

Assignment-2

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Download all python codes from

<https://github.com/spdanda/AI1103/tree/main/Assignment2/codes>

and latex-tikz codes from

<https://github.com/spdanda/AI1103/blob/main/Assignment2/Assignment2.tex>

Problem 5.31 :

Two cards are drawn simultaneously (or successively without replacement) from a well-shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

Solution :

Let X denote the no. of kings in a draw of 2 cards.

$$\Rightarrow \Pr(X = 0) = \frac{{}^{48}C_2}{{}^{52}C_2} = \frac{188}{221} \quad (0.0.1)$$

$$\Pr(X = 1) = \frac{{}^4C_1 \times {}^{48}C_1}{{}^{52}C_2} = \frac{32}{221} \quad (0.0.2)$$

$$\Pr(X = 2) = \frac{{}^4C_2}{{}^{52}C_2} = \frac{1}{221} \quad (0.0.3)$$

SNo.	Case	Probability of the case
1	$\Pr(X = 0)$	$188/221$
2	$\Pr(X = 1)$	$32/221$
3	$\Pr(X = 2)$	$1/221$

TABLE 0: Probability distribution table

$$\text{Mean of } X = E(X) \quad (0.0.4)$$

$$= \sum_{k=0}^2 k \Pr(X=k) \quad (0.0.5)$$

$$= 1 \times \frac{32}{221} + 2 \times \frac{1}{221} \quad (0.0.6)$$

$$= \frac{34}{221} = 0.154 \quad (0.0.7)$$

$$\text{Variance} = E(X^2) - [E(X)]^2 \quad (0.0.8)$$

$$= \sum_{k=0}^2 k^2 \Pr(X=k) - \frac{34^2}{221^2} \quad (0.0.9)$$

$$= 1^2 \times \frac{32}{221} + 2^2 \times \frac{1}{221} - \frac{34^2}{221^2} \quad (0.0.10)$$

$$= \frac{6800}{48841} = 0.139 \quad (0.0.11)$$

$$\text{Standard Deviation } \sigma = \sqrt{\text{Var}(X)} \quad (0.0.12)$$

$$= \sqrt{0.139} \quad (0.0.13)$$

$$= 0.373 \quad (0.0.14)$$

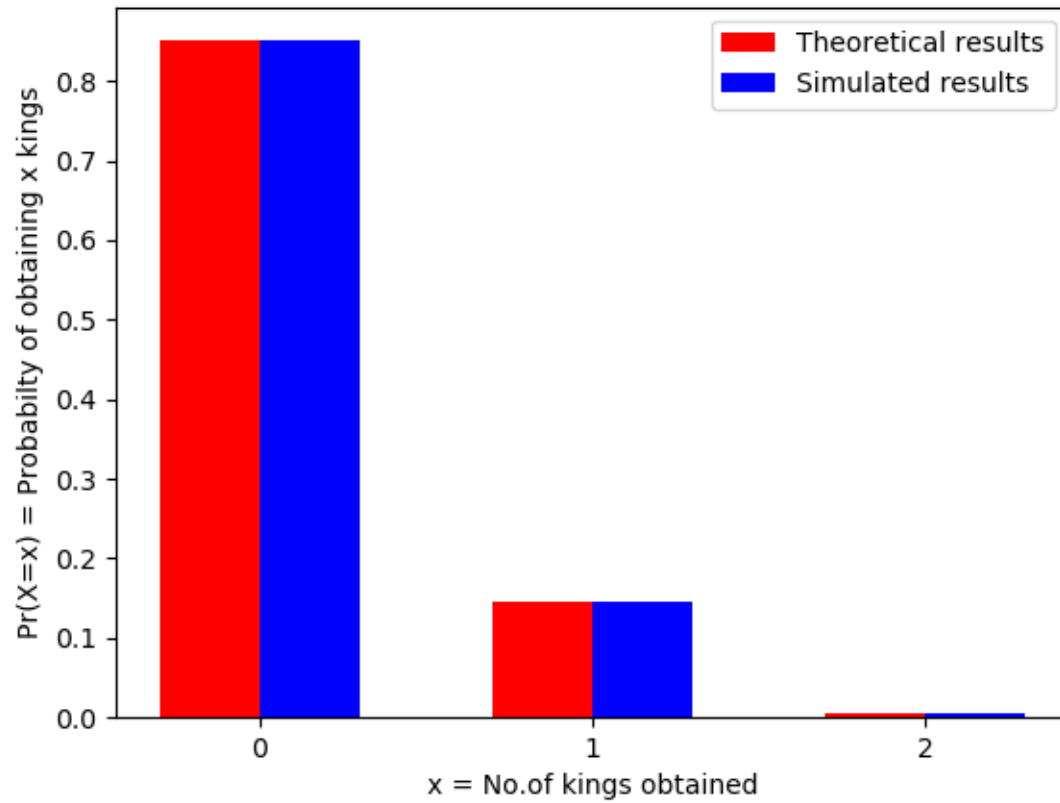


Fig. 0: Theoretical and Simulated probability results