

Exemplar - 10.13.3.39

EE22BTECH11043 - Rambha Satvik*

A die has its face marked 0,1,1,1,6,6. Two such dice are thrown together and their score is recorded.

- 1) How many different scores are possible ?
- 2) What is the probability of getting a total 7 ?

Solution: Let the random variables be defined as:

Random Variable	Values	Description
X	$X = \{0,1,6\}$	First Dice Roll
Y	$Y = \{0,1,6\}$	Second Dice Roll

- 1) **Possible outcomes:** The following data can be interpreted from the data given in the question,

$$p_X(k) = \begin{cases} \frac{1}{6} & \text{if } k = 0 \\ \frac{1}{2} & \text{if } k = 1 \\ \frac{1}{3} & \text{if } k = 6 \\ 0 & \text{Otherwise} \end{cases} \quad (1)$$

$$p_Y(k) = \begin{cases} \frac{1}{6} & \text{if } k = 0 \\ \frac{1}{2} & \text{if } k = 1 \\ \frac{1}{3} & \text{if } k = 6 \\ 0 & \text{Otherwise} \end{cases} \quad (2)$$

(3)

The probability mass function for the case where total score of both the dice is 'k' is,

$$p_{X+Y}(k) = \Pr(X + Y = k) \quad (4)$$

$$= \Pr(X = k - Y) \quad (5)$$

$$= E(p_X(k - Y)) \quad (6)$$

$$= \sum_{i=0}^6 (p_X(k - i)) (p_Y(i)) \quad (7)$$

The possible outcomes: 0,1,2,6,7&12

- 2) **Probability of getting a 7 :**

$$p_{X+Y}(7) = \sum_{i=0}^6 (p_X(7 - i)) (p_Y(i)) \quad (8)$$

$$= p_X(6)p_Y(1) + p_X(1)p_Y(6) \quad (9)$$

$$= \frac{1}{3} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{3} \quad (10)$$

$$= \frac{1}{3} \quad (11)$$

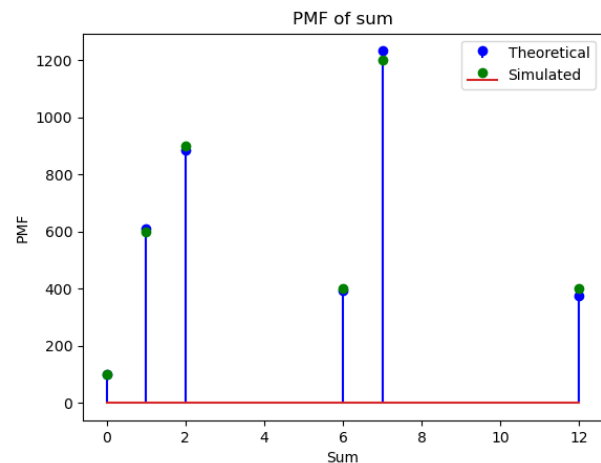


Fig. 1. Sketch of Probability Mass Function for Sum