Section 5.4 → Binomial Experiments

Gathering categorical data is always a binomial experiment (in some way). A binomial has \( n \) trials (independent). The trials each have 2 outcomes: 
\[ S = \text{success}, \quad F = \text{failure}. \]
\[ p = P(S) = P(\text{success in a trial}), \quad q = 1 - p = P(F) = P(\text{failure}) \]
\[ x = \# \text{ of successes in } n \text{ trials.} \]
\[ P(x) = P(x \text{ successes}) \leftarrow \text{Depends on the number of ways we can get } x \text{ successes, counts the number of ways to get } x \text{ successes} \]
\[ nC_x = \frac{n!}{x! \cdot (n-x)!} \leftarrow \text{List Outcomes} \]
\[ \text{Ex. Toss Kerrich's coin } n=4 \text{ times. How many ways to get } x=2 \text{ heads.} \]
\[ nC_x = 4C_2 = \frac{4!}{2! \cdot (4-2)!} = \frac{24 \cdot 3 \cdot 2}{2 \cdot 1 \cdot 2} = 6 \]
\[ \text{In General } P(x) = nC_x p^x q^{n-x} \]
\[ p^x = \text{Prob. of } x \text{ successes, } q^{n-x} = \text{Prob. of } n-x \text{ failures} \]
\[ nC_x = \text{ways to get } x \text{ successes} \]