Math 1700: Elementary Statistics

4^{th} Week Summary (09/18/25)

- **Random Variables**: A variable that assumes a unique numerical value for each of the outcomes

  Discrete: A random variable that can assume a countable number of values

  Continuous: A random variable that can assume an uncountable (continuum) number of values

- **Probability function**: A distribution of the probabilities associated with each of the values of a random variable

- **Probability distribution**: A rule, $P(x)$, that assigns probabilities to the values of the random variables

  Property 1: $0 \leq P(x) \leq 1$

  Property 2: $\sum_{\text{all x}} P(x) = 1$

- **Population Parameters**

  $\mu = \sum_{i=1}^{n} x_i P(x_i)$ is the population mean.

  $\sigma^2 = \sum_{i=1}^{n} (x_i - \mu)^2 P(x_i) = \sum_{i=1}^{n} [x_i^2 P(x_i)] - \mu^2$ is the population variance

  $\sigma = \sqrt{\sigma^2}$ is the population standard deviation.

- **Binomial probability experiment**:

  1. There are n repeated identical independent trials.
  2. Each trial has two possible outcomes (*success* or *failure*).
  3. $P(\text{success}) = p$, $P(\text{failure}) = q$, and $p + q = 1$.
  4. The binomial random variable x is the count of the number of successful trials that occur; x may take on any integer value from zero to n

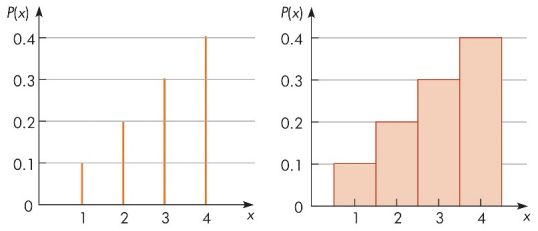
- **Binomial probability function**:

- $P(x) = \dfrac{n!}{x!(n-x)!}(p^x)(q^{n-x}), \quad \text{for } x = 0, 1, 2, \cdots, n$

  $\mu = np$

  $\sigma^2 = npq$

  $\sigma = \sqrt{npq}$



x	P(x)
1	$\frac{1}{10} = 0.1$ ✓
2	$\frac{2}{10} = 0.2$ ✓
3	$\frac{3}{10} = 0.3$ ✓
4	$\frac{4}{10} = 0.4$ ✓
	$\frac{10}{10} = 1.0$