Assignment 3

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Download all python codes from

https://github.com/VIB2020/AI1103/blob/main/Assignment%203/code/Assignment%203.py

and latex-tikz codes from

https://github.com/VIB2020/AI1103/blob/main/Assignment%203/Assignment%203.pdf

1 Problem

GATE 2015 (EE paper 01 new 2), Q. 27

(Electrical Engg. section)

Two players A, and B alternately keep rolling a fair dice. The person to get a six first wins the game. Given that player A starts the game, the probability that A wins the game is:

A: $\frac{5}{11}$ $B: \frac{1}{2}$ $C: \frac{7}{13}$ $D: \frac{6}{11}$

2 Solution

Let the random variable X denote the win of A.

Given the die is fair.

The probability of getting 6 = $\frac{1}{6}$ = p (say)

The probability of NOT getting 6 = $\frac{5}{6}$ = q (say)

P(A wins on the first throw) = p

Constraint:A wins the game.

Thus, if A does not get 6 on the first throw then B also should not get 6 on the second throw.

P (A wins on the third throw) = q^2p

P (A wins on the $(2n+1)^{th}$ throw) =$q^{2n}p$

$$P(X) = \sum_{n=1}^{+\infty} q^{2n}p \quad (1)$$

$$= p\sum_{n=1}^{+\infty}(q^2)^n \quad (2)$$

$$= p\left(\frac{1}{1-q^2}\right) = \frac{p}{1-q^2} = \frac{\frac{1}{6}}{1-\frac{25}{36}} = \frac{6}{11} \quad (3)$$

$$\text{P(A wins the game)} = \text{P(X)} = \frac{6}{11}$$

Option D