

AI1110: Probability and Random Variable

Assignment-1

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Question: 12.13.2.5

Problem Statement:

A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event, 'the number is even,' and B be the event, 'the number is red'. Are A and B independent?

Solution:

Given,

'S' = Sample space = {1, 2, 3, 4, 5, 6}

'A' = Event that number is even = {2, 4, 6}

'B' = Event that number is red = {1, 2, 3}

$$n(A) = 3$$

$$n(B) = 3$$

$$n(S) = 6$$

$$n(AB) = 1$$

Now,

$$\Pr(A) = \frac{n(A)}{n(S)} = \frac{3}{6} = \frac{1}{2} \quad (1)$$

$$\Pr(B) = \frac{n(B)}{n(S)} = \frac{3}{6} = \frac{1}{2} \quad (2)$$

$$\Pr(AB) = \frac{n(AB)}{n(S)} = \frac{1}{6} \quad (3)$$

Now,

$$\Pr(A) \times \Pr(B) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \quad (4)$$

$$\Rightarrow \Pr(AB) \neq \Pr(A) \times \Pr(B) \quad (5)$$

Hence, A and B are not independent.