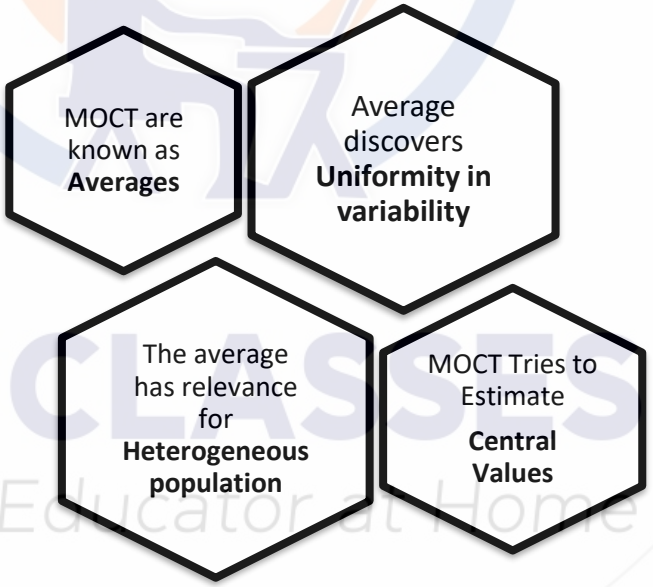
MOCT

Practical Cum Theory

- Measures of central tendency is the central location **(Central Value)** of the observations
- Weighted averages are considered when all the observations are not of equal importance
- Simple average is sometimes called **Un-weighted average**
- Each value is considered only once for **Simple average**
- Each value is considered as many times as it occurs for **Weighted average**
- Multiplying the values of the variables by the corresponding weights and then dividing the sum products by the sum of weights is **Weighted average**
- **Simple** average is obtained on dividing the total of a set of observations by their number
- Frequencies are generally used are **Weights**

Points to Remember

Logical



Just Learn It

- The **correction factor** is applied in **Exclusive type of distribution**
- Measures of central tendency are called averages of the **1st** order

MEAN

Practical Cum Theory

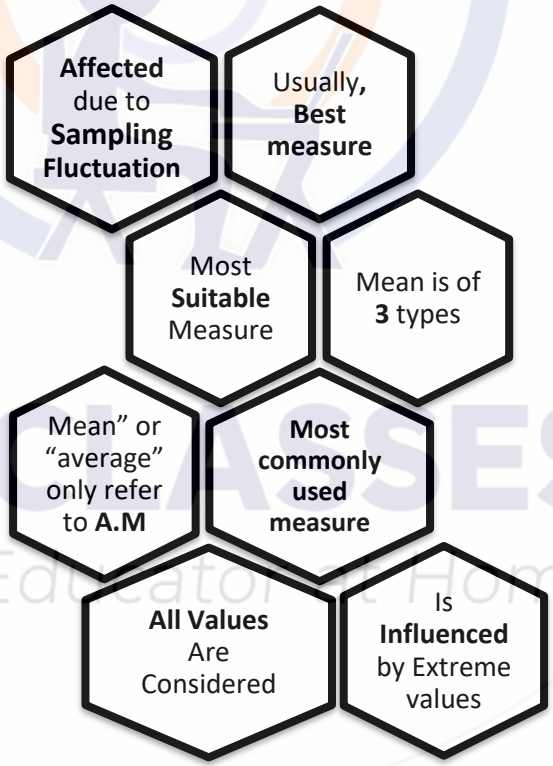
- **A.M** of a set of observations is defined to be their sum, divided by the no. of observations.
- While computing the AM from a grouped frequency distribution, we assume that –All the values of a class are equal to the mid-value of that class
- The algebraic sum of deviations of observations from their A.M is **0**
- The total of a set of observations is equal to the product of their number of observations and the **A.M**

  E.g., Let There are three observations Say 2,3,4 (Here n=3 And mean =2+3+4/3 = 3 Total of Observation = 9

  Total of Observation (9) = No of Observation (3) * Mean (3)
- A.M is never less than G.M
- When the algebraic sum of deviations from the arithmetic mean is not equal to zero, the figure of arithmetic mean **Is not** correct
- If the same amount is added to or subtracted from all the values, the mean shall increase or decrease by the **Same** amount

Points to Remember

Logical



Just Learn It

- Pooled Mean is also called **Grouped Mean**
- **A.M** is used when **variability** has also to be calculated.
- **Mean** is used when sampling variability should be least.
- Weighted A.M is related to **Frequency**
- The words "mean" or "average" only refer to **A.M**
- **Mean** is used when representation value is required & distribution is asymmetric.
- Extreme values have **some** effect on A.M

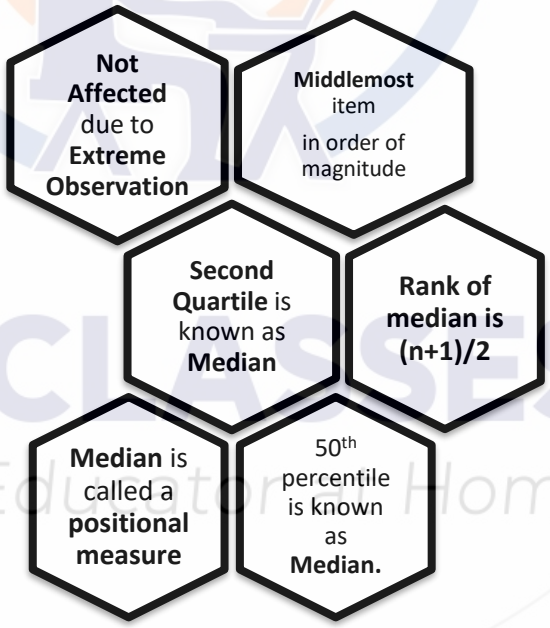
Median

Practical Cum Theory

- **Median** always lies in between the arithmetic mean & mode.
- For **open-end classification**, Median is the **best measure** of central tendency
- In case of an **even number** of observations median is the **simple average** of these two middle values
- Median is based on only fifty per cent of the central values.
- In formula of median for grouped frequency distribution N is **Total frequency**
- For calculation of **Median,** we have to construct cumulative frequency distribution
- **Median** is equal to value corresponding to **cumulative frequency (N + 1)/2 from simple frequency distribution**
- For grouped frequency distribution **Median** is equal to the value corresponding to **cumulative frequency N/2**
- In the case of a continuous frequency distribution, the size of the **n/ 2th** item indicates class interval in which the median lies.

Points to Remember

Logical



Just Learn It

- In a distribution with a **single peak** and **moderate skewness to the right**, it is closer to the concentration of the distribution in case of **Median**
- **Median** is used when distribution pattern has to be studied at **varying levels.**
- The number of observations smaller than **Median** is the same as the number larger than it.

Partition Value

Quartile	Decile	Percentile
• Quartiles can be determined graphically using **Ogive** • **Quartiles** divide the total no. observations into 4 equal parts. • **Lower quartile is First quartile** • **Upper Quartile is Third quartile** • Above upper quartile, the frequency is equal to **N/4** • Less than First quartile, the frequency is equal to **N/4** • Between first & second quartile, the frequency is equal to **N/4** • **Quartiles** are used for **measuring central tendency, dispersion & skewness.** • Three Quartiles are used by **Bowley's formula**	• There are **9** deciles • Corresponding to first decile, the cumulative frequency is **N/10** • Fifth decile is equal to **Median**	• The values which divide the total number of observations into 100 equal parts is **Percentiles**
Rank of Partition Value		
• Rank of k^{th} quartile is **k(n+1)/4** ***Here (K = 1,2,3,4)***	Rank of k^{th} decile is **k(n+1)/10** *Here* ***(K = 1,2,3,4,5,6…10)***	Rank of k^{th} decile is **k(n+1)/10** *Here* ***(K = 1,2,3,4,5,6…100)***
Tutorial Note : Theory Question Can Be Asked in the form of Direct Formula		
• *Corresponding to* ***K Quartile****, the* ***cumulative frequency*** *is* ***KN/4 Here (K = 1,2,3,4)*** **E.g.,** Corresponding to first quartile, the cumulative frequency is **N/4** Corresponding to second quartile, the cumulative frequency is **2 N/4** Corresponding to upper quartile, the cumulative frequency is **3N/4**	• *Corresponding to* ***K Decile****, the* ***cumulative frequency*** *is* ***KN/10,*** *Here* ***(K = 1,2,3,4,5,6…10)*** **E.g.,** Corresponding to second decile, the cumulative frequency is **2N/10**	• *Corresponding to* ***K Percentile****, the* ***cumulative frequency*** *is* ***KN/100*** *Here* ***(K = 1,2,3,4,5,6…100)***
Theory Questions Can Be asked in Form of Calculation of percent coverage		
1 Quartile = 25 % ***1 Decile = 10 %*** ***1 Percentile = 1 %***	Using this Variety of Questions Can be Formed Where we need to Check **LHS = RHS**	20th percentile = **2nd decile** 25th percentile = **1st quartile**

MODE

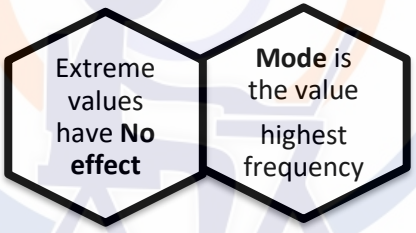
Practical Cum Theory

- Mode is **not uniquely** defined
- The value which occurs with the maximum frequency is called **Mode**
- When all values occur with equal frequency, there is no **Mode**
- **Mode** cannot be treated algebraically
- The class in which mode belongs is known as **Modal class**
- For calculation of **Mode,** we have to construct a grouped frequency distribution

  Eg: For ordering shoes of various sizes for resale, a **Modal** size will be more appropriate.

Points to Remember

Logical



Just Learn It

- **Mode** is the value of the variable at which the concentration of observation is the densest.
- The formula of mode is applicable if classes are of **Equal and unequal** width

Geometric Mean (GM)

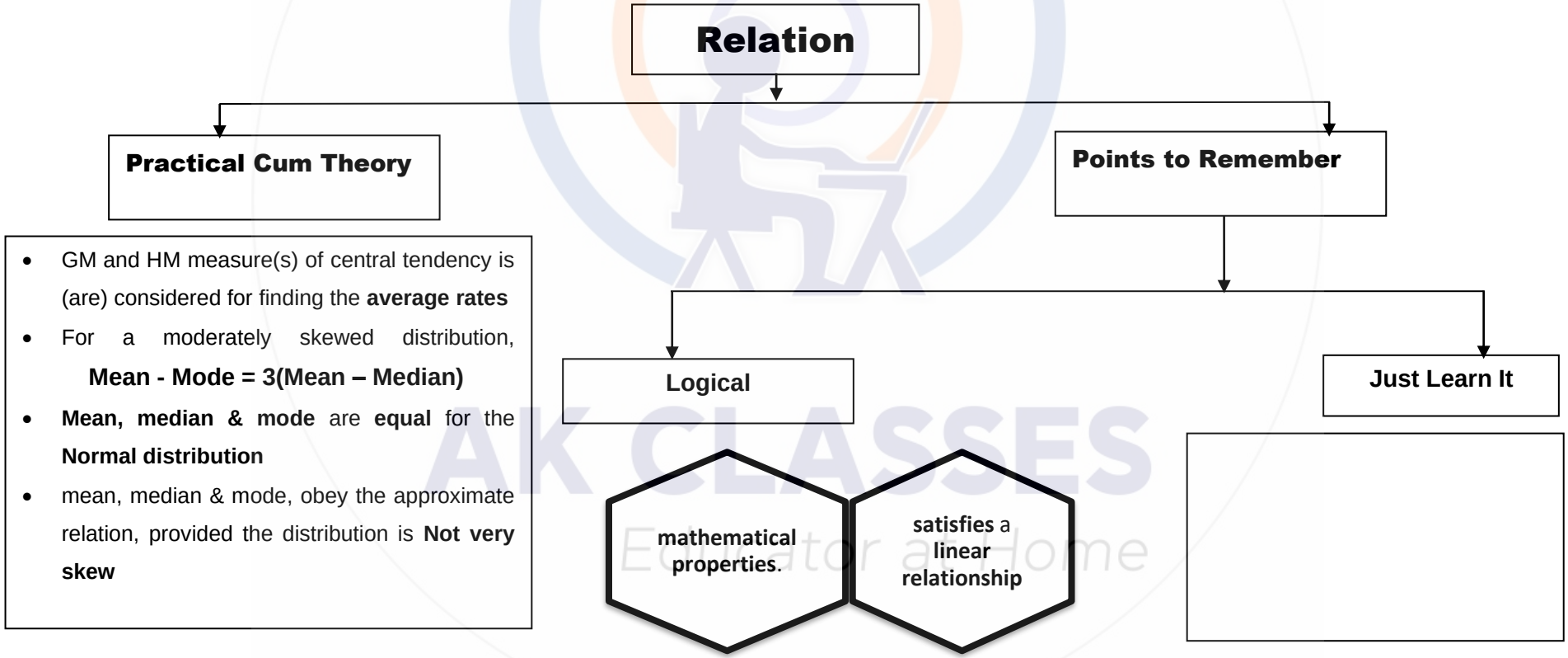
- GM is difficult to compute
- When a firm register both profits and losses, **GM cannot be considered**
- G.M is defined only when **All observations have the same sign and none is zero**
- **G.M** is useful in averaging ratios, rates and percentages
- **H.M & G.M** cannot be calculated if any observation is zero.

- **G.M** is used when rate of growth or decline is required.
- In **G.M** the quantities are in ratios.
- Logarithm of G.M is the **Weighted Mean** of logarithms of the different values.
- **G.M** is **not much** affected by fluctuations of sampling.

Harmonic Mean (HM)

- **H.M** has a limited use
- **H.M & G.M** cannot be calculated if any observation is zero.
- **H.M** is a good substitute to a weighted average.
- Extreme values have **Greatest** effect on H.M
- **H.M** is the reciprocal of the A.M of reciprocal of observations.

Relation between Various Measures of Central Tendency



Comparative Chart of Common Theory Point of MOCT

Sr No.	Particulars	Arithmetic Mean	Median	Mode	Geometric Mean (GM)	Harmonic Mean (HM)
1	**Meaning**	It is obtained by dividing the sum of values of all items of a series by the number of items of that Series	It is the central value that divides the series into two equal parts in such a way that half of the items lie above this value and the remaining half lie below this value	It is that value in a series which is the greatest frequency	GM of n items is the n^{th} root of their Product.	HM of Various items of a series is the reciprocal of the AM of their reciprocal
2	**Symbol Used**	$\overline{X}$	M_d	M_O	G.M.	H.M.
3	**Whether based on All items of Series**	YES	No	No	YES	YES
4	**Can its formula be extended to calculate Combined Average of two or more related series?**	YES	No	No	YES	YES
5	**Whether it requires arrangement of data in ascending/ descending order?**	No	Yes	No	No	No

6	**Whether affected by Sampling Fluctuation**	Least	Affected more than AM	Affected more than AM	Affected more than AM	Affected more than AM
7	**Whether affected by extreme values**	Yes	No	No	Yes (Gives more weight to small item	Yes (gives largest weight to smallest item)
8	**Suitable for**	Other Cases	Open-ended distribution	Qualitative data	Average Rate of Increase/ Decrease, Average Ratios/ Percentages	For Rates and Ratios involving Speed, Time, Distance, Price & Quantity.
9	**Can it be determined graphically**	No	Yes	Yes	No	No
10	**Is it independent of choice of origin**	No	No	No	No	No
11	**Is it independent of choice of scale**	No	No	No	No	No
12	**Mathematical Property**	**1.**Sum of Deviations from AM is always zero. **2.**the sum of Squared Deviations from AM is Minimum	The Sum of Absolute Deviations from Median is Minimum		**1.**The product of the values of series will remain unchanged when the value of geometric mean is substituted for each individual value. **2.**The sum of the deviations of the logarithms of the of the original observations above or below the logarithm of the geometric mean is equal.	If each value of the variant id replaced by harmonic mean the total of reciprocals of value of variant remains the same.

Summary Notes