

Quick sanity check!

- Is this a distribution?
- Specifically, is

$$\sum_{k=0}^n \mathbb{P}(\text{Bin}(n, p) = k) = 1?$$

- Check

$$\sum_{k=0}^n \binom{n}{k} p^k q^{n-k} = (p + q)^n = 1^n = 1.$$

If $p = q = 1/2$, then we get

$$\binom{n}{k} \left(\frac{1}{2}\right)^k \left(\frac{1}{2}\right)^{n-k} = \binom{n}{k} \left(\frac{1}{2}\right)^n.$$