Median (Me):
If the values of a series are arranged in an ascending or descending order of magnitude then the middle most value in this arrangement is called the median of the series.
Median is usually denoted by Me.

Determination of Median:
Let n be the number of observations.

For ungrouped data:

a. When ***n is odd*** the value of the $\frac{n+1}{2}$ th observation will be the median.

b. When ***n is even*** the median will be the AM of the values of $\frac{n}{2}$ th and $(\frac{n}{2}+1)$ th observation in the series.

Example: ***(ungroup data n is odd)***
The ages of a family of seven members are given as 12, 7, 2, 34, 17, 21 and 19. Find the median age.

Step 1 ▶ Count the total number of elements, n=? ▶ Here n= 7 ▶ 7 is a odd number

Step 2 ▶ Arrange the values in ascending order ▶ 2, 7, 12, 17, 19, 21, 34

Step 3 ▶
Median: Me = Value of $\frac{n+1}{2}$ th observation
= Value of $\frac{7+1}{2}$ th observation
= Value of 4^{th} observation = 17

Step 4 ▶ Median age of the family is 17 years

Example: ***(ungroup data n is even)***
The ages of a family of eight members are given as 12, 7, 2, 34, 17, 40, 21 and 19. Find the median age.

Step 1 ▶ Count the total number of elements, n=? ▶ Here n= 8 ▶ 8 is a even number

Step 2 ▶ Arrange the values in ascending order ▶ 2, 7, 12, 17, 19, 21, 34, 40

Step 3 ▶ Median: Me = AM of the values of $\frac{n}{2}$ th and $(\frac{n}{2}+1)$ observation
= AM of the values of ___ and ___ observation
= $\frac{\_\_+\_\_}{2}$ =?

Step 4 ▶ Median age of the family is ? ? ? years

Test yourself:
The following data represents the amount (in thousands taka) of loan requirements of the people of two different upazilla. Using median comment on which upazilla has the greater average demand of loans.

Upazilla 1	42	12	26	18	9	35	28	39	8
Upazilla 2	8	15	10	18	22	20	26	42	35

Median for grouped data:

Me is given by the formula, $Me = L_0 + \frac{\left(\frac{n}{2} - F_{-Me}\right)}{f_{Me}} * W_{Me}$

Where

Me	= Median	f_{Me}	= Frequency of the median class
L_0	= Lower Limit of the median class	W_{Me}	= Width of the median class
F_{-Me}	= Cumulative frequency of the pre median class	n	= Total number of observation

MEDIAN CLASS *is the class that contains* $\frac{n}{2}$ *th observation of the given data.*

Test yourself:
Table 1.6 displays summary information of the parent of 50 students. Compute the median age of woman.

Table 1.6: Income distribution of the student's of ECO 202

Income of parent (in thousand taka)	Frequency
Below 20	3
20 – 40	4
40 – 60	6
60 – 80	8
80 – 100	12
100 – 120	10
120 and over	7
Total	50

Hints:
Step 1: Compute the cumulative frequencies.
Step 2: Determine $\frac{n}{2}$, one half of the total number of cases.
Step 3: Locate the median class.
Step 4: Determine the lower limit (L_0) of the median class.
Step 5: Sum the frequencies of all the classes prior to the median class. This is F_{-Me}.
Step 6: Determine the frequency of the median class f_{Me}.
Step 7: Determine the width of the median class.

When to use Median:
The median is generally the best average in open – end grouped distribution, especially where if plotted as a frequency curve one gets a J or reverse J shaped curve.

Hints:

Table 1.6: Income distribution of the student's

	Income of parent (in thousand taka)	Frequency	cumulative frequency	number of observations falls in to class	
	Below 20	3	3	1,2,3	
	20 – 40	4	7	4,5,6,7	
	40 – 60	6	13	8-13	
	60 – 80	8	21	14-21	
Median class	**80 – 100**	12	33	*22-33*	n/2 =25th observation falls into this class
	100 – 120	10	43	34-43	
	120 and over	7	50	44-50	
	Total	50			

Answer: Median = 86.66

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Test yourself
Median

1. The following table gives the data pertaining to kilowatt hours of electricity consumed by 100 randomly selected flat owners of Japan garden city.

Consumption (in K-watt hours)	0-100	100-200	200-300	300-400	400-500
No. of users	6	25	36	20	13

Calculate

i. Mean consumption of electricity
ii. Median use of electricity
iii. Standard deviation of electricity consumption
iv. Skewness of electric consumption.

2. The following data represents the amount (in thousands taka) of loan requirements of the people of two different upazilla. Using median comment on which upazilla has the greater average demand of loans.

Upazilla 1	42	12	26	18	9	35	28	39	8
Upazilla 2	8	15	10	18	22	20	26	42	35

Mode:
The mode is the value of the variable that occurs most frequently; that is for which the frequency is a maximum. Mo denotes mode.

Determination of mode:

For ungroup data / categorical variable mode is the value of the variable for which the frequency is highest.

For the data sets:

i. 7, 8, 6, 7, 9, 7, and 4: Here '7' appears highest 3 times, hence mode is '7'and the data is unimodal.
ii. 6, 4, 8, 5, 8, 1, 2, 5, 4, 7, 5, 2, 4, and 3: here '5' and '4' both occur highest 3 times hence the mode '5' and '4' and the data is bimodal.
iii. 1, 5, 7, 2, 6, 9, and 4: there is no mode.
iv. Consider the following table representing the frequency distribution of religion

Religion	Muslim	Hindu	Buddhist	Christian	Others
Frequency	18	75	12	4	2

Here the highest frequency '75' occurs for the category 'Hindu'. Hence mode for the given data is _ _ _ _ _ _ _.
For grouped data mode is obtained by using the following formula

$$Mo = L_0 + \left\{\frac{(f_0 - f_{-1})}{(f_0 - f_{-1}) + (f_0 - f_1)}\right\} * W$$

Where,

Mo = Mode
L_0 = Lower Limit of the Modal class
f_0 = Frequency of the modal class
f_{-1} = Frequency of the pre modal class
f_1 = Frequency of post modal class
W = Width of the modal class

When to use Mode:
Generally speaking, mode can be used to describe qualitative data. Mode is particularly useful average for discrete data.

Test yourself
MODE

1. Calculate ***mode*** from the data given for **MEDIAN.**

Answer: Mode = 93.2

For any queries related to this presentation please contact
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