Set rules

$A \cap B = B \cap A$ $\quad$ $A \cup B = B \cup A$

$A \cap A = A$ $\quad$ $A \cup A = A$

$A \cap S = A$ $\quad$ $A \cup S = S$

$A \cap \emptyset = \emptyset$ $\quad$ $A \cup \emptyset = A$

$A \cap A' = \emptyset$ $\quad$ $A \cup A' = S$

$A \cap (B \cap C) = (A \cap B) \cap C$ $\quad$ $A \cup (B \cup C) = (A \cup B) \cup C$

$(A \cap B)' = A' \cup B'$ $\quad$ $(A \cup B)' = A' \cap B'$

Probability $\Rightarrow P(A) = \dfrac{\text{favourable outcomes in event } A}{\text{total nos. of outcomes}}$

Axioms $0 \leq P(A) \leq 1$

$P(\emptyset) = 0$

$P(S) = 1$

for an event A: $P(A') = 1 - P(A)$

for events A and B $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$

Conditional Prob. of event A, given B $\boxed{P(A|B) = \dfrac{P(A \cap B)}{P(B)}}$

$$P(C|A \cap B) = \frac{P(C \cap B \cap A)}{P(A \cap B)}$$

$$P(A \cup B|C) = P(A|C) + P(B|C) - P(A \cap B|C)$$

$$P(A|B) = 1 - P(A'|B)$$

Multiplicative Rule $\rightarrow P(A \cap B) = P(A).P(B|A)$

Independence $\rightarrow P(A|B) = P(A)$ or $P(B|A) = P(B)$

also $P(A \cap B) = P(A).P(B)$

Law of Total Probability

$$P(A) = \sum_{i=1}^{k} P(A|B_i)(P(B_i))$$

Bayes Rule

$$P(B_r|A) = \frac{P(A|B_r).P(B_r)}{\sum_{i=1}^{k} P(A|B_i)P(B_i)}$$

Counting sample points

$n! = n(n-1)(n-2)\ldots 1$

$0! = 1$

> Multiplication Rule $\rightarrow n_1 \times n_2$

> Choose r out of n : $\binom{n}{r} = \frac{n!}{r!\,(n-r)!}$ [Here order doesn't matter]

nC_r

> Permutation $nP_r \rightarrow$ Ordered arrangement of a set of distinct objects

$$nP_r = \frac{n!}{(n-r)!}$$

Ordered arrangement of a set objects not all distinct

$$\frac{n!}{n_1!\,n_2!\ldots n_k!}$$

Ways to Partition