

Bernoulli trials

- Assume an experiment that is a sequence of independent trials;
- Each trial has

$$\mathbb{P}(\text{success}) = p, \quad \mathbb{P}(\text{failure}) = q = 1 - p.$$

- Probability of the sequence *SSFSF*?
- Let $X_i = 1$ if i is success, $X_i = 0$ if i is failure. Then

$$\begin{aligned}\mathbb{P}(SSFSF) &= \mathbb{P}(X_1 = 1 \wedge X_2 = 1 \wedge X_3 = 0 \wedge X_4 = 1 \wedge X_5 = 0) \\ &= \mathbb{P}(X_1 = 1)\mathbb{P}(X_2 = 1)\mathbb{P}(X_3 = 0)\mathbb{P}(X_4 = 1)\mathbb{P}(X_5 = 0) \\ &= p \cdot p \cdot q \cdot p \cdot q \\ &= p^3 q^2.\end{aligned}$$

Any sequence of k successes and l failures will have probability $p^k q^l$.