



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!).

$$\mu_X = E(X) = \sum_{\text{all } x} x \cdot f(x)$$

Example 1:

Let X = the number of pizza Alex orders per week.

x	$f(x)$
0	0.05
1	0.1
2	0.2
3	0.35
4	
5	0.1

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)

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

Example 1: (cont.)

b) Find the variance of X.

x	$f(x)$
0	0.05
1	0.1
2	0.2
3	0.35
4	
5	0.1

Standard Deviation

$$\sigma_X = SD(X) = \sqrt{Var(X)}$$

Example 1: (cont.)

- c) Find the standard deviation of X.
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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?