

① Mutually exclusive events $\rightarrow (A \text{ and } B)$

$$P(A \cap B) = 0$$

↑
and

② Exhaustive events $\rightarrow P(A \cup B)$

↑
OR

③ Independent events $\rightarrow P(A \cap B) = P(A) \cdot P(B)$

④ Complementary events

Formulas: Permutation and Combination.

Permutation $P(n, r) = {}^n P_r = \frac{n!}{(n-r)!}$ where $n! = n(n-1)(n-2) \dots 3 \times 2 \times 1$

Combination $C(n, r) = {}^n C_r = \frac{n!}{(n-r)! r!}$

③ **Addition of probability of two events A and B**
or **Total probability theorem**: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

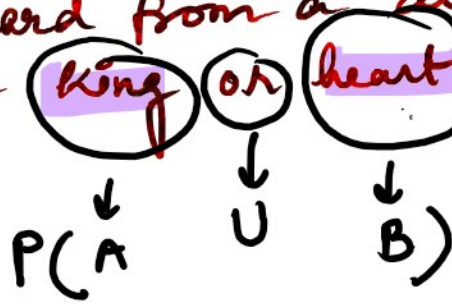
(i) **Mutually exclusive events** $\Rightarrow P(A \cap B) = 0$

then $P(A \cup B) = P(A) + P(B)$

(ii) **In non-mutually exclusive events** $\Rightarrow P(A \cap B) \neq 0$

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

Q1: What is the probability that a randomly chosen card from a deck of cards will be either a king or heart?



Total cards = 52

$$P(B) = \frac{13}{52}$$

$$P(A) = \frac{4}{52}, \quad P(A \cap B) = \frac{1}{52}$$

$$\begin{aligned}
 P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\
 &= \frac{4}{52} + \frac{13}{52} - \frac{1}{52} \\
 &= \frac{16}{52} \text{ (ans)}, = \frac{4}{13}
 \end{aligned}$$

Q6 (from book)

$A \rightarrow \begin{matrix} 160 \\ 52 \end{matrix}$ persons.
 unmarried $\therefore \bar{A} \rightarrow$ not single/married.
 $B \rightarrow \begin{matrix} 72 \\ 52 \end{matrix}$ college graduates $\therefore \bar{B} \rightarrow$ not graduates
 $\frac{3}{4}$ of 52 \rightarrow unmarried and college graduates
 $A \cap B = \frac{3}{4} \times 52 = 39$ ($A \cap B$)

$$\therefore P(\bar{A} \cap \bar{B}) = ?$$

$$\begin{array}{r}
 124 \\
 39 \\
 \hline
 85
 \end{array}$$

$$P(\bar{A} \cap \bar{B}) = P(A \cup B)^c = 1 - P(A \cup B)$$

$$\begin{aligned}
 P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\
 &= \frac{160}{52} + \frac{72}{52} - \frac{39}{52}
 \end{aligned}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= \frac{52}{150} + \frac{72}{150} - \frac{39}{150} = \frac{85}{150} \checkmark$$

$$P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B)$$
$$= 1 - \frac{85}{150}$$

$$= \frac{150 - 85}{150} = \frac{65}{150} = \frac{13}{30} \text{ (ans)}$$