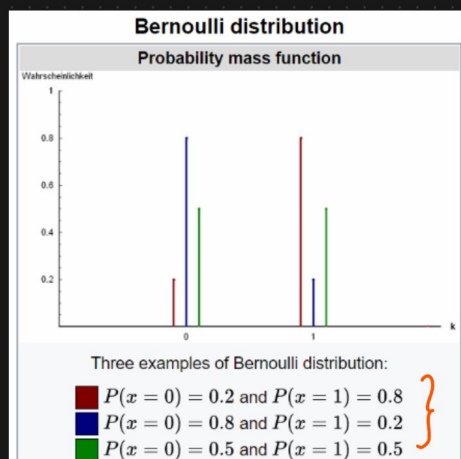


# ① Bernoulli Distribution

[Binary outcomes]

In probability theory and statistics, the Bernoulli distribution, named after Swiss mathematician Jacob Bernoulli, is the discrete probability distribution of a random variable which takes the value **1 with probability p** and the value **0 with probability q=1-p**. Less formally, it can be thought of as a model for the set of possible outcomes of any single experiment that asks a yes-no question. Such questions lead to outcomes that are boolean-valued: a single bit whose value is **success/yes/true/one with probability p** and **failure/no/false/zero with probability q**.



Outcomes are Binary

H ↓ ↓ T

Eg: Tossing a Fair Coin {0,1}

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

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

Eg: Whether the Person Pass/Fail

pmf

pmf vs pdf  
↓  
Discrete  
Random  
Variable

pdf  
↓  
Continuous  
Random Variable

K = 0 or 1

pmf

$$P(x=k) = p^k (1-p)^{1-k}$$

↓

$$① P(x=1) = p^1 (1-p)^0$$

$$P(x=1) = p //$$

Simplified way of PMF

$$PMF = \begin{cases} q = 1-p & \text{if } k=0 \\ p & \text{if } k=1 \end{cases}$$

$$② P(x=0) = p^0 (1-p)^{1-0}$$

$$= (1-p) = q //$$

## ② Mean, Variance And Standard Deviation

Mean

$$K = 1 \text{ or } 0$$

$$E(K) = \sum_{i=1}^K K \cdot P(K)$$

$$P(K=1) = 0.6 = p$$

$$P(K=0) = 1 - 0.6 = q = 0.4$$

$$= 1 * 0.6 + 0 * 0.4$$

$$= 0.6 = p$$

Median of Bernoulli Distribution

$$\text{Median} = \begin{cases} 0 & \text{if } p < 1/2 \\ [0, 1] & \text{if } p = 1/2 \\ 1 & \text{if } p > 1/2 \end{cases}$$

Variance & Std

$$p = 0.5 \quad q = 0.5$$

$$\text{Variance} = p(1-p) = pq$$

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