Math 1700: Elementary Statistics

3^{th} Week Summary (09/11/25)

- **Probability**

  An **experiment** is a process by which a measurement is taken or observations is made

  An **outcome** is the result of an experiment

  Sample space is a listing of possible outcomes

  An **event** A is an outcome or a combination of outcomes.

- **Different** type of Probability

  Subjective, Empirical (experimental) and Theoretical

- **Tree Diagram**

- **Properties** of Probability

  A probability is always a numerical value between zero and one: $0 \leq P(A) \leq 1$

  The sum of probabilities for all *outcomes* of an experiment is equal to exactly one: $\sum_{\text{all}} P(A) = 1$

- **Law of large numbers**: As the number of times an experiment is repeated increases, the ratio of the number of successful occurrences to the number of trials will tend to approach the theoretical probability of the outcome for an individual trial.

- **Odds**: If the odds in favor of an event A are $(a : b)$, then $P(A) = \dfrac{a}{a+b}$

- **Conditional probability**: $P(A|B)$ is "probability of A happening, knowing B has already occurred"

- **Rules** of probability

  Complement Rule: $P(\bar{A}) = 1 - P(A)$

  General Addition Rule: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

  General Multiplication Rule: $P(A \text{ and } B) = P(A) \cdot P(B|A) = P(B) \cdot P(A|B)$

- **Mutually exclusive** events: $P(A \text{ and } B) = 0$

  Special Addition Rule: $P(A \text{ or } B \text{ or } C \text{ or } \cdots \text{ or } E) = P(A) + P(B) + P(C) + \cdots + P(E)$

- **Independent** events: $P(A) = P(A|B)$, or equivalently: $P(A \text{ and } B) = P(A) \cdot P(B)$

  Special Multiplication Rule: $P(A \text{ and } B \text{ and } C \text{ and } \cdots \text{ and } E) = P(A) \cdot P(B) \cdot P(C) \cdots P(E)$