AI1103 - Assignment - 2

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Download all python codes from

https://github.com/VamsiPreetham−21/AI1103−Assignment−2/blog/main/Assignment2.py

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GATE 2012(EC), Q37 :
A fair coin is tossed till a head appeared for the first time. The probability that the number of tosses required is odd,
Solution:
Let 'X' is a random variable denoting the trail at which the first head appeared

$$\Pr(X = 1) = \frac{1}{2} \tag{1}$$

$$\Pr(X = 3) = \left(\frac{1}{2}\right)^3 \tag{2}$$

Similarly (3)

$$\Pr X = n = \left(\frac{1}{2}\right)^n \tag{4}$$

Probability of required tosses to be odd, is

$$= \Pr(X = 1) + \Pr(X = 3) + \Pr(X = 5) + ... \tag{5}$$

$$= \frac{1}{2} + \left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^5 + ... \tag{6}$$

$$= \frac{1}{2}\left(1 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^4 + ...\right) \tag{7}$$

$$= \frac{1}{2}\left(1 + \left(\frac{1}{4}\right) + \left(\frac{1}{4}\right)^2 + ...\right) \tag{8}$$

$$= \frac{1}{2}\left(\frac{1}{1 - \frac{1}{4}}\right) \tag{9}$$

$$= \frac{1}{2} \times \frac{4}{3} \tag{10}$$

$$= \frac{2}{3} \tag{11}$$