the Arithmetic mean from the following data.

Weight below	20	25	30	35	40
No. of. boys	160	145	100	50	9

Soln :-

weight below	No. of. boys	weight (Kgs)	No. of. boys
20	160	20-25	160 - 145 = 15
25	145	25-30	145 - 100 = 45
30	100	30-35	100 - 50 = 50
35	50	35-40	50 - 9 = 41
40	9	40-45	9
			$\Sigma f = 160$

mid value (m)	$d' = \dfrac{m - A}{c}$	fd'
22.5	-2	-30
27.5	-1	-45
32.5 ^{A}	0	0
37.5	1	41
42.5	2	18
		$\Sigma fd' = -16$

$$\bar{X} = A \pm \frac{\Sigma fd'}{\Sigma f} \times c$$

$$= 32.5 - \frac{16}{160} \times 5$$

$$\bar{X} = 32 \ kgs$$

Median :-

Def. Median is the value of the middle most item. When all the items are in the order of magnitude.

M – Median (or) M_e

Problems :-

N – odd number

1. Find median from the following

6, 9, 21, 5, 7, -2, 0, 52, 9

Soln :-

Values in ascending order

→ Median

-2, 0, 5, 6, ⑦, 9, 9, 21, 52

Position of median is $\dfrac{N+1}{2}$

$$\Rightarrow \dfrac{9+1}{2}$$

$$\Rightarrow \dfrac{10}{2}$$

$$\Rightarrow 5 - item$$

Median = 7

2. Find the median

5, 8, 12, 22, 10, 7, 6.

Soln :

    Values in ascending order

$$5, 6, 7, \textcircled{8}, \overset{\rightarrow \text{Median}}{10}, 12, 22$$

    Position of median is $\dfrac{N+1}{2}$

$$= \dfrac{7+1}{2}$$

$$= \dfrac{8^4}{2_1} - \text{item}$$

    Median = 8

3. Find median

                                                  N - even number

57, 58, 61, 42, 38, 65, 72, 66.

Soln :

    Values in ascending order

$$38, 42, 57, \underset{}{\overset{\overset{58+61}{2} \rightarrow \text{Median}}{\boxed{(58, 61)}}}, 65, 66, 72$$

    Position of median is $\dfrac{N+1}{2}$

$$= \dfrac{8+1}{2}$$

$$= \dfrac{9}{2} = 4.5 - \text{item}$$

$$\begin{array}{r} 4.5 \\ 2\overline{)9} \\ 8 \\ \overline{10} \\ 10 \\ \overline{0} \end{array}$$

$$= \frac{58+61}{2}$$

$$= 59.5$$

$$\begin{array}{r} 58 \\ 61 \\ \hline 119 \end{array} \qquad \begin{array}{r} 59.5 \\ 2\,\overline{)119} \\ \underline{10\downarrow} \\ 19 \\ \underline{18} \\ 10 \\ \underline{10} \\ 0 \end{array}$$

4. Find the median

10, 17, 25, 41, 60, 45, 32, 19, 1

Soln :

values in ascending order

1, 10, 17, 19, (25), 32, 41, 45, 60

Position of median is $\frac{N+1}{2}$

$$\partial = \frac{9+1}{2}$$

$$= \frac{10^{5}}{2^{1}}$$

Median = 25

Discrete Series

$$Median = Size \ of \ \left(\frac{N+1}{2}\right)^{th} item$$

Problems:-

1. Find the median from the following data.

x	5	5.5	6	6.5	7	7.5	8
f	10	16	28	15	30	40	34

Soln:-

x	f	Cf
5	10 →	10
5.5	16	$(10+16) = 26$
6	28	$(26+28) = 54$
6.5	15	$(54+15) = 69$
⑦ →Median	30	$(69+30) = ⑨⑨$
7.5	40	$(99+40) = 139$
8	34	$(139+34) = 173$
	$\Sigma f = 173$	

$$\text{Median} = \text{Size of } \left(\frac{N+1}{2}\right)^{th} \text{item}$$

$$N = 173$$

$$\frac{N+1}{2} = \frac{(73+1)}{2}$$

$$= \frac{174}{2}$$

$$= 87$$

Size of (87th) item

Median = 7

2. Find the median from the following data

x	0	1	2	3
f	1	2	5	3

Soln:.

x	f	Cf
0	1 →	1
1 Median→	2	(1+2) = 3
②	5	(3+5) = ⑧
3	3	(8+3) = 11
	$\Sigma f = 11$	

Median = Size of $\left(\frac{N+1}{2}\right)^{th}$ item

$$N = 11$$

$$\frac{N+1}{2} = \frac{11+1}{2}$$

$$= \frac{12}{2}$$

$$= 6$$

Size of $(6)^{th}$ item

Median = 2

continuous Series :-

The formula for finding median is

$$M = L + \frac{\frac{N}{2} - cf}{f} \times c$$

where, L = Lower limit of the median class

f = frequency of the median class

cf = cumulative frequency of median class

c = class interval of median class

Problems

Calculate the median from the following data.

marks	10-25	25-40	40-55	55-70	70-85
f	6	20	44	26	3

marks	85-100
f	1

Soln :-

Marks	f	Cf
10 -25	6	6
25 -40	20	(20+6) = 26
40 - 55	44	(26+44) = 70
55 - 70	26	(70+26) = 96
70 - 85	3	(96+3) = 99
85 -100	1	(99+1) = 100
	$\Sigma f = 100$	

$$\text{Median} = 1 + \frac{\frac{N}{2} - cf}{f} \times C$$

$$= 40 + \frac{50 - 26}{44} \times 15$$

$$= 48.18$$

$L = 40 \quad f = 44 \quad cf = 26$

$N = \Sigma f \qquad \Sigma f = 100 \qquad \frac{N}{2} = \frac{100}{2} = 50$

2. Marks $\overset{-.5 \quad +.5}{10-19}$ $20-29$ $30-39$ $40-49$ $50-59$

60-69 70-79 80-89 90-99

f 7   15   18   25   30

20   16   7   2

Soln:-

Marks	f	cf
9.5 - 19.5	7	7
19.5 - 29.5	15	(7+15) = 22
29.5 - 39.5	18	(22+18) = 40

39.5 - 49.5	25	(40+25)=(65)
(49.5) - 59.5	(30)	(65+30)=95
59.5 - 69.5	20	(95+20) = 115
69.5 - 79.5	16	(115 +16) = 131
79.5 - 89.5	7	(131+ 7) =138
89.5 - 99.5	2	(138+ 2) = 140

$$\Sigma f = 140$$

$$M = \ell + \frac{\frac{N}{2} - cf}{f} \times c$$

$$= 49.5 + \frac{\frac{140}{2} - 65}{30} \times 10$$

$$= 51.16$$

3. Mid value 115 125 135 145 155 165

175 185 195

F: 6   25   48   72   116   60

38   22   3

Soln:-

C.I	Mid value	f	cf
110 – 120	115	6	6
120 – 130	125	25	(6+25)=31
130 – 140	135	48	(31+48)=79
140 – 150	145	72	(79+72)=(151)
(150)– 160	155	(116)	(151+116)=267
160 – 170	165	60	(267+60)=327
170 – 180	175	38	(327+38)=365
180 – 190	185	22	(365+22)=387
190 – 120	195	3	(387+3)=390

$$\Sigma f = 390$$

$$M = L + \frac{\frac{N}{2} - Cf}{f} \times c$$

$$= 150 + \frac{\frac{390}{2} - 151}{116} \times 10$$

$$= 150 + \frac{195 - 151}{116} \times 10$$

$$= 153.79$$

Less than type →

calculate Median :-

1.

Age (less than)	10	20	30	40	50	60	70	80
No. of. persons	4	16	40	76	96	112	120	125

Soln:-

Age (less than)	No. of. persons (f)	C. I	f	cf
10	4	(1-10)	4	4
20	16	(10-20)	12	16
30	40	(20-30)	24	40
40	76	(30-40)	36	76
50	96	(40-50)	20	96
60	112	(50-60)	16	112
70	120	(60-70)	8	120
80	125	(70-80)	5	125
			$\Sigma f = 125$	

$$M = L + \frac{\frac{N}{2} - Cf}{f} \times C$$

$$= 30 + \frac{\frac{125}{2} - 40}{36} \times 10$$

$$= 30 + \frac{62.5 - 40}{36} \times 10 \qquad = \frac{30 + 22.5}{36} \times 10$$

$$= 36.25$$

More than Type →

1. Find median Annual profits (more than

Annual profits	0	4	8	12	16
No. of years	50	35	25	15	6

Soln :-

Annual profits (more than)	No. of years	C .I	f	cf
0	50	0 - 4	15	15
4	35	4 - 8	10	25
8	25	8 - 12	10	35
12	15	12 - 16	9	44
16	6	-	6	50
			$\Sigma f = 50$	

$$M = L + \dfrac{\dfrac{N}{2} - Cf}{f} \times C$$

$$= 4 + \dfrac{\dfrac{50}{2} - 15}{10} \times 4$$

$$= 4 + \dfrac{25 - 15}{10} \times 4 = \underline{4 + 4} = 8$$

2.

value (more than)	5	10	15	20	25	30
	35	40	45	50		
f	250	240	210	170	100	40
	25	15	5	0		

Soln :

Values	frequency	C.I	f	cf
5	250	5 - 10	10	10
10	240	10 - 15	30	40
15	210	15 - 20	40	80
20	170	20 - 25	70	150
25	100	25 - 30	60	210
30	40	30 - 35	15	225
35	25	35 - 40	10	235
40	15	40 - 45	10	245
45	5	45 - 50	5	250
50	0	—	0	250
			$\Sigma f = 250$	

$$\frac{N}{2} = 125$$

$$M = L + \frac{\frac{N}{2} - cf}{f} \times C$$

$$= 20 + \frac{(125 - 80)}{70} \times 5 = 23.21$$

Merits of median :-

* It is easy to compute and easy to understand.

* It eliminates the effect of extreme items.

* Median can be calculated even from qualitative phenomena.

That is (i.e) honesty, character, etc.

* It is further used for algebraic process.

* Its value generally lies in the distribution.

Demerits of median :-

* Where the no. of. items is large pre-requisite process.

i.e, array the items is a difficult process.

* It ignores the extreme items.

* In case of continuous series, the median is estimated but not calculated.

MODE :-

Def. Mode is defined as the value of variable which occurs more frequency in a distribution.

Types of mode :-

* If there is only one mode in the series, it is called <u>unimodal</u>.

* If there are two modes, it is called <u>bimodal</u>.

* If there are three modes, it is called <u>trimodal</u>.

* If there are more than three modes, it is called <u>multimodal</u>.

Individual Series :-

Problems :-

1. Find the mode, 850, 750, 600, 825, 850, 725, 600, 850, 640, 530.

Soln :-

Mode = 850

Therefore, 850 occurs three times

This is unimodal.

2. Find the mode 40, 44, 57, 78, 48.

Soln :-

There is no mode.

3. Find the mode 45, 55, 50, 45, 40, 55, 45, 45.

Soln :-

Mode = 45

Therefore, 45 occurs four times

This is unimodal

Discrete Series:

We cannot depend on the method of inspection to find out the mode. It is suggested to prepare a grouping table and an analysis table to find out the mode.

Steps for the calculation of mode:-

i) Preparing a grouping table with six column.

ii) Write the size of the item in the margin.

iii) In column 1; Write the frequency against the respective items

iv) In column 2, the frequencies are grouped into two's.

i.e; ~~one~~ 1 & 2, 3 & 4, 5 & 6 and so on.

v) In column 3, the frequencies are grouped into two's leaving the first frequency.

i.e; 2 & 3, 4 & 5, 6 & 7 and so on.

vi) In column 4, the frequencies are grouped in three's.

i.e; 1, 2 & 3, 4, 5 & 6 and so on.

vii) In column 5, the frequencies are grouped in three's leaving the first frequency.

i.e; 2, 3 & 4, 5, 6 & 7 and so on.

viii) In column 6, the frequencies are grouped in three's leaving the first two frequencies.

i.e; 3, 4 & 5, 6, 7 & 8 and so on.

Problems:

1. calculate the mode from the following data.

Size	10	11	12	13	14	15	16	17	18
f	10	12	15	19	20	8	4	3	2

Soln:-

Grouping table

(1,2) (2,3) (1,2,3) (2,3,4) (3,4,5)

Size	C_1	C_2	C_3	C_4	C_5	C_6
10	10	10+12 = 22				
11	12		12+15 = 27	10+12+15 = 37		
12	15	15+19 = 34			12+15+19 = 46	
13	19		19+20 = 39	19+20+8 = 47		15+19+20 = 54
14	20	20+8 = 28			20+8+4 = 32	
15	8		8+4 = 12			
16	4	4+3 = 7				8+4+3 = 15
17	3		3+2 = 5	4+3+2 = 9		
18	2					

Analysis table :

Size	C_1	C_2	C_3	C_4	C_5	C_6	Total
10	10						
11	12				1		→ 1
12	15	1			1	1	→ 3
(13)	19	1	1	1	1	1	→ (5)
14	20		1	1		1	→ 3
15	8			1			→ 1
16	4						
17	3						
18	2						

∴ The mode is 13.

continuous series :

The formula for mode is

$$z = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$$

where, z = mode

L = lower limit of the modal class

f_0 = frequency of the class preceding the modal class

f_1 = frequency of modal class

f_2 = frequency of the class succeeding the modal class

c = class interval

Problems :-

1. Compute the mode from the following series

Size of item	0-5	5-10	10-15	15-20	20-25
	25-30	30-35	35-40	40-45	
f	20	24	32	28	20
	16	34	10	8	

Soln :-

Grouping table :-

Size	c_1	c_2 (1,2)	c_3 (2,3)	c_4 (1,2,3)	c_5 (2,3,4)	c_6 (3,4,5)
0-5	20	20+24 = 44		20+24+32 = 76		
5-10	24		24+32 = 56		24+32+28 = 84	
10-15	32	32+28 = 60				32+28+20 = 80
15-20	28		28+20 = 48	28+20+16 = 64		
20-25	20	20+16 = 36			20+16+34 = 70	
25-30	16		16+34 = 50			16+34+10 = 60
30-35	34	34+10 = 44		34+10+8 = 52		
35-40	10		10+8 = 18			
40-45	8					

Analysis table:.

Size	c_1	c_2	c_3	c_4	c_5	c_6	Total
0-5	20				1		→1
5-10	24 f_0		1	1	1		→3
10-15	(32) f_1	1	1	1	1	1	→(5)
15-20	28 f_2	1			1	1	→3
20-25	20					1	→1
25-30	16						
30-35	34						
35-40	10						
40-45	8						

$$Z = 1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$$

$$= 10 + \frac{32 - 24}{2(32) - 24 - 28} \times 5$$

$$= 10 + \frac{8}{12} \times 5$$

$$= 13.333$$

Measures of central Tendency :- (Averages).

Average is a value which is typical or representative of a set of data.

The Average is sometimes describes as number which is typical of the whole group.

Merits of Mean :-

* It is easy to understand.

* It is easy to calculate.

* If provides a good basis for comparison.

* It is based on the value of every item in the series.

* It is rigidly defined.

* It is unrealistic.

* It may led to a false conclusion.

* It cannot be located by observation or the graphical method.

* It cannot be accurately determined even if one of the value is not known.

Merits of mode :-

* It is simple and precious

* It is the most representative average.

* The value of mode can be determined by the graphic method.

* It is easy to understand as well as easy to calculate.

* It is usually and actual value as it occurs more frequently in the series.

* It is not affected by extreme values as in the average.

Demerits of mode :-

* It is not suitable for further mathematical treatment.

* It is stable only when the sample is large.

* It will not give the aggregate value as in average.

* It may not give weight to extreme item.

1. Mean 78, Median 72, find mode?

Soln :.

$$Mean - Mode = 3(Mean - Median)$$

$$78 - Mode = 3(78 - 72)$$

$$78 - Mode = 3(6)$$

$$-Mode = 18 - 78$$

$$+Mode = +60$$

$$Mode = 60$$

2. Mean = 62, Mode = 70, find Median?

Soln :.

$$Mean - Mode = 3(Mean - Median)$$

$$62 - 70 = 3(62 - Median)$$

$$-8 = 186 - 3\,Median$$

$$-8 - 186 = -3\,Median$$

$$-194 = -3\,Median$$

$$\frac{194}{3} = Median$$

$$Median = 64.66$$