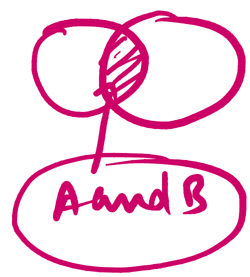
12 December 2023 09:49 PM

1. Experiment
2. Random experiment → all possible outcomes
3. Trial → Unique outcome.
4. Outcome → end result.
5. Event → one particular outcome of a random experiment.
6. Mutually exclusive events.
   → probability of any two events occurring simultaneously is zero.
   i.e. $P(A \cap B) = 0$.



7. Equally likely events.
8. Independent events: $\boxed{P(A \cap B) = P(A)\, P(B)}$
9. Exhaustive events: All the possible elementary events associated with any experiment is known as exhaustive events.

→ One of the events will necessarily occur.

(10) favourable event : The no. of events favourable to an event in a trial is the no. of outcomes which entails the happening of the event.

Ex: Probability of getting even no. while rolling a die

Total outcome = 6 = 'n'

favourable outcome = 3 = m

(11) **Classical definition of probability** is

$$P(A) = \frac{\text{no. of elementary event favourable to } A}{\text{Total no. of elementary event associated with experiment.}}$$

ie, $P(A) = \frac{m}{n} = \frac{3}{6} = 1/2$ (ans).

Q: Suppose two unbiased coins are tossed. Construct the sample space of the outcomes of the random experiment!

Find the probability of (i) both heads

(ii) one head & one tail

(iii) atleast one head.

(ii) one head & one ...
(iii) atleast one head
(iv) exactly one tail.

Sol $S = \{HH, HT, TH, TT\}$

(i) A is event of getting both heads
then $P(A) = 1/4$

(ii) B . . . . one head & one tail
then $P(B) = 2/4 = 1/2$

(iii) C . . . . . atleast one head
$P(C) = 3/4$

(iv) exactly one tail , $P(D) = \frac{2}{4} = 1/2$

(v) $\boxed{\text{atmost}}$ one tail $(\leq 1) \Rightarrow 0, 1 = 3/4$

Theorem of Total Probability.

(a) in case of mutually exclusive events.

if there are are two events A and B then Theorem of Probability states that

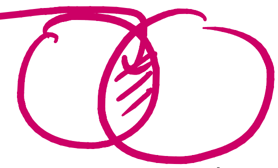
$P(A \cup B) = P(A) + P(B)$, ?

$$P(A \cup B) = \underline{P(A) + P(B)}$$

Case 2: Non-mutually exclusive events:

$$P(A \cup B) = P(A) + P(B) - \underline{P(A \cap B)}$$

$A \cap B$



If events A and B are mutually exclusive as well as exhaustive

$\cup \Rightarrow$ or

$\cap \Rightarrow$ and

$$\Rightarrow P(A \cup B) = 1$$

$$P(A) + P(B) = 1$$

$$\boxed{P(A) = 1 - P(B)}$$

or,

$$\boxed{P(B) = 1 - P(A)}$$

A, B, C

$P(A) + P(B) + P(C) = 1$

1. $0 \le P \le 1$

2. sum of probability $\Sigma P = 1$

Theorem of compound probability and Conditional Probability

Conditional Probability:

If A_1 and A_2 are 2 events, the conditional ... denoted by

If A_1 and A_2 are 2 events, :

probability of A_2 given A_1 denoted by

$$P(A_2|A_1) = \frac{P(A_2 \cap A_1)}{P(A_1)} \quad -(1)$$

$$\text{or} \quad P(A_1|A_2) = \frac{P(A_1 \cap A_2)}{P(A_2)} \quad -(2)$$

from (1) : $P(A_2 \cap A_1) = P(A_1) \cdot P(A_2/A_1)$

from (2) : $P(A_1 \cap A_2) = P(A_2) \cdot P(A_1/A_2)$

is called compound probability.

If two events A_1 and A_2 are independent, the probability of occurence of A_1 as well as A_2 is given by the product of their individual probabilities.

i.e $P(A_1 \cap A_2) = P(A_1)\,P(A_2)$

Conditional probability $P(A_1|A_2) = \frac{P(A_1 \cap A_2)}{P(A_2)}$

$$= \frac{P(A_1) \cdot \cancel{P(A_2)}}{}$$

$$= \frac{P(A_1)\cdot \cancel{P(A_2)}}{\cancel{P(A_2)}}$$

$$\boxed{P(A_1/A_2) = P(A_1)}$$

Compound probability, $P(A_1 \cap A_2) = P(A_1)\, P(A_2/A_1)$

$$\boxed{P(A_1 \cap A_2) = P(A_1)\cdot P(A_2)}$$