Elements of Probability: Discrete Probability

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Basic Terminology

The Cast and Crew

- **Experiment:** a repeatable procedure with well-defined possible outcomes
- **Sample space:** the set of all possible outcomes. This is often denoted by Ω or S.
- **Event:** a subset of the sample space
- **Probability (mass) function (PMF):** a function giving the probability for each outcomes

Later Concepts

- **Probability density:** a continuous distribution of probabilities
- **Random variable:** a random numerical outcome (an outcome about whose value we are a priori uncertain)

Simple Examples

Example 1: Tossing a Fair Coin

- Experiment: toss the coin, report if it lands heads or tails
- Sample space: $\Omega = \{H, T\}$
- PMF: $P(H) = 0.5 \quad$ and $\quad P(T) = 0.5$

Example 2: Toss a Fair Coin 3 Times

- Experiment: toss the coin 3 times, list the results.
- Sample space:
  $\Omega = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$
- PMF: Each outcome is equally likely with probability $1/8$.

The PMF as a Table

Outcomes	HHH	HHT	HTH	HTT	THH	THT	TTH	TTT
Probability	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8