

Some Useful Formulas

- Sample standard deviation:

$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\frac{\left(\sum x^2 - \frac{(\sum x)^2}{n} \right)}{n - 1}} = \sqrt{\frac{\sum x^2 - n(\bar{x})^2}{n - 1}}$$

- $P(E_1 \text{ or } E_2) = P(E_1) + P(E_2) - P(E_1 \text{ and } E_2)$

- **Conditional Probability:** $P(E_1 | E_2) = \frac{P(E_1 \text{ and } E_2)}{P(E_2)}$

- **Binomial:**

$$P(x) = \frac{n!}{x!(n-x)!} p^x q^{n-x}, \quad \mu = E(X) = np, \quad \sigma = \sqrt{npq}$$

- **Poisson:** $P(x) = \frac{(\lambda t)^x e^{-\lambda t}}{x!}, \quad \mu = \lambda t, \quad \sigma = \sqrt{\lambda t}$

- **Hypergeometric:** $P(x) = \frac{C_{n-x}^{N-x} C_x^X}{C_n^N}$

- **Uniform:** $f(x) = \begin{cases} \frac{1}{a-b} & \text{if } a \leq x \leq b \\ 0 & \text{otherwise} \end{cases}$

- **Exponential:** $P(0 \leq x \leq a) = 1 - e^{-\lambda a}$