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 and X_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:

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