ASSIGNMENT-14

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1 QUESTION No-6.19(Probability)

A die is thrown. If E is the event "the number appearing is a multiple of 3" and F be the event "the number appearing is even" then find whether E and F are independent ?

2 Solution

Lemma 2.1. *If A and B are independent events then the property can be expressed as*

$$\Pr(A|B) = \Pr(A). \tag{2.0.1}$$

Let the random variable representing the events be $X \in \{0, 1\}$,where

X	0	Number appearing is a multiple of 3
	1	Number appearing is even

From the given information we have,

$$\Pr(X = 0) = \frac{1}{3} \tag{2.0.2}$$

$$\Pr(X = 1) = \frac{1}{2} \tag{2.0.3}$$

$$\Pr(X = 0, X = 1) = \frac{1}{6} \tag{2.0.4}$$

Now to check whether the events are independent we use Lemma 2.1

$$\Pr(X = 0|X = 1) = \frac{\Pr(X = 0, X = 1)}{\Pr(X = 1)} \tag{2.0.5}$$

$$= \frac{1}{3} \tag{2.0.6}$$

$$= \Pr(X = 0) \tag{2.0.7}$$

Thus $\Pr(X = 0|X = 1) = \Pr(X = 0)$ which implies the events are independent.