

Probability Rules

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A)P(B|A)$$

Expected Value & Variance For a discrete random variable X with outcomes x_k and corresponding probabilities p_k .

$$E(X) = \mu = \sum p_k x_k$$

$$\text{Var}(X) = \sigma^2 = \sum p_k (x_k - \mu)^2$$

Expected Value Rules

$$E(cX) = cE(X)$$

$$E(X + Y) = E(X) + E(Y)$$

Variance Rules

$$\text{Var}(cX) = c^2 \text{Var}(X)$$

$$\text{Var}(X + Y) = \text{Var}(X) + \text{Var}(Y) \quad (\text{only if } X \text{ and } Y \text{ are independent})$$

Mean & Variance for the Binomial Distribution If $X \sim \text{Binom}(n, p)$, then

$$E(X) = \mu = np$$

$$\text{Var}(X) = \sigma^2 = p(1 - p)n$$