

## MEASURES OF LOCATION & SPREAD

### KEY WORDS & DEFINITIONS

#### 1. Measure of Location

A single value which describes a position in a data set.

#### 2. Measure of Central Tendency

A measure of location which describes the central position in a data set.

#### 3. Measure of Spread or Dispersion

A value which describes how spread out the data is.

#### 4. Mean

The sum of all the data divided by how many pieces of data there are. Includes all pieces of data. Affected by outliers.

#### 5. Median $Q_2$

The middle value when the data values are put in order. Does not include all pieces of data. Not affected by outliers.

#### 6. Mode

The value that occurs most often in the data. Good for non-numerical data.

#### 7. Modal class

The class that has the highest frequency in grouped data.

#### 8. Lower Quartile $Q_1$

A measure of location that is one quarter of the way through the data set.

#### 9. Upper Quartile $Q_3$

A measure of location that is three-quarters of the way through the data set.

#### 10. Percentile

A measure of location that is the specified percentage of the way through the data set.

#### 11. Range

The difference between the largest and smallest values in a data set. Affected by outliers.

#### 12. Inter-quartile Range

The difference between the upper and lower quartiles in a data set.  $Q_3 - Q_1$   
Not affected by outliers.

### IMPORTANT FORMULAE

Mean:  $\bar{x} = \frac{\Sigma x}{n}$

Mean from Frequency  
 $\bar{x} = \frac{\Sigma fx}{\Sigma f}$

Table:  
Variance  $\sigma^2$ :

$$\frac{\Sigma (x - \bar{x})^2}{n} = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$

Standard Deviation  $\sigma = \sqrt{\text{Variance}}$

### CODING

If data is coded using  $y = \frac{x - a}{b}$

Mean of coded data =  $\bar{y} = \frac{\bar{x} - a}{b}$

s.d. of coded data =  $\sigma_y = \frac{\sigma_x}{b}$

To find mean & s.d. of original data use:

$$\bar{x} = b\bar{y} + a$$

$$\sigma_x = b\sigma_y$$

### INTERPOLATION

Assume data values are evenly distributed within each class then estimate median or percentile values using proportional reasoning.

Age	10 – 19	20 – 29	30 – 39
Frequency	4	8	5
Cumulative Freq	4	12	17

17 people  $\therefore$  median is 9<sup>th</sup> person

9<sup>th</sup> person is in 20 – 29 group

Take boundaries to be 19.5 & 29.5



$$\frac{m - 19.5}{29.5 - 19.5} = \frac{9 - 4}{12 - 4}$$

$$m = 25.75$$