

4.9: Formula Review

4.1 Hypergeometric Distribution

$$h(x) = \frac{\binom{A}{x} \binom{N-A}{n-x}}{\binom{N}{n}} \quad (4.9.1)$$

4.2 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 $x = 0, 1, 2, 3, \dots, n$

p = the probability of a success for any trial

q = the probability of a failure for any trial

$$\begin{aligned} p + q &= 1 \\ q &= 1 - p \end{aligned} \quad (4.9.2)$$

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

$$P(x) = \frac{n!}{x!(n-x)!} \cdot p^x q^{(n-x)} \quad (4.9.3)$$

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

4.3 Geometric Distribution

$$P(X = x) = p(1 - p)^{x-1} \quad (4.9.4)$$

$X \sim G(p)$ 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 $x = 1, 2, 3, \dots$

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

4.4 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 $x = 0, 1, 2, 3, \dots$

The mean μ or λ is typically given.

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

$$\sigma = \sqrt{\mu} \quad (4.9.5)$$

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.

$$P(x) = \frac{\mu^x e^{-\mu}}{x!} \quad (4.9.6)$$

4.9: Formula Review is shared under a [not declared](#) license and was authored, remixed, and/or curated by LibreTexts.