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}

$$\text{n(A)=3}$$
$$\text{n(B)=3}$$
$$\text{n(S)=6}$$
$$n(A \cap B) = 1$$

Now,

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

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

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{1}{6}$$

Now,

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

$$\Rightarrow \quad P(A \cap B) \neq P(A) \times P(B)$$

Hence, A and B are not independent.

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