

Assignment 2

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Download all python codes from

<https://github.com/Ganesh-RB/AI1103prob-and-randomvariables/Assignment2/codes>

and latex-tikz codes from

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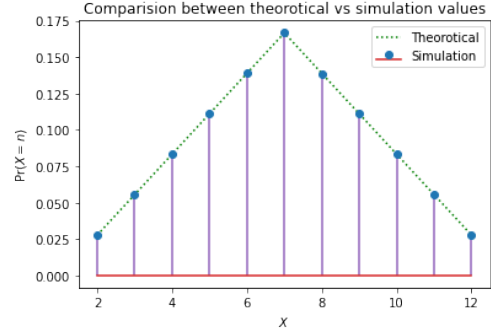


Fig. 0: Probability as a function of n

1 PROBLEM

Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean or expectation of X .

2 SOLUTION

Let $X_1, X_2 \in \{1, 2, 3, 4, 5, 6\}$ be two random variables associated with event.

$X = X_1 + X_2$, representing sum of outcomes of two dices.

$$\therefore X \in \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

Now

$$\Pr(X = n) = \Pr(X_1 + X_2 = n) \quad (2.0.1)$$

$$= \Pr(X_1 = k, X_2 = n - k) \quad (2.0.2)$$

$$= \sum_k \Pr(X_1 = k) \times \Pr(X_2 = n - k) \quad (2.0.3)$$

$$P_X(n) = \begin{cases} 0 & n < 2 \\ \frac{n-1}{36} & 2 \leq n \leq 7 \\ \frac{13-n}{36} & 7 < n \leq 12 \\ 0 & 12 < n \end{cases} \quad (2.0.4)$$

n	2	3	4	5	6	7	8	9	10	11	12
$\Pr(X = n)$	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{5}{36}$	$\frac{1}{6}$	$\frac{5}{36}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{18}$	$\frac{1}{36}$

TABLE 0: Probability as a function of n

For mean

$$\hat{X} = \sum_{n=2}^{12} n \times \Pr(X = n) \quad (2.0.5)$$

$$= \sum_{n=2}^7 n \times \left(\frac{n-1}{36} \right) + \sum_{n=8}^{12} n \times \left(\frac{13-n}{36} \right) \quad (2.0.6)$$

$$= \frac{112}{36} + \frac{140}{36} = \frac{252}{36} \quad (2.0.7)$$

$$= 7.0 \quad (2.0.8)$$

\therefore expectation value of X is 7