

Probability

- Two events are **mutually exclusive** if $P(A \cap B) = 0$
- Two events are **independent** if $P(A \cap B) = P(A)P(B)$

DRV

- $\text{Var}(X) = E(X^2) - (E(X))^2$

Binomial

- (the number of trials, n , is fixed)
- (each trial results in only two outcomes, "success" or "failure")
- The probability of success, p , is **the same** for each trial
- Each trial is **independent** from each other

Normal

- $E(aX - b) = aE(X) - b$
- $\text{Var}(aX - b) = a^2\text{Var}(X)$
- $\text{Var}(X - Y) = \text{Var}(X) + \text{Var}(Y)$
- For $X_1 + X_2, 2X - 3Y, \bar{X}$ to be normally distributed, X_1, X_2, Y must be **independent**

Sampling

- The **population** includes all members of a study
- A **sample** is a subset of the population
- A sample is **random** if each member of the population has the same probability of being selected into the sample. Each member of the sample is independently selected.
- μ : **population mean**
- \bar{x} : **sample mean** (also used as the unbiased estimate of population mean)
- σ : **population standard deviation**
- σ^2 : **population variance**
- s^2 : **unbiased estimate of population variance**
- $s^2 = \frac{n}{n-1}$ (sample variance)

Hypothesis Testing

- A **null hypothesis**, H_0 , is an assertion about a population that we would like to test
- An **alternative hypothesis**, H_1 , is a contrasting hypothesis that will be tested against H_0
- \bar{x} and z are our **test statistic**
- The **critical region** is the set of values for the test statistic such that H_0 is rejected
- The **critical value** is the cut-off value for the critical region
- The **level of significance** is the probability that our hypothesis test concludes that H_1 is true when in fact H_0 is true
- The **p-value** is the
 - probability that, under H_0 , we obtain a test statistic less/more extreme/more than the value obtained from our sample
 - the least level of significance that will result in the rejection of H_0