

① Binomial Distributions

In probability theory and statistics, the binomial distribution with parameters n and p is the discrete probability distribution of the number of successes in a sequence of n independent experiments, each asking a yes-no question, and each with its own Boolean-valued outcome: **success (with probability p)** or **failure (with probability $q=1-p$)**. A single success/failure experiment is also called a Bernoulli trial or Bernoulli experiment, and a sequence of outcomes is called a Bernoulli process; **for a single trial, i.e., $n = 1$, the binomial distribution is a Bernoulli distribution.**

Eg: Tossing a Coin {Bernoulli Distribution}

$$P(H) = 0.5 = 1-p$$

↓
0

$$P(T) = 0.5 = p$$

↓
1

$$\boxed{n=10}$$

Eg: Tossing a Coin for 10 times

	1 st time	2 nd	3 rd	4 th
{	$P(T) = p$	p	p	p
	$P(H) = 1-p$	$1-p$	$1-p$	$1-p$



Binomial Distribution

Parameters

$n \in \{0, 1, 2, 3, \dots\} \rightarrow$ Number of Trials or Experiment

$p \in [0, 1] \rightarrow$ success or probability for each trial

$$q = 1-p$$

② PMF $P(k) = {}^n C_k p^k (1-p)^{n-k}$

$K \in \{0, 1, 2, \dots, n\} \rightarrow$ number of success.

③ Mean of Binomial distribution

$$\text{Mean} = np$$

④ Variance And Std

$$\text{Variance} = npq$$

$$\text{Std} = \sqrt{npq}$$