INDEPENDENT EVENTS

If the probability of event A is not changed by the occurrence of event B, we say that A and B are independent events

$$P(A|B) = P(A)$$

$$P(B|A) = P(B)$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \rightarrow \boxed{P(A \cap B) = P(A|B) \cdot P(B)}$$

Multiplicative Rule

If A & B are Independent $\rightarrow$ $\boxed{P(A \cap B) = P(A)\,P(B)}$

Example: Bag of Marbles

10 { 4 Red, 6 Not Red

Draw two marbles, in succession, with replacement. What is the probability that both are red?

A = Second Marble is red

B = First " " "

$$P(A \cap B) = P(A) \cdot P(B) = \frac{4}{10} \times \frac{4}{10} = \frac{16}{100}$$

Example: Now, without replacement

$$\underbrace{\frac{4}{10}}_{\text{1st Marble}} \cdot \underbrace{\frac{3}{9}}_{\text{2nd Marble}}$$

$$P(A \cap B) = P(A|B) \cdot P(B) = \frac{3}{9} \times \frac{4}{10} = \frac{12}{90}$$