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)
  - $P(E) = {}^{\text{Favorable Outcomes}}/_{\text{Total Outcomes}}$
    - 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(At Least 1) = 1 - P(None)
- Conditional Probability: Probability that takes into account a given condition
  - $P(A/B) = {}^{P(A \cap B)}/_{P(B)}$

Combinations

- ${}_nC_r = {}^{n!}/_{(n-r)!\, r!}$
- ${}_nC_r = {}_nC_{n-r}$
- Order does not matter with combinations
  - A, B, C
  - ${}_3C_1$ = A, B, C
  - ${}_3C_2$ = AB, BC, AC
- ${}_nC_r\, p^r\, q^{n-r}$
  - n = Number of Trials
  - r = Number of Successes
  - p = P(Success)
  - q = P(Not Success) = 1 - p

Discrete Random Variables

- $\sigma = \sqrt{({}^{\Sigma(x-\bar{x})2}/_n)}$
- $S = \sqrt{({}^{\Sigma(x-\bar{x})2}/_{n-1})}$
- $E(X \pm Y) = E(X) \pm E(Y)$
  - $E(X) = \bar{x}$

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