

AI1110: Probability and Random Variables

Assignment 1

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12.13.5.9: Question: On a multiple-choice examination with three possible answers for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing?

Solution:

- Let the probability of correct guess be **p** and incorrect be **q** which are $\frac{1}{3}$ and $\frac{2}{3}$ respectively
- **X** represents the number of correct answers by guessing in the set of 5 multiple choice questions.

Clearly, X has binomial distribution with $n=5$ and $p=\frac{1}{3}$

$$\Pr(X = x) = \binom{n}{x} p^x q^{n-x} \quad (1)$$

$$= \binom{5}{x} \left(\frac{1}{3}\right)^x \left(\frac{2}{3}\right)^{5-x} \quad (2)$$

$$\Pr(X \geq 4) = \Pr(X = 4) + \Pr(X = 5) \quad (3)$$

$$= \binom{5}{4} \left(\frac{1}{3}\right)^4 \left(\frac{2}{3}\right) + \binom{5}{5} \left(\frac{1}{3}\right)^5 \quad (4)$$

$$= 5 \cdot \left(\frac{1}{81}\right) \left(\frac{2}{3}\right) + 1 \cdot \left(\frac{1}{243}\right) \quad (5)$$

$$= \frac{11}{243} \quad (6)$$

\therefore probability that a candidate would get 4 or more correct answers by guessing would be $\frac{11}{243}$