Independent Events

Definition 1: Two events A and B are said to be independent of each other if the occurrence of anyone of them will not change the probability of the occurrence of the other.

Example 1: The events below are independent events:
1) Event A is rolling a sum of 7 from two dice. Event B is flipping a head in coin toss.
2) Event A is winning the super lotto, event B is winning is horse race in Del Mar.
3) Event A is getting an even number on the first spin of a roulette wheel, event B is getting a number between 19 and 36 in the second spin of the same roulette wheel.

Probability of independent Events

Rule 1: If events A and B are independent, then the probability of them occurring successively is

Prob(A followed by B) = P(A)×P(B)

Definition 2: **Sampling with Replacement:** If individuals are returned to the eligible pool for each selection.

Definition 3: **Sampling without Replacement:** If sampled individuals are not eligible for subsequent selection.

Example 2: You have a bag of marbles. 6 are red, 4 are blue, and 6 are white.

1) What is the probability that you pull out two blue marbles if you are sampling with replacement?
   Event A: Pull out a Blue Marble
   Event B: Pull out a Blue Marble
   P(A and B)= P(Blue and Blue) = $P(\text{Blue}) \times P(\text{Blue}) = \frac{4}{16} \times \frac{4}{16} = 0.0625$

2) What is the probability that you pull out a blue marble on the first try and a blue marble on the second try if you are sampling without replacement?
   $P(\text{Blue and Blue}) = P(\text{Blue}) \times P(\text{Blue}|\text{Blue}) = \frac{4}{16} \times \frac{3}{15} = 0.05$