1. Types of statistics:
- Descriptive: displaying data in an informative way
- inferential: generalization the population by examination of sample

2. Types of data:
- Qualitative: data not expressed in terms of numbers (Bar chart - pie chart)
- Quantitative: data expressed in terms of numbers (histogram - frequency polygon)
  - discrete: certain values
  - continuous: within a specific range

- frequency: عدد مرات حدوث الحدث
- Relative frequency: frequency ÷ number of observations
- Percentage frequency = relative frequency x 100
- angle frequency (pie chart) = relative frequency x 360
- How to create a frequency table from raw data?
  1) Range = largest value - smallest value
  2) get the number of classes (k): $2^k > n$, where n = sample size (interval)
  3) class width = $\frac{\text{Range}}{k}$ ← يتقرب لأعلى • midpoint classes: $\frac{\text{class} + \text{class}}{2}$
  4) Set the class limits.

- population mean (μ) = $\frac{\Sigma x}{N}$ • central tendency: mean, mode, median
- Sample mean ($\bar{x}$) = $\frac{\Sigma x}{n}$
- median (second quartile) = • in the middle • 50% of the data before & 50% of the data after
  (1) arrange ascendingly (2) Median location: $\frac{n+1}{2}$, when n is odd sample space number
  (3) Median value $\frac{n}{2}, \frac{n}{2}+1$, where n is even sample space #
- mode: is the value that occurs most frequently in a data set.
- Range: largest value - smallest value
- Standard deviation (s) = $\sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$ (x_i ← data, $\bar{x}$ ← mean) • s^2 → variance ? variation في data ← هل في تقارب في ال
  • dispersion cannot be less than zero
  ← يقيس بُعد كل observation عن ال mean value

$$= \sqrt{\frac{1}{n-1}\left[\Sigma x_i^2 - \frac{(\Sigma x_i)^2}{n}\right]}$$

- IQR = $Q_3 - Q_1$
- lower bound = $Q_1 - 1.5(IQR)$
- upper bound = $Q_3 + 1.5(IQR)$

- coffient of variation:
  - $\frac{s}{\bar{x}} \times 100\%$
  - $\frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100\%$ (extreme value)

- commenting on box-plot:

1) measure of center tendency
2) IQR
3) Symmetric or not (-ve skewed or +ve skewed)
4) extreme value or not

$0 \leq p(A) \leq 1$

$p(A \cup B) = p(A) + p(B) - p(A \cap B)$ (general)

$p(A \cup B) = p(A) + p(B)$ (disjoint) → لا يمكن حدوثهم في نفس الوقت

$p(A \cup B) = p(A) + p(B) - p(A).p(B)$ (independent) → يمكن حدوثهم في نفس الوقت

$p(A \cap B) = p(A).p(B)$

- $p(A|B) = \frac{p(A \cap B)}{p(B)}$ where $p(B) \neq 0$ (conditional probability)
- $p(I)\,p(B|I) + p(II)\,p(B|II) + \dots$ (total probability rule)
- $p(D) = p(D \cap I) + p(D \cap II)$

$= p(I).p(D|I) + p(II).p(D|II)$

Bay's rule: $p(II|D) = \frac{p(II \cap D)}{p(D)}$

- probability distribution:

i) $p(x) \geq 0$ ii) $\sum p(x) = 1$ $\overset{\neq 1}{\rightsquigarrow}$ $c[x] = 1$ $c = \frac{1}{x}$

- Expected value $= E(x) = \sum x\,p(x) = 1$, $E(x^2) = \sum x^2 p(x)$

$S^2 = E(x^2) - (E(x))^2$ varience

- $E(ax+b) = 0$

$aE(x) + b$

- $V(ax+b) = a^2 V(x)$