Classical Probability – Probability of an Event

In an experiment, **an event** is the result that we are interested in.

Definition: If the outcomes in a sample space are equally likely to occur, then the classical probability written $P(A)$ of an event A is defined to be:

$$P(A) = \frac{\text{Number of outcomes favorable the occurrence of A}}{\text{Total number of equally likely outcomes}}$$

$$P(A)=\frac{n(A)}{n(S)}$$

If we can assume that all the simple events in a sample space have the same chance of occurring, then we can measure the probability of an event as a proportion, relative to the number of points in the sample space. Such a probability measurement is referred to as classical probability.

Properties of probability:

$0 \le P(A) \le 1$

$P(S) = 1$

Example 1: When a fair die is thrown, what is the probability of getting

a) The number 5
b) A number that is a multiple of 3
c) A number that is greater than 6
d) A number that is less than 7

A **fair** die is an unbiased die where each of the six numbers is **equally likely** to turn up.
S = {1, 2, 3, 4, 5, 6}

a) Let A = event of getting the number 5 = {5}
Let n(A) = number of outcomes in event A = 1
n(S) = number of outcomes in S = 6

$$P(A) = \frac{1}{6}$$

b) Let B = event of getting a multiple of 3
Multiple of 3 = {3, 6}

$$P(B) = \frac{2}{6} = \frac{1}{3}$$

c) Let C = event of getting a number greater than 6
There is no number greater than 6 in the sample space S.
C = { }

$$P(C) = \frac{0}{6} = 0$$

A probability of **0** means the event will **never** occur.

d) Let D = event of getting a number less than 7
Numbers less than 7 = {1, 2, 3, 4, 5, 6}

$$P(D) = \frac{6}{6} = 1$$

A probability of **1** means the event will **always** occur.