4.8: Formula Review

4.2 : Hypergeometric Distribution

$$h(x) = \frac{\binom{A}{x}\binom{N-A}{n-x}}{\binom{N}{n}} \tag{4.8.1}$$

4.3 : Binomial Distribution

$X \sim B(n, p)$ means that the discrete random variable X has a binomial probability distribution with n trials and probability of success p.

$X =$ the number of successes in n independent trials

$n =$ the number of independent trials

X takes on the values $x = 0, 1, 2, 3, \ldots, n$

$p =$ the probability of a success for any trial

$q =$ the probability of a failure for any trial

$p + q = 1$

$q = 1 - p$

The mean of X is $\mu = np$. The standard deviation of X is $\sigma = \sqrt{npq}$.

$$P(x) = \frac{n!}{x!(n-x)!} \cdot p^x q^{(n-x)} \tag{4.8.2}$$

where $P(X)$ is the probability of X successes in n trials when the probability of a success in ANY ONE TRIAL is p.

4.4 : Geometric Distribution

$P(X = x) = p(1-p)^{x-1}$

$X \sim G(p)$ means that the discrete random variable X has a geometric probability distribution with probability of success in a single trial p.

$X =$ the number of independent trials until the first success

X takes on the values $x = 1, 2, 3, \ldots$

$p =$ the probability of a success for any trial

$q =$ the probability of a failure for any trial $p + q = 1$

$q = 1 - p$

The mean is $\mu = \frac{1}{p}$.

The standard deviation is $\sigma = \sqrt{\frac{1-p}{p^2}} = \sqrt{\frac{1}{p}\left(\frac{1}{p} - 1\right)}$.

4.5: Poisson Distribution

$X \sim P(\mu)$ means that X has a Poisson probability distribution where $X =$ the number of occurrences in the interval of interest.

X takes on the values $x = 0, 1, 2, 3, \ldots$

The mean μ or λ is typically given.

The variance is $\sigma^2 = \mu$, and the standard deviation is

$$\sigma = \sqrt{\mu} \tag{4.8.3}$$

The probability of having exactly x successes in r trials is $P(X=x)=\left(e^{-\mu}\right)\frac{\mu^{x}}{x!}$.

When $P(\mu)$ is used to approximate a binomial distribution, $\mu=np$ where n represents the number of independent trials and p represents the probability of success in a single trial.

$$P(x)=\frac{\mu^{x}e^{-\mu}}{x!} \tag{4.8.4}$$