ASSIGNMENT-13

Unnati Gupta

Download all python codes from

https://github.com/unnatigupta2320/Assignment_13

and latex-tikz codes from

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1 Question No-6.20

An unbiased dice is thrown twice. Let the event A be 'odd number on the first throw' and B be 'Odd number on second throw'. Check the independence of event A and B.

2 Solution

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

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

1) According to question,the events are:-

Events	Description
A	Odd number on first throw
B	Odd number on second throw
AB	Odd Numbers appears on both throws

2) Let X_0 and X_1 be the random variables representing the numbers we get when a dice is thrown for first and second time respectively.

$$X_0 \epsilon \{1,2,3,4,5,6\} \tag{2.0.2}$$
$$X_1 \epsilon \{1,2,3,4,5,6\} \tag{2.0.3}$$

3) Also, the probability

$$\Pr(X=i) = \begin{cases} \frac{1}{6} & 1 \le i \le 6 \\ 0 & otherwise \end{cases} \tag{2.0.4}$$

4) From the above information we have,

$$\Pr(A) = \sum_{i=1,3,5} \Pr(X_0 = i) = \frac{1}{2} \tag{2.0.5}$$
$$\Pr(B) = \sum_{i=1,3,5} \Pr(X_1 = i) = \frac{1}{2} \tag{2.0.6}$$
$$\Pr(AB) = \frac{1}{4} \tag{2.0.7}$$

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

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \tag{2.0.8}$$
$$= \frac{1}{2} \tag{2.0.9}$$
$$= \Pr(A) \tag{2.0.10}$$

6) Thus $\Pr(A|B) = \Pr(A)$ which implies the events are **independent**.