



PROBABILITY

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WHAT IS PROBABILITY AND HOW IS IT DEFINED?

- Probability/chance
- An expression or likelihood or chance of occurrence of an event
- It is a number which ranges from zero (0) to one (1)
- Zero- for an event which cannot occur and one for an event which are certain to occur

WHAT IS PROBABILITY AND HOW IS IT DEFINED?

- Classical or a priori probability
- Relative frequency theory of probability
- Subjective Approach to probability
- Axiomatic Approach to probability

CLASSICAL OR A PRIORI PROBABILITY

- It is the oldest and simplest
- Originated in the eighteenth century
- Basic assumptions- Outcomes of a random experiment are 'equally likely'
- The event whose probability is sought consists of one or more possible outcomes of the given activity
- Example- When a dice is rolled, any one of the six possible outcomes can occur

CLASSICAL OR A PRIORI PROBABILITY

- The ratio of the number of favourable cases to the total number of equally likely cases
- If probability of occurrence of A is denoted by $P(A)$, then by the definition,

$$P(A) = \frac{\text{Number of favourable Cases}}{\text{Total number of equally likely cases}}$$

- For calculating probability, two things need to be found out
 - Number of favourable cases
 - Total number of equally likely cases



LIMITATIONS

- Cannot be applied whenever it is not possible to make simple enumeration of cases which can be considered equally likely
- Cannot be applied towards legitimate questions

RELATIVE FREQUENCY THEORY

- The probability is the value which is approached by a/n when n becomes infinity
- Example- if a coin is tossed 10 times we may get 6 heads and 4 tails (probability of head will be 0.6 and tail will be 0.4)
- If the experiment is carried out a large number of times approximately equal number of heads and tails can be expected

RELATIVE FREQUENCY THEORY

- If n approaches ∞ (infinity), the probability of getting a head or tail approached 0.5
- The probability of an event when that occurs an indefinitely large number of trials can be defined as the relative frequency
- If an even occurs a times out of n , its relative frequency is a/n
- The value which is approached by a/n when n becomes infinity is called the limit of the relative frequency

RELATIVE FREQUENCY THEORY

- Symbolically $P(A) = \lim_{n \rightarrow \infty} \frac{a}{n}$
- Theoretically the probability of an above limit can never be obtained
- In practice, we can only try to have a close estimate

SUBJECTIVE APPROACH TO PROBABILITY

- Introduced by Frank Ramsey in the year 1926
- As defined as the probability assigned to an event by an individual based on whatever evidence is available

AXIOMATIC APPROACH TO PROBABILITY

- Introduced by A N Kolmogorov in the year 1933
- No precise definition of probability is given, rather certain axioms or postulates are given on which probability is given

AXIOMATIC APPROACH TO PROBABILITY

- The whole field of probability theory for finite sample spaces is based upon the three axioms
 - The probability of an event ranges from zero to one. If the event cannot take place its probability shall be zero and if it is certain, then its probability shall be one
 - The probability of the entire sample space is 1, i.e., $P(S) = 1$
 - If A and B are mutually exclusive (or disjoint) events then the probability of occurrence of either A or B denoted by $P(A \cup B)$

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

SOME TERMS....

- Experiments and Events
- Mutually Exclusive Events
- Independent and Dependent Events
- Equally likely Events
- Simple and Compound Events
- Exhaustive Events
- Complementary Events