Assignment 3

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Download all python codes from

https://github.com/Digjoy12/probability/blob/main/Assignment%204/Code/main.py

and latex codes from

https://github.com/Digjoy12/probability/blob/main/Assignment%204/main.tex

Problem

(GATE CS - 2012 Q.33) Suppose a fair six-sided die is rolled once. If the value on the die is 1,2, or 3, the die is rolled a second time. What is the probability that the sum total of values that turn up is at least 6?

1) 10/21
2) 5/12
3) 2/3
4) 1/6

Solution

Let us define a random variable $X \in \{0, 1\}$

X=0	Getting 1,2, or 3 on first roll
X=1	Getting the sum total of values at least 6

TABLE 4: Random Variables

Probability of getting 1,2, or 3 on first roll is given by,

$$\Pr(X = 0) = \frac{3}{6} = \frac{1}{2} \tag{0.0.1}$$

(0.0.2)

Probability of getting sum total of 6 on first roll is given by,

$$\Pr(X = 1) = \frac{1}{6} \tag{0.0.3}$$

(0.0.4)

Probability of getting sum total of 6 after getting 1,2,or,3 in first roll is given by,

$$\Pr(X = 1|X = 0) = \frac{9}{18} = \frac{1}{2} \tag{0.0.5}$$

Now,probability of getting sum total of 6 and getting 1,2,or,3 in first roll is given by,

$$\Pr(X = 1 \cap X = 0) = \Pr(X = 1|X = 0) \times \Pr(X = 0) \tag{0.0.6}$$

$$= \frac{1}{2} \times \frac{1}{2} \tag{0.0.7}$$

$$= \frac{1}{4} \tag{0.0.8}$$

X	X=0	X=1	X=1|X=0
$\Pr(X)$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{2}$

TABLE 4: Probability distribution table

The probability that the sum total of values that turn up is at least 6 is given by

$$\Pr(X = 1 \cap X = 0) + \Pr(X = 1) = \frac{1}{4} + \frac{1}{6} \tag{0.0.9}$$

$$= \frac{5}{12} \tag{0.0.10}$$