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Multiplication Rule:

1. Independent Event

2. Dependent Event

Independent events

- **Definition:** The occurrence of one event has no impact on the probability of the other event.
- **Formula:** $P(A \text{ and } B) = P(A) \times P(B)$
- **Example:** The probability of flipping a coin and getting heads ($P(A)$) and then rolling a die and getting a six ($P(B)$) is calculated by multiplying their probabilities:

$$P(A) \times P(B) = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}.$$

Dependent events

- **Definition:** The occurrence of one event changes the probability of the other event.
- **Formula:** $P(A \text{ and } B) = P(A) \times P(B|A)$
- **Explanation of terms:**
 - $P(B|A)$ is the conditional probability of event B, given that event A has already happened.
- **Example:** Drawing two cards from a deck without replacement.
 - Let event A be drawing an ace first. $P(A) = \frac{4}{52}$.
 - Let event B be drawing a second ace. Since one ace is already removed, the probability of drawing a second ace depends on the first event.
 - The probability of drawing a second ace, given that the first card was an ace, is $P(B|A) = \frac{3}{51}$.
 - The probability of both events happening is $P(A \text{ and } B) = P(A) \times P(B|A) = \frac{4}{52} \times \frac{3}{51}$.