MODE

Dr- Ekta Khare

Mode

- The mode is one of the values of the measures of central tendency.
- This value gives us a rough idea about which of the items in a data set tend to occur most frequently.
- There may or may not be a modal value for a given set of data. For data without any repeating values, there might be no mode at all.
- Also, we can find data with only one mode, two modes, three modes, or multiple modes. This depends on the given dataset.
- A list can be unimodal, bimodal, trimodal, or multimodal, depending upon the number of modes it has.
- **Bimodal, Trimodal & Multimodal (More than one mode)**
- When there are two modes in a data set, then the set is called **bimodal**
- For example, The mode of Set A = {2,2,2,3,4,4,5,5,5} is 2 and 5, because both 2 and 5 is repeated three times in the given set.
- When there are three modes in a data set, then the set is called **trimodal**
- For example, the mode of set A = {2,2,2,3,4,4,5,5,5,7,8,8,8} is 2, 5 and 8
- When there are four or more modes in a data set, then the set is called **multimodal**

Mode Formula

Ungrouped Data

- The value occurring most frequently in a set of observations is its mode.
- In other words, the mode of data is the observation having the highest frequency in a set of data.
- There is a possibility that more than one observation has the same frequency, i.e. a data set could have more than one mode.
- In such a case, the set of data is said to be multimodal.
- Let us look into an example to get a better insight.

Example: The following table represents the number of wickets taken by a bowler in 10 matches. Find the mode of the given set of data.

Match No.	1	2	3	4	5	6	7	8	9	10
No. of Wickets	2	1	1	3	2	3	2	2	4	1

It can be seen that 2 wickets were taken by the bowler frequently in different matches. Hence, the mode of the given data is 2.

Mode Formula For Grouped Data

- In the case of grouped frequency distribution, calculation of mode just by looking into the frequency is not possible.
- To determine the mode of data in such cases we calculate the modal class.
- Mode lies inside the modal class.
- The mode of data is given by the formula:

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

- Where,
- l = lower limit of the modal class
- h = size of the class interval
- f_1 = frequency of the modal class
- f_0 = frequency of the class preceding the modal class
- f_2 = frequency of the class succeeding the modal class
- Let us take an example to understand this clearly.

How to Find the Mode

Let us learn here how to find the mode of a given data with the help of examples.

Example 1: Find the mode of the given data set: 3, 3, 6, 9, 15, 15, 15, 27, 27, 37, 48.

Solution: In the following list of numbers,

3, 3, 6, 9, 15, 15, 15, 27, 27, 37, 48

15 is the mode since it is appearing more number of times in the set compared to other numbers.

Example 2: Find the mode of 4, 4, 4, 9, 15, 15, 15, 27, 37, 48 data set.

Solution: Given: 4, 4, 4, 9, 15, 15, 15, 27, 37, 48 is the data set.

As we know, a data set or set of values can have more than one mode if more than one value occurs with equal frequency and number of time compared to the other values in the set.

Hence, here both the number 4 and 15 are modes of the set.

Example 3: Find the mode of 3, 6, 9, 16, 27, 37, 48.

Solution: If no value or number in a data set appears more than once, then the set has no mode.

Hence, for set 3, 6, 9, 16, 27, 37, 48, there is no mode available.

Example 4: In a class of 30 students marks obtained by students in mathematics out of 50 is tabulated as below. Calculate the mode of data given.

Marks Obtained	Number of student
10-20	5
20-30	12
30-40	8
40-50	5

Solution:

The maximum class frequency is 12 and the class interval corresponding to this frequency is 20 – 30. Thus, the modal class is 20 – 30.

Lower limit of the modal class (l) = 20

Size of the class interval (h) = 10

Frequency of the modal class (f_1) = 12

Frequency of the class preceding the modal class (f_0) = 5

Frequency of the class succeeding the modal class (f_2)= 8

Substituting these values in the formula we get;

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 20 + \left(\frac{12 - 5}{2 \times 12 - 5 - 8}\right) \times 10 = 26.364$$

Mean Median Mode Comparison

Mean	Median	Mode
Mean is the average value that is equal to the ration of sum of values in a data set and total number of values. Mean = Sum of observations/Number of observations	**Median** is the central value of given set of values when arranged in an order.	**Mode** is the most repetitive value of a given set of values.
For example, if we have set of values = 2,2,3,4,5, then;		
Mean = (2+2+3+4+5)/5 = 3.2	**Median = 3**	**Mode = 2**

Mode Median Mean Formula

There exists an empirical relationship between mode, median and mean and this can be expressed using the formula:

Mode = 3 Median − 2 Mean

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Practice Problems

1. Find the mode of the following marks (out of 10) obtained by 20 students:
   4, 6, 5, 9, 3, 2, 7, 7, 6, 5, 4, 9, 10, 10, 3, 4, 7, 6, 9, 9
2. Find the mode for the following data set.
   41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60
3. Find the mode of the given distribution.

Class Interval	10 – 25	25 – 40	40 – 55	55 – 70	70 – 85	85 – 100
Frequency	12	9	17	16	20	16