PROBABILITY

Probability is the likelihood of something occurring.

An **Outcome** is a possible result of an experiment or event.

Experimental Probability is a probability based on experimental trials. Sometimes experimental probability is referred to as *statistical probability* or *empirical probability*.

- $P(A) = \frac{n(A)}{n(T)}$ where P(A) is the probability that outcome A occurs, n(A) is the number of time that outcome A occurred, and n(T) is the total number of trials.

$$P(A) = \frac{number\ of\ times\ A\ occurs}{total\ number\ of\ trials}$$

Random means that each outcome has an equal likelihood of happening/occurring.

Sum of probabilities:
For a probability experiment in which there are *n* outcomes, $P_1 + P_2 + P_3 + ... + P_n = 1$, where $P_1, P_2, P_3, ..., P_n$ are the probabilities of the individual outcomes.

Subjective Probability is a probability estimate based on intuition or experience. Subjective probability often involves little or no mathematical data.

Theoretical Probability is a probability based on analysis of all possible outcomes. Sometimes theoretical probability is referred to as *classical probability*.

Sample Space is the collection of all possible outcomes. Sometimes referred to as *sample set*.

Event is a set of outcomes that have a common characteristic. An event has to be clearly defined/described.

- $P(A) = \frac{n(A)}{n(S)}$, where P(A) is the probability that event A can occur, n(A) is the numbers of ways the event A can occur, and n(S) is the total number of possible outcomes in the sample space.

$$P(A) = \frac{number\ of\ times\ a\ desired\ outcome\ can\ occur}{total\ number\ of\ possible\ outcomes}$$

!!! Experimental probability approaches theoretical probability as a very large number of trials are carried out.

Complement is the set of possible outcomes not included in an event.
- Let A be the desired event that an even number is rolled on a 6-sided fair die.
- Then $A' = A^c = \bar{A}$ is the complement of the event A and it is the collection of all events when an even number is not rolled on a 6-sided fair die. That is, A^c is the event that an odd number is rolled.

$$P(A) + P(A^c) = 1 \qquad\qquad P(A^c) = 1 - P(A) \qquad\qquad P(A) = 1 - P(A^c)$$

Odds in Favour = the ratio of the probability that an event will happen to the probability that it will not occur. *The odds in favour of $A = P(A): P(A^c)$*

Example:

Odds Against =ratio of the probability that an event will not happen to the probability that it will occur. *The odds against of $A = P(A^c): P(A)$*

Example: