

AI1103-Assignment 4

Name : Ayush Jha
Roll Number: CS20BTECH11006

Download all python codes from

<https://github.com/ayushjha2612/AI11003/tree/main/Assignment4/Codes>

and latex-tikz codes from

<https://github.com/ayushjha2612/AI11003/tree/main/Assignment4>

GATE 2017 (XE-A), Q.170

Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the top faces of the dice is a perfect square is

- (A) $\frac{1}{9}$ (B) $\frac{2}{9}$ (C) $\frac{1}{3}$ (D) $\frac{4}{9}$

ANSWER

Option (B) $\frac{2}{9}$

SOLUTION

Let X be a random variable which is equal to 1, when the product of the numbers appearing on the top faces of the dice is a perfect square and 0 when it is not a perfect square.

The total no. of possible outcomes is 36.

Outcomes corresponding to $X = 1$ are listed in table 0. The total no. of favourable outcomes are

Squares	Favourable outcomes
1	(1,1)
4	(1,4) , (2,2) , (4,1)
9	(3,3)
16	(4,4)
25	(5,5)
36	(6,6)

TABLE 0: Outcomes for $X=1$

8. Therefore we have,

$$\Pr(X = 1) = \frac{8}{36} \quad (0.0.1)$$

$$= \frac{2}{9} \quad (0.0.2)$$

Similarly we have that the probability of not getting a perfect square as a product i.e. $X = 0$

$$\Pr(X = 0) = 1 - \Pr(X = 1) \quad (0.0.3)$$

$$= 1 - \frac{2}{9} \quad (0.0.4)$$

$$= \frac{7}{9} \quad (0.0.5)$$

The simulation vs analysis plot can be seen at figure 0. Simulations are close to analysis

Therefore the probability that the product of the numbers appearing on the top faces of the dice is a perfect square is $\frac{2}{9}$ i.e. option (B).

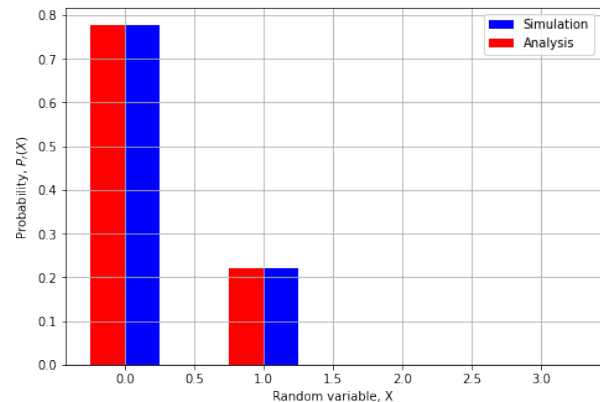


Fig. 0: Probability distribution of X