Statistics

Introduction to Statistics

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- Study dealing with the collection, presentation and interpretation and analysis of data is called as statistics.

Data

- Facts /figures numerical or otherwise collected for a definite purpose is called as data.
- data collected first hand data:- Primary
- Secondary data: data collected from a source that already had data stored

Frequency

- The number of times a particular instance occurs is called frequency in statistics.

Ungrouped data

Ungrouped data is data in its original or raw form. The observations are not classified in groups.

Grouped data

In grouped data, observations are organized in groups.

Class Interval

- The size of the class into which a particular data is divided.
- E.g divisions on a histogram or bar graph.
- Class width = upper class limit - lower class limit

Regular and Irregular class interval

- Regular class interval: When the class intervals are equal or of the same sizes.
- E.g 0-10, 10-20, 20-30….. 90-100
- Irregular class interval: When the class intervals are of varying sizes.
- E.g 0-35, 35-45, 45-55, 55- 80, 80-90, 90-95, 95-100

Frequency table

- A frequency table or distribution shows the occurrence of a particular variable in a tabular form.

Sorting

- Raw data needs to be sorted in order to carry out operations.-
- Sorting ⇒ ascending order or descending order

Ungrouped frequency table

- When the frequency of each class interval are not arranged or organised in any manner.

Grouped frequency table

- The frequencies of the corresponding class intervals are organised or arranged in a particular manner, either ascending or descending.

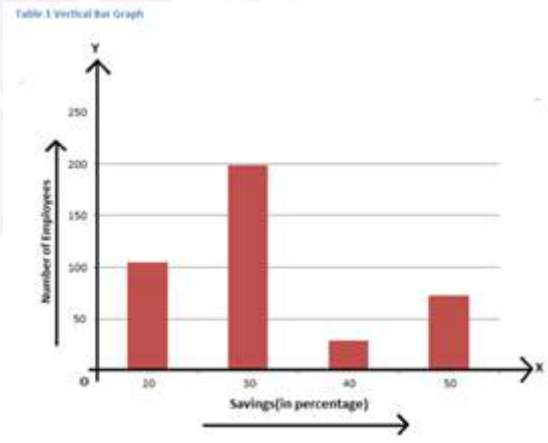
Graphical Representation of Data

Bar graphs

Graphical representation of data using bars of equal width and equal spacing between them (on one axis). The height of the bar on the other axis depicts the value of the variable.

Savings (in percentage)	*Number of Employees (Frequency)*
20	105
30	199
40	29
50	73
Total	400

The data can be represented as:



Data shown in a bar graph

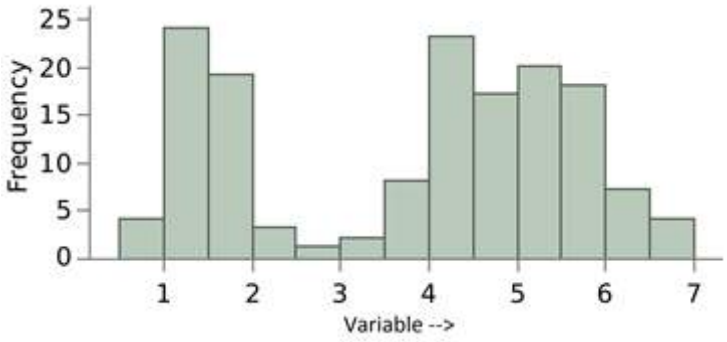
Variable being a number

- A variable can be a number such as 'no. of students' or 'no. of months'.
- Can be represented by bar graphs or histograms depending on the type of data.

Discrete → bar graphs
Continuous → Histograms

Histograms

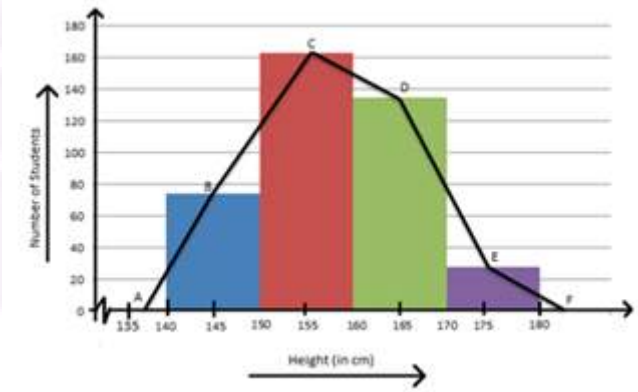
- Like bar graphs, but for continuous class intervals.
- Area of each rectangle is ∝ Frequency of a variable and the width is equal to the class interval.



Histogram

Frequency polygon

- If the midpoints of each rectangle in a histogram are joined by line segments, the figure formed will be a frequency polygon.
- Can be drawn without histogram. Need midpoints of class intervals



Frequency polygon

Mid point of class interval

Mid point of class interval is called as class mark

$$\text{Class mark} = \frac{\text{Upper Limit} + \text{Lower Limit}}{2}$$

Equality of areas

- Addition of two class intervals with zero frequency preceding the lowest class and succeeding the highest class intervals enables to equate the area of the frequency polygon to that of the histogram(Using congruent triangles.)

Measures of Central Tendency

Average

- The average of a number of observations is the sum of the values of all the observations divided by the total number of observations.

Mean

Mean for ungrouped frequency distribution, $\bar{x} = \frac{\sum x_i f_i}{f_i}$

where f_i is the frequency of i^{th} observation x_i

Mode

- The most frequently occurring observation, is called the mode.
- The class interval with the highest frequency is the modal class

Median

- Value of the middle most observation.
- If n(number of observations) is odd, Median $= (\frac{n+1}{2})^{th}$ observation.
- If n is even, Median is the mean or average of $(\frac{n}{2})^{th}\ and\ (\frac{n+1}{2})^{th}$ observation.