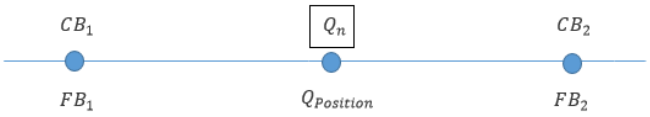
Equations to remember

Equations not given in the formula sheet

- $Lower\ Quartile\ (Q_1) = \frac{\sum f}{4}^{th}\ data\ value$
- $Median\ (Q_2) = \frac{\sum f}{2}^{th}\ data\ value$
- $Upper\ Quartile\ (Q_3) = \frac{3\sum f}{4}^{th}\ data\ value$
- $10th\ Percentile\ (P_{10}) = \frac{\sum f}{10}^{th}\ data\ value$
- $60th\ Percentile\ (P_{60}) = \frac{6\sum f}{10}^{th}\ data\ value$

Interpolation:



$$\frac{Q_n - CB_1}{CB_2 - CB_1} = \frac{Q_{Position} - FB_1}{FB_2 - FB_1}$$

\

- $Mean: \quad \bar{x} = \frac{\sum x}{n}$
- $Variance = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2$
- $Standard\ deviation\ (\sigma) = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$

IN FREQUENCY TABLES:

- $Standard\ deviation\ (\sigma) = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$

Coding (Mean & Standard deviation)

$$y = \frac{x - a}{b}$$

x = original data y = coded data a & b = constants

- **Mean** of the coded data:

$$\bar{y} = \frac{\bar{x} - a}{b}$$

- **Standard Deviation** of the coded data:

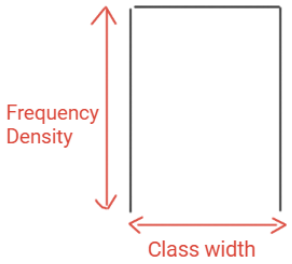
$$\sigma_y = \frac{\sigma_x}{b}$$

Histograms

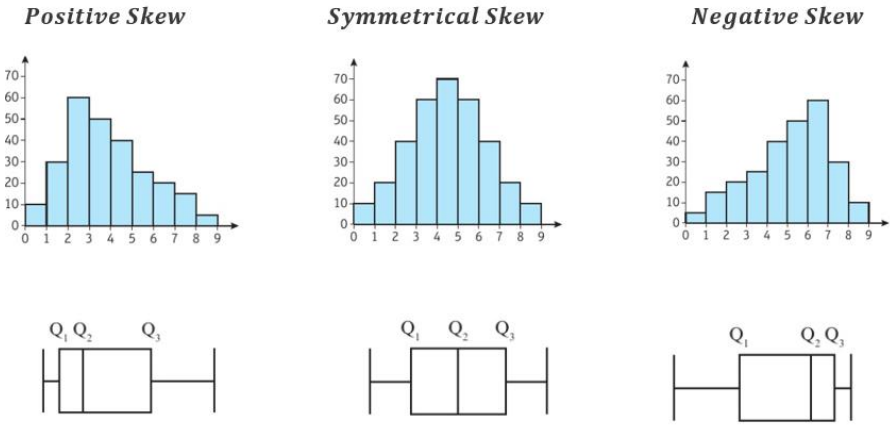
- $Frequency\ Density = \frac{Frequency}{Class\ Width}$

Can be rearranged to find frequency

- $Frequency = Frequency\ Density \times Class\ width$



Skewness



1) By using the **difference between quartiles** (as shown above):

- Positive skew : $Q_2 - Q_1 < Q_3 - Q_2$'
- Symmetrical : $Q_2 - Q_1 = Q_3 - Q_2$
- Negative Skew : $Q_2 - Q_1 > Q_3 - Q_2$

2) By using the measures of location such as **mode, median, mean** :

- Positive skew : $mode < median < mean$
- Symmetrical : $mode = median = mean$
- Negative Skew : $mode > median > mean$

3) By using an equation with **mean**, **median** and **standard deviation**:

$$\frac{3(mean - median)}{standard\ deviation} > 0 \quad : \quad Positively\ Skewed$$

$$\frac{3(mean - median)}{standard\ deviation} = 0 \quad : \quad Symmetrical$$

$$\frac{3(mean - median)}{standard\ deviation} < 0 \quad : \quad Negatively\ Skewed$$

** The further the value from 0, the data will be more skewed.*

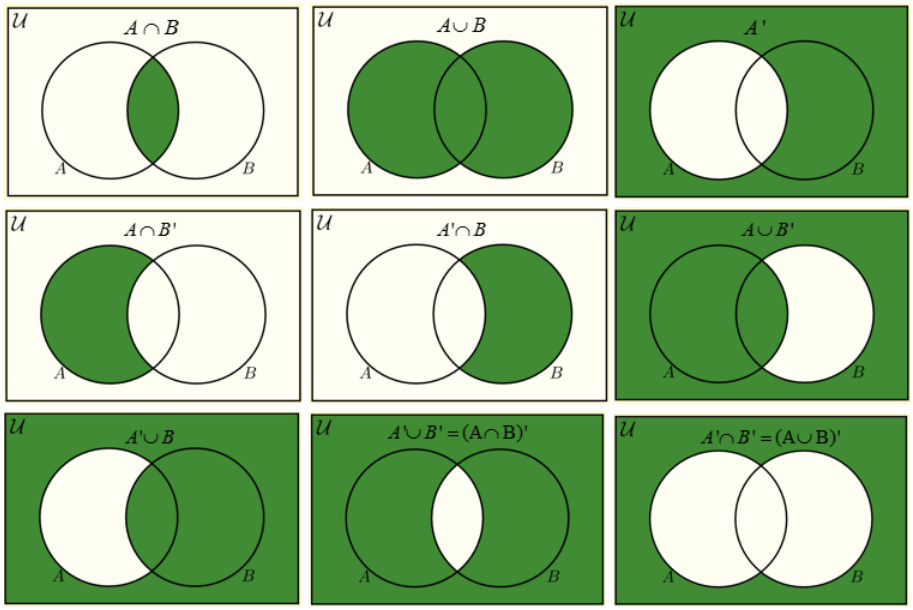
Probabilities in Venn Diagrams

Mutually Exclusive: $P\ (A\ U\ B) = P(A) + P(B)$

Independent Events: $P\ (A \cap B) = P(A) \times P(B)$

- In the case of **independent events**, the probability of the previous event **does not affect** the probability of another. Therefore:

$$\boldsymbol{P(A|B) = P(A|B') = P(A}$$



Conditional Probabilities

$$\boldsymbol{P(A|B) = \frac{P(A \cap B)}{P(B)}} \quad \left(\frac{Wanted\ outcome}{Restricted\ sample\ space}\right)$$

Discreet Random Variables

$$\boldsymbol{F(X)} = Cumulative\ addition\ of\ P(X = x)\ values$$

$$\boldsymbol{E(X)} = \sum x\,P(X = x)$$

$$\boldsymbol{E(X^2)} = \sum x^2\,P(X = x)$$

$$\boldsymbol{Var(X)} = E(X^2) - [E(X)]^2$$

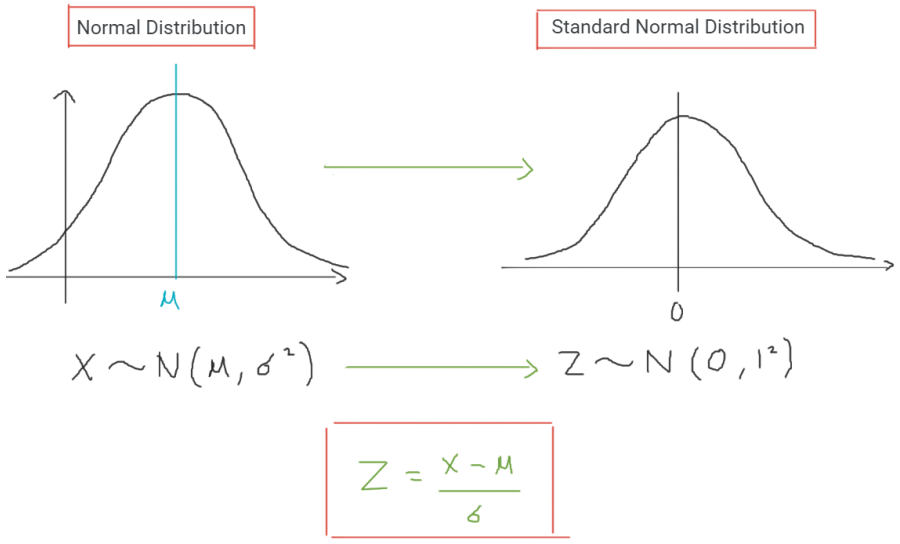
CODING:

$$E(aX + b) = a\,E(X) + b$$

$$Var(aX + b) = a^2 Var(X)$$

$$E(Y + X) = E(X) + E(Y)$$

Normal & Standard Normal Distribution



Normal distribution can be converted into standard normal distribution using this equation.

- $P(Z < z)$ Can be found on the table
- $P(Z > z) = 1 - P(Z < z)$
- $P(Z < -z) = 1 - P(Z < z)$