COST L3

AM AND HM

Revision

AM and Median of Frequency Distribution and Grouped Data

Arithmetic Mean

- Class Mark – Mid point of class

Median

- Cumulative Frequency
- Median class (class for which *c.f.* is just > $\frac{N}{2}$) $\mathrm{N} = \sum f$

Mode for the grouped data

Modal Class- The class interval with maximum frequency

$$\text{Mode} = l_1 + \left\{(l_2 - l_1)\left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)\right\}$$

Where,

l_1= *lower class boundary of the modal class*

l_2= *upper class boundary of the modal class*

f_0= *frequency of the class preceding modal class*

f_1= *frequency of the modal class*

f_2= *frequency of the class succeeding modal class*

Mode for grouped data

Viewing time (mins)	No of students *f*	
9.3-9.7	2	
9.8-10.2	5	
10.3-10.7	12	$f0$
10.8-11.2	17	$f1$
11.3-11.7	14	$f2$
11.8-12.2	6	
12.3-12.7	3	
12.8-13.2	1	

$$\text{Mode} = l_1 + \left\{(l_2 - l_1)\left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)\right\}$$

Modal Class- The class interval with maximum frequency

$f0$ — $Frequencycy\ preceeding\ modal\ class$

$f1$ — $Highest\ frequency$

$f2$ — $Frequencycy\ succeeding\ modal\ class$

Modal Class

l_1= 10.8

l_2 =11.2

Mode = ????

Question

Viewing time (mins)	No of students
300-399	14
400-499	46
500-599	58
600-699	76
700-799	68
800-899	62
900-999	48
1000-1099	22
1100-1199	6

- Find MODE

Geometric Mean

- *G.M. of N observations* $X_1, X_2 \ldots\ldots X_n$ *is denoted by* G *and defined as-*

$$G.M = G = \sqrt[N]{X_1.X_2.X_3 \ldots\ldots X_n}$$

$$= (X_1.X_2.X_3 \ldots\ldots X_n)^{\frac{1}{N}}$$

- *Consider a data with N observations* $X_1, X_2 \ldots\ldots X_n$ *occurring with the frequencies* $f_1, f_2 \ldots f_n$*, then GM is denoted by* G *and is defined as-*

$$G.M = G = \sqrt[N]{(X_1)^{f_1}.(X_2)^{f_2} \ldots\ldots (X_n)^{f_n}}$$

Where N= $\sum f$

Question

Define G.M. How to calculate it? Find the G.M. of –

250, 12, 4.5, 119.5, 42, 35.4, 75, 30

Solution:

$$G.M = G = \sqrt[N]{X_1.X_2.X_3..... X_n}$$

$$= (X_1.X_2.X_3..... X_n)^{\frac{1}{N}}$$

$$= (250 \text{ x } 12 \text{ x } 4.5 \text{ x } 119.5 \text{ x } 42 \text{ x } 35.4 \text{ x } 75 \text{ x } 30)^{\frac{1}{8}}$$

Question

Find GM of following-

Marks	0-10	10-20	20-30	30-40	40-50
No of students	5	7	15	25	8

Solution:

$$G.M = G = \sqrt[N]{(X_1)^{f_1}.(X_2)^{f_2} \ldots\ldots (X_n)^{f_n}}$$

Where N= $\sum f$

Solution

$$G.M = G = \sqrt[N]{(X_1)^{f_1}.(X_2)^{f_2} \ldots\ldots (X_n)^{f_n}}$$

Where N= $\sum f$

Marks
0-10
10-20
20-30
30-40
40-50

Harmonic Mean

H.M. of N observations X_1, X_2…… X_n is denoted by H and defined as-

$$H = \frac{N}{\frac{1}{X_1} + \frac{1}{X_2} + \cdots \frac{1}{X_n}}$$

Consider a data with N observations X_1, X_2…… X_n occurring with the frequencies f_1, f_2…f_n, then HM is denoted by H and is defined as-

$$H = \frac{N}{\frac{f_1}{X_1} + \frac{f_2}{X_2} + \cdots \frac{f_n}{X_n}}$$

Where N= $\sum f$

Question

1. Cities A, B and C are equidistant from each other. A motorist travels from A to B at 30 mph, from B to C at 40 mph and from C to A at 50 mph. Determine his average speed.

Solution :

$$H = \frac{N}{\frac{1}{X_1} + \frac{1}{X_2} + \cdots \frac{1}{X_n}}$$

Question

2. An aeroplane travels distances of 2500, 1200 and 500 miles at speeds 500, 400 and 250 mph respectively. Find HM of the speed.

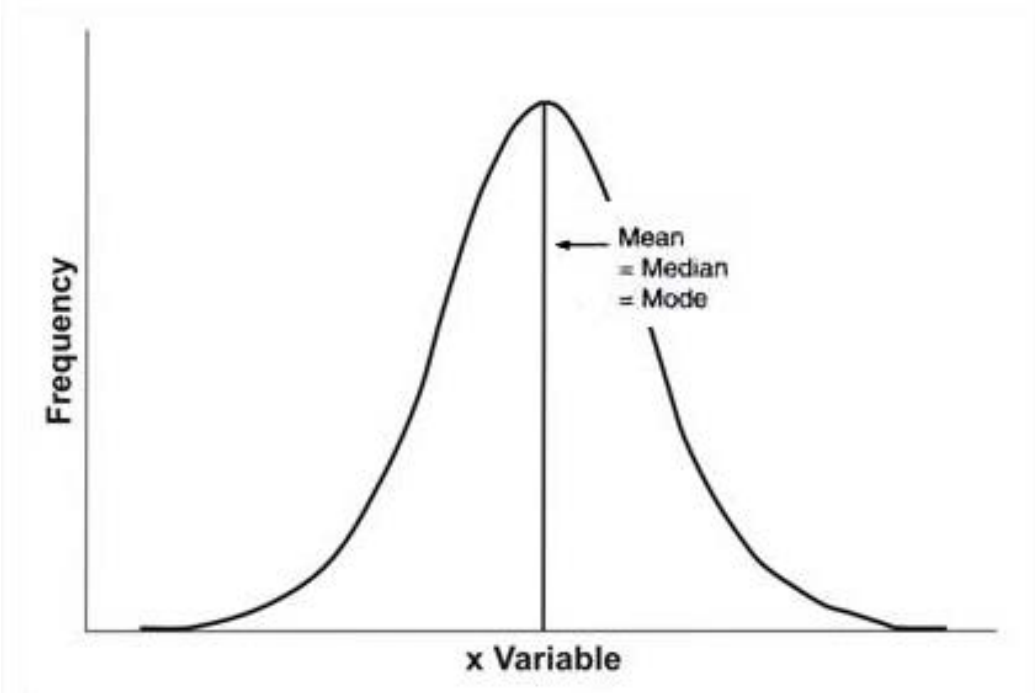
$$H = \frac{\sum f}{\frac{f_1}{X_1} + \frac{f_2}{X_2} + \cdots \frac{f_n}{X_n}}$$

$$= \frac{2500 + 1200 + 500}{\frac{2500}{500} + \frac{1200}{400} + \frac{500}{250}}$$

Empirical Relation between Mean, Median and mode

If a frequency distribution graph is having a **symmetrical frequency curve**, the mean, median, and mode will be equal.

Mean= Median= Mode



Empirical Relation between Mean, Median and mode

If a frequency distribution graph is having an **asymmetrical frequency curve, then**

$$\boldsymbol{Mode = 3\ Median\ - 2\ Mean}$$

Or

$$\boldsymbol{Mean - \ Mode = 3\ (Mean - \ Median\ )}$$