The Bernoulli Distribution

Many applications of probability and statistics concern the repetition of an experiment, where each repetition is called a *trial*. A **Bernoulli trial** is an experiment with exactly two possible outcomes, labeled "success" and "failure." The probability of success is denoted by p and the probability of failure is denoted by $1 - p$.

<u>The Bernoulli Distribution</u>:

For any Bernoulli trial, we define a random variable X as follows:

If the experiment results in success, then $X = 1$. Otherwise, $X = 0$.

It follows that X is a discrete random variable with probability mass function $p(x)$ defined by

$$p(0) = P(X = 0) = 1 - p$$

$$p(1) = P(X = 1) = p$$

The random variable X is said to have the **Bernoulli distribution** with parameter p.

The notation is $\boldsymbol{X \sim Bernoulli(p)}$.

<u>Mean and Variance of a Bernoulli Random Variable</u>:

If $X \sim Bernoulli(p)$, then

$$\mu_X = p \qquad \text{and} \qquad \sigma_X^2 = p(1 - p)$$