AI1103-Assignment 2

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PROBLEM 5.27

Find the probability distribution of number of doublets in three throws of a pair of dice?

SOLUTION

Let $X_1, X_2 \in \{1, 2, 3, 4, 5, 6\}$ represent the two dice. We have,

$$\Pr(X_1 = X_2) = \frac{1}{6} \qquad (0.0.1)$$

Similarly we have,

$$\Pr(X_1 \neq X_2) = \frac{5}{6} \qquad (0.0.2)$$

Let the number of doublets in three throws of a pair of dice be represented by a random variable, X
When a pair of dice is thrown three times the number of doublets can be 0,1,2 and 3 respectively. So X can take these values

$$\Pr(X = 0) = \Pr(X_1 \neq X_2)^3 \qquad (0.0.3)$$

$$= \frac{125}{216} \qquad (0.0.4)$$

Similarly we have,

$$\Pr(X = 1) = 3 \times \Pr(X_1 \neq X_2)^2 \times \Pr(X_1 = X_2) \qquad (0.0.5)$$

$$= \frac{75}{216} \qquad (0.0.6)$$

Note : 3 is multiplied as we have to select which dice will have doublet

$$\Pr(X = 2) = 3 \times \Pr(X_1 \neq X_2) \times \Pr(X_1 = X_2)^2 \qquad (0.0.7)$$

$$= \frac{15}{216} \qquad (0.0.8)$$

And lastly,

$$\Pr(X = 2) = \Pr(X_1 = X_2)^3 \qquad (0.0.9)$$

$$= \frac{1}{216} \qquad (0.0.10)$$

The probability distribution of number of doublets in three throws of a pair of dice can be found out at figure 0. The corresponding table can be found at table 0

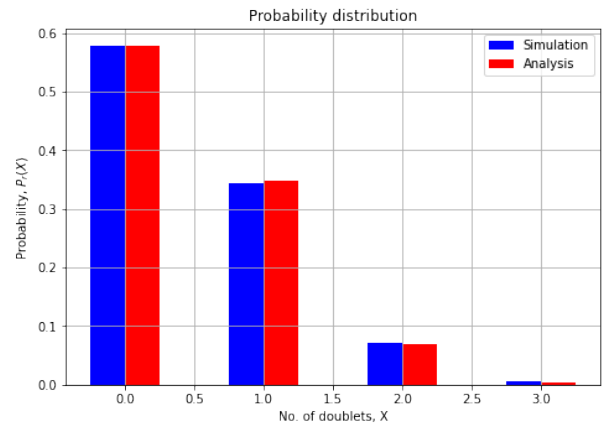| No. of doublets	Probability
0	125/216
1	75/216
2	15/216
3	1/216

TABLE 0: Probability of doublets

Fig. 0: Probability distribution