Expected Value

The expected value of a random variable is the average of all outcomes of the trials if we are to repeat the trial many times (think 100,000 or 1 million times!).

\[ \mu_X = E(X) = \sum_{all\ x} x \cdot f(x) \]

Example 1:
Let \( X = \) the number of pizza Alex orders per week.

\[ x \quad f(x) \]
\[
\begin{array}{c|c}
0 & 0.05 \\
1 & 0.1 \\
2 & 0.2 \\
3 & 0.35 \\
4 & \\
5 & 0.1 \\
\end{array}
\]

a) What is the expected value of \( X \)?

Variance

The variance of a random variable is a measurement of how spread out the outcomes of the trial are! (just like variance of data)

\[ \sigma_X^2 = Var(X) = \sum_{all\ x} (x - \mu_X)^2 \cdot f(x) \]

Example 1: (cont.)

b) Find the variance of \( X \).

\[ x \quad f(x) \]
\[
\begin{array}{c|c}
0 & 0.05 \\
1 & 0.1 \\
2 & 0.2 \\
3 & 0.35 \\
4 & \\
5 & 0.1 \\
\end{array}
\]
Standard Deviation

\[ \sigma_X = SD(X) = \sqrt{Var(X)} \]

Example 1: (cont.)
  
c) Find the standard deviation of \( X \).

Example 2:
We are flipping 3 loaded coins. With these coins, the probability of getting tail is 0.3. Let \( X \) be the number of heads we get.

a) What is the probability distribution of \( X \)?

b) On average, how many heads will we get each time?

c) Find the variance and the standard deviation of \( X \)?