Chapter 7

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- Discrete Probability distribution
  - $0 \leq P(x) \leq 1$ for all x
  - $\sum_{\text{all } x} P(x) = 1$
- Population Mean: $E(X) = \mu = \sum_{\text{all } x} xP(x)$
- Population Variance: $V(X) = \sigma^2 = \sum_{\text{all } x}(x - \mu)^2 P(x)$

$$= E(x^2) - \left[E(x)\right]^2$$

Quick review (2)

- Laws of Expected Value (note that c means a constant, a number)
  - $E(c) = c$
  - $E(X + c) = E(X) + c$
  - $E(cX) = cE(X)$
- Laws of Variance
  - $V(c) = 0$
  - $V(X + c) = V(X)$
  - $V(cX) = c^2 V(X)$

Binomial random variable

- The binomial experiment consists of a **fixed number of trials** (n).
- Each trial has **two possible outcomes**: S/F.
- The probability of success is p (**fixed**). The probability of failure is 1-p (fixed).
- The trials are **independent**.
- $P(x) = nCx \ p^x(1 - p)^{n-x}$.
- $E(x) = np$, $Var(x) = np(1 - p)$.

Quick review (4)

The Poisson random variable

- Defined as **number of successes** that occur in a period of time or an interval of space.
- The number of successes that occur in any interval is **independent** of the number of successes that occur in any other interval.
- The probability of a success in an interval is the same for all equal-size intervals.
- The probability of a success in an interval is **proportional to the size of the interval**.
- $P(x) = \frac{e^{-\mu}\mu^x}{x!}$ where μ is the mean number of successes in the interval or region.
- $E(x) = \mu$, $Var(x) = \mu$.