

AI1103 - Assignment 1

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Download all python codes from

<https://github.com/CS20BTECH11004/AI1103/tree/main/Assignment%201/codes>

and latex-tikz codes from

<https://github.com/CS20BTECH11004/AI1103/blob/main/Assignment%201/Assignment%201.tex>

1 QUESTION

In an examination, 20 questions of true-false type are asked. Suppose a student tosses a fair coin to determine his answer to each question. If the coin falls heads, he answers 'true'; if it falls tails, he answers 'false'. Find the probability that he answers at least 12 questions correctly.

2 SOLUTION

Let X be the number of correct answer ($X \in \{0, 1, 2, \dots, 20\}$). Let p be the probability of getting the answer correct and q be the probability of getting the answer wrong. $p = q = 0.5$

$$\begin{aligned} \Pr(X \geq 12) \\ = \sum_{r=12}^{20} {}^{20}C_r p^r q^{20-r} \end{aligned} \quad (2.0.1)$$

$$= {}^{20}C_{12} p^{12} q^8 + {}^{20}C_{13} p^{13} q^7 + \dots + {}^{20}C_{20} p^{20} q^0 \quad (2.0.2)$$

$$= \left(\frac{1}{2}\right)^{20} ({}^{20}C_{12} + {}^{20}C_{13} \dots + {}^{20}C_{20}) \quad (2.0.3)$$

$$= 0.25172233581 \quad (2.0.4)$$

The following situation can be represented by a binomial distribution where $n = 20$ and $p = 1/2$