Assignment 9

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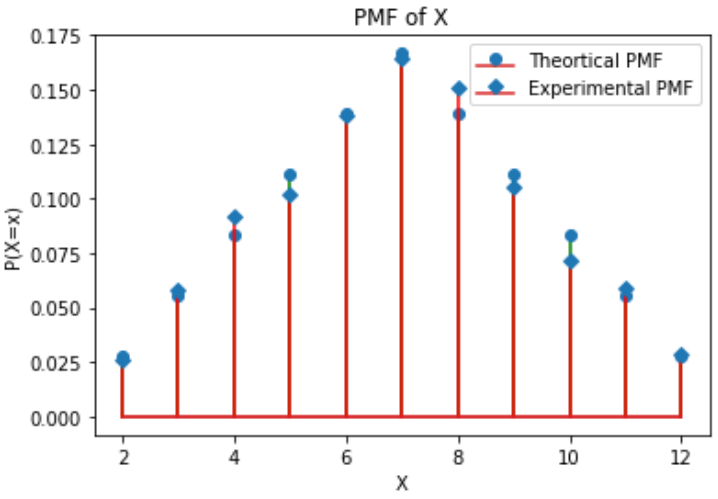
Python code link:https://github.com/ParvezAlam123/Assignment-9



1 Prob. Misc. 5.29

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.

Solution: Let X_1 be random variable for first dice andX_2 be random variable for second dice

$$X_1, X_2 \in \{1, 2, 3, 4, 5, 6\}$$
$$X = X_1 + X_2$$
$$X \in \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

Expectation:

$$\begin{aligned}
X &= X_1 + X_2 \\
E[X] &= E[X_1 + X_2] \\
&= \sum_{x_1}\sum_{x_2}(x_1 + x_2)P(X_1 = x_1, X_2 = x_2) \\
&= \sum_{x_1} x_1 \sum_{x_2} P(X_1 = x_1, X_2 = x_2) + \sum_{x_2} x_2 \sum_{x_1} P(X_1 = x_1, X_2 = x_2) \\
&= \sum_{x_1} P(X_1 = x_1) + \sum_{x_2} P(X_2 = x_2) \\
&= E[X_1] + E[X_2] \\
&= \sum_{i=1}^{6} x_i P(X_1 = x_i) + \sum_{i=1}^{6} x_i P(X_2 = x_i) \\
&= \frac{1}{6}(1 + 2 + 3 + 4 + 5 + 6) + \frac{1}{6}(1 + 2 + 3 + 4 + 5 + 6) \\
&= \frac{1}{6} \times 2 \times 21 \\
&= 7
\end{aligned}$$