Binomial random variables: Say X is a Binomial(n,p) random variable if X has mass $p_X(x) = \binom{n}{x} p^x q^{n-x}$ (again $q = 1-p$)

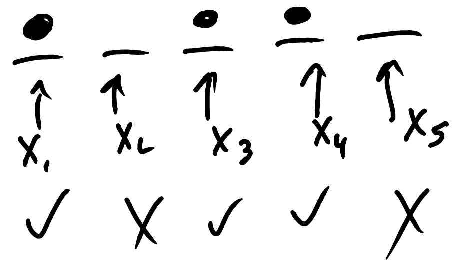
for $x = 0, 1, \ldots, n$.

Interpretation: X is the number of successes in n independent trials that each have probability p of success, probability q of failing.

E.g. If we define $X_1, \ldots, X_n$ as n independent Bernoulli(p) random variables (i.e. n independent indicator random variables)

then $X = X_1 + X_2 + \cdots + X_n$ is a Binomial (n,p) random variable.

For instance, say $n = 5$



E.g. if $X = 3$ need 3 successes, 2 failures

Know $\binom{5}{3} = \frac{5!}{3!2!} = 10$ ways to specify 3 successes, 2 failures.

Each such setup has probability of $p^3 q^2$ of going "as planned"

So $p_X(3) = P(X=3) = \binom{5}{3} p^3 q^2$

In general $p_X(x) = P(X=x) = \binom{n}{x} p^x q^{n-x}$.