

Assignment:- 1

AI1110: Probability and Random Variables

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Question. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is $\frac{5}{6}$. What is the probability that he will knock down fewer than 2 hurdles?

Answer: 0.48451

Solution:

Probability of clearing a hurdle $\Pr(E) = \frac{5}{6}$

Probability of knocking down a hurdle $\Pr(E') =$

$$1 - \frac{5}{6} = \frac{1}{6}$$

Let,

X be the number of hurdles the player knocks down.

Using Cumulative Distribution Function(cdf),

$$F_X(r) = \Pr(X \leq r) = \sum_{i=0}^r \Pr(X = i) \quad (1)$$

Here,

$$F_X(r) = \sum_{i=0}^r {}^{10}C_i \left(\frac{1}{6}\right)^i \left(\frac{5}{6}\right)^{10-i} \quad (2)$$

$r=1$ for knocking down fewer than 2 hurdles.

$$\therefore F_X(1) = \sum_{i=0}^1 {}^{10}C_i \left(\frac{1}{6}\right)^i \left(\frac{5}{6}\right)^{10-i} \quad (3)$$

$$= 0.48451 \quad (4)$$

So, the probability that the player will knock down fewer than 2 hurdles is 0.48451 or approximately 48.45%.