# AI1103 Assignment 3

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Download latex-tikz codes from

https://https://github.com/Sandeep−L/AI1103_3/blob/main/Assignment_3_AI1103.tex

## Question 2

Let $X$ have a binomial distribution with parameters $n$ and $p$, where $n$ is an integer greater than 1 and $0 < p < 1$. If $P(X = 0) = P(X = 1)$, then the value of $p$ is

(A) $\frac{1}{n-1}$ (C) $\frac{1}{n+!}$

(B) $\frac{n}{n+1}$ (D) $\frac{1}{1+n^{\frac{1}{n-1}}}$

## Solution

Let the given table defines the variables

| Variables | Definition |
|---|---|
| $X$ | Random variable |
| $p$ | Probability of success |
| $n$ | Number of trials |
| $k$ | Number of successes |

TABLE 4: Definition of Variables

By Binomial Distribution, we have

$$\Pr(X = k) = {}^{n}C_k p^k (1-p)^{n-k} \tag{0.0.1}$$

Given $\Pr(X = 0) = \Pr(X = 1)$

$$\Pr(X = 0) = \Pr(X = 1) \tag{0.0.2}$$
$${}^{n}C_0 p^0 (1-p)^{n-0} = {}^{n}C_1 p^1 (1-p)^{n-1} \tag{0.0.3}$$
$$(1-p)^n = np(1-p)^{n-1} \tag{0.0.4}$$
$$(1-p) = np \tag{0.0.5}$$
$$1 = (1+n)p \tag{0.0.6}$$
$$p = \frac{1}{n+1} \tag{0.0.7}$$

Therefore, the value of $p$ is option (C) $\frac{1}{n+1}$