Quartile

Quantile are the values of Statistical data which divide the whole set of observation (variates) into four equal parts.

Lower Quantile -
when variates arranged in ascending order, then observation lying midway between lower extreme and median is called lower quantile. Its devoted by Q_1

$$Q_1 = \begin{cases} \frac{n+1}{4} \text{ th observation} & \text{if } n = \text{odd} \\ \frac{n}{4} \text{ th observation} & \text{if } n = \text{even} \end{cases}$$

Upper Quantile -
when variates arranged in ascending order, the observation lying midway between the median and upper extreme is upper Quantile. Its denoted by Q_3

$$Q_3 = \begin{cases} \frac{3(n+1)}{4} \text{ th observation} & \text{if } n = \text{odd} \\ \frac{3n^{th}}{4} \text{ observation} & \text{if } n = \text{even} \end{cases}$$

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Middle quantise or Q_2 is Median

Inter Quantile Ranges -
Its the difference between the upper Quantile Q_3 and lower Quantil Q_1

Inter Quantile Range $Q_3 - Q_1$

Example 8 →

Q. In a class test the marks Scored by 11 Students are - 13, 12, 20, 5, 3, 19, 7, 6, 11, 15, 17 ; Find
(i) Median, (ii) lower Quantile (iii) upper Quantile
(iv) inter Quantile Range

Ans. Here $n = 11$ i.e odd, order being - 3, 5, 6, 7, 11, 13, 15, 12, 12, 19, 20

(i) ∴ Median = $\frac{n+1}{2}^{th}$ observation = 6^{th} observation

Median = 13

(ii) Lower Quantile (Q_1) = $\frac{n+1}{4}^{th} = \frac{12}{4}^{th}$ = 3rd observation

$Q_1 = 6$

(iii) upper Quantile (Q_3) = $\frac{3}{4}(n+1)^{th}$ observation = 9^{th} observation

$Q_3 = 17$

(iv) Quantile Range = $Q_3 - Q_1$

$= 12 - 6 = 11$

Standard Deviation

It is the degree of dispersion or scatter of data points relative to its mean. It tells us how measure of variation of data from values are spread across a data sample and its the measure of variation of data from the mean.

It is given by the formula

$$\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N-1}}$$

σ = Standard deviation

N = Total size

μ = mean

Example 9-

Q. There are some plants in a garden A few plants are selected and their height is recorded which is 51, 38, 79, 46, 57 Calculate the Standard deviation of their height.

Ans. $N = 5$

$$\text{Mean } (\mu) = (51 + 38 + 79 + 46 + 57)/5 = 54.2$$

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{\Sigma(x_i - \bar{x}(\mu))^2}{N-1}}$$

$$= \sqrt{\frac{(51-54.2)^2 + (38-54.2)^2 + (79-54.2)^2 + (46-54.2)^2 + (57-54.2)^2}{4}}$$

$$\sigma = 15.5$$

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Measures of dispersion

The measure of dispersion indicates Scattering of data. It explains the disparity of data from one another, delivering a precise view of their distribution. The measure of dispersion displays and gives us an idea about variation and central value of an indivisual item

In other words, dispersion is the extent to which values in distribution differ from average of the distribution. It gives us an idea about to which indivisual items vary from one another and from the central values.

Variation can be measured in different measures namely:-

(1) Quartile deviation
(2) Mean deviation
(3) Standard deviation