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/tree/main/Assignment%201

1 Problem

(ProbMan 1.9) 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∈{0,1,2,...,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

$$\Pr(X \geq 12) = \sum_{r=12}^{20} \binom{20}{r} p^r q^{20-r} \tag{2.0.1}$$

$$= \binom{20}{12}\left(\frac{1}{2}\right)^{20} + \binom{20}{13}\left(\frac{1}{2}\right)^{20} \ldots + \binom{20}{20}\left(\frac{1}{2}\right)^{20} \tag{2.0.2}$$

$$= \left(\frac{1}{2}\right)^{20}\left(\binom{20}{12} + \binom{20}{13} \ldots + \binom{20}{20}\right) \tag{2.0.3}$$

$$= 0.25172233581 \tag{2.0.4}$$

The following situation can be represented by a binomial distribution where n=20 and p=1/2
By simulations, we can see that the experimental value is close to the theoretical value.