BENEFITS OF RANDOM DISCRETE VARIABLES

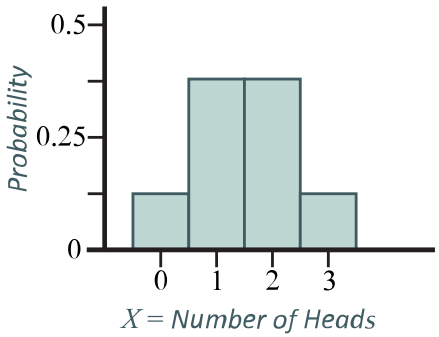
Definitions

- **Random variables:** a numerical representation of an outcome from a random experiment
  - **Notation:** Use the capital letter X.
  - **Examples:**
  - **Discrete random variables:** values can only be countable numbers (positive integers); typically result from counting something.
    - **Examples**:
  - **Continuous random variables:** values can be any real number; typically result from measuring something.
    - **Examples**:
- **Probability distribution:** a table or graph that lists the probability of each outcome

Example 1: *Heads or Tails*

Let X be the number of heads showing. Create a probability distribution table and graph. Then determine $P(1 \le X \le 3)$ and explain its meaning.

X	0	1	2	3
$P(X)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$



$P(1 \le X \le 3) =$

Take Note

- Each probability, $P(X)$, must be between 0 and 1, inclusive: $0 \le P(X) \le 1$.
- The sum of all the possible probabilities is 1: $\sum P(x_i) = 1$.

Definitions

- **Mean (expected value):** $\mu_X = E(X) = \sum x_i \cdot P(x_i)$; is not an ordinary average; it is a weighted average
- **Standard deviation:** $\sigma_X = \sqrt{\sum (x_i - \mu_X)^2 \, p_i}$

Example 2: *Drawing Cards*

There is a deck of four cards: an ace, 2, and 3 of hearts, and an ace of spades. One card is randomly drawn, replaced, and a second card is drawn. Let X be the sum of the two drawn cards, where the ace has a value of 1. Create a probability distribution table and graph. Then calculate the expected value and standard deviation.

Sample Space	X

Sample Space	X

X	$P(X)$