

AP Statistics: Probability

From Simple Studies, <https://simplestudies.edublogs.org> & @simplestudiesinc on Instagram

Definitions

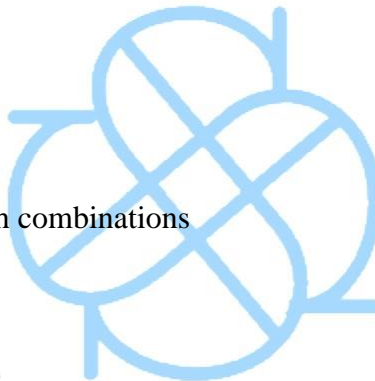
- **Sample Space:** The collection of all possible outcomes of a chance experiment
- **Event:** Any collection of outcomes from the sample space
- **Complement:** Consists of all outcomes that are *not* in the event
- **Union:** The event A *or* B happening
 - Consists of all outcomes that are in at least one of the two events
 - $E = A \cup B$
- **Intersection:** The events A *and* B happening
 - Consists of all outcomes that are in both events
 - $E = A \cap B$
- **Mutually Exclusive (Disjoint):** Two events have *no* outcomes in common
- **Venn Diagrams:** Used to display relationships between events
 - Helpful in calculating probabilities
- **Probability:** Denoted by P (Event)
 - $P(E) = \frac{\text{Favorable Outcomes}}{\text{Total Outcomes}}$
 - Only appropriate when the outcomes of the sample space are equally likely
- **Experimental Probability:** The relative frequency at which a chance experiment occurs
- **Law of Large Numbers:** As the number of repetitions of a chance experiment increase, the difference between the relative frequency of occurrence for an event and the true probability approaches zero
- **Independent:** Two events are independent if knowing that one will occur does not change the probability that the other occurs

Basic Rules of Probability

- **Legitimate Values:** For any event E, $0 \leq P(E) \leq 1$
- **Sample Space:** If S is the sample space, $P(S) = 1$
- **Complement:** For any event E, $P(E) + P(\text{Not } E) = 1$
- **Addition:** Two events A and B, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- **Multiplication:** If two events A and B are independent, $P(A \cap B) = P(A) \cdot P(B)$
 - **General Rule:** $P(A \cap B) = P(A) \cdot P(B/A)$
- **At Least One:** $P(\text{At Least } 1) = 1 - P(\text{None})$
- **Conditional Probability:** Probability that takes into account a given condition
 - $P(A/B) = \frac{P(A \cap B)}{P(B)}$

Combinations

- ${}_n C_r = \frac{n!}{(n-r)! r!}$
- ${}_n C_r = {}_n C_{n-r}$
- **Order does not matter with combinations**
 - A, B, C
 - ${}_3 C_1 = A, B, C$
 - ${}_3 C_2 = AB, BC, AC$
- ${}_n C_r p^r q^{n-r}$
 - n = Number of Trials
 - r = Number of Successes
 - p = P(Success)
 - q = P(Not Success) = 1 - p



Discrete Random Variables

- $\sigma = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$
- $S = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$
- $E(X \pm Y) = E(X) \pm E(Y)$
 - $E(X) = \bar{x}$

- $E(Y) = \bar{y}$
- $\sigma^2(X \pm Y) = \sigma^2(X) + \sigma^2(Y)$

