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.

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

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

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

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

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

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

$$= 1 \times \frac{32}{221} + 2 \times \frac{1}{221} \tag{0.0.6}$$

$$= \frac{34}{221} = 0.154 \tag{0.0.7}$$

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

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

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

$$= \frac{6800}{48841} = 0.139 \tag{0.0.11}$$

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

$$= \sqrt{0.139} \tag{0.0.13}$$

$$= 0.373 \tag{0.0.14}$$

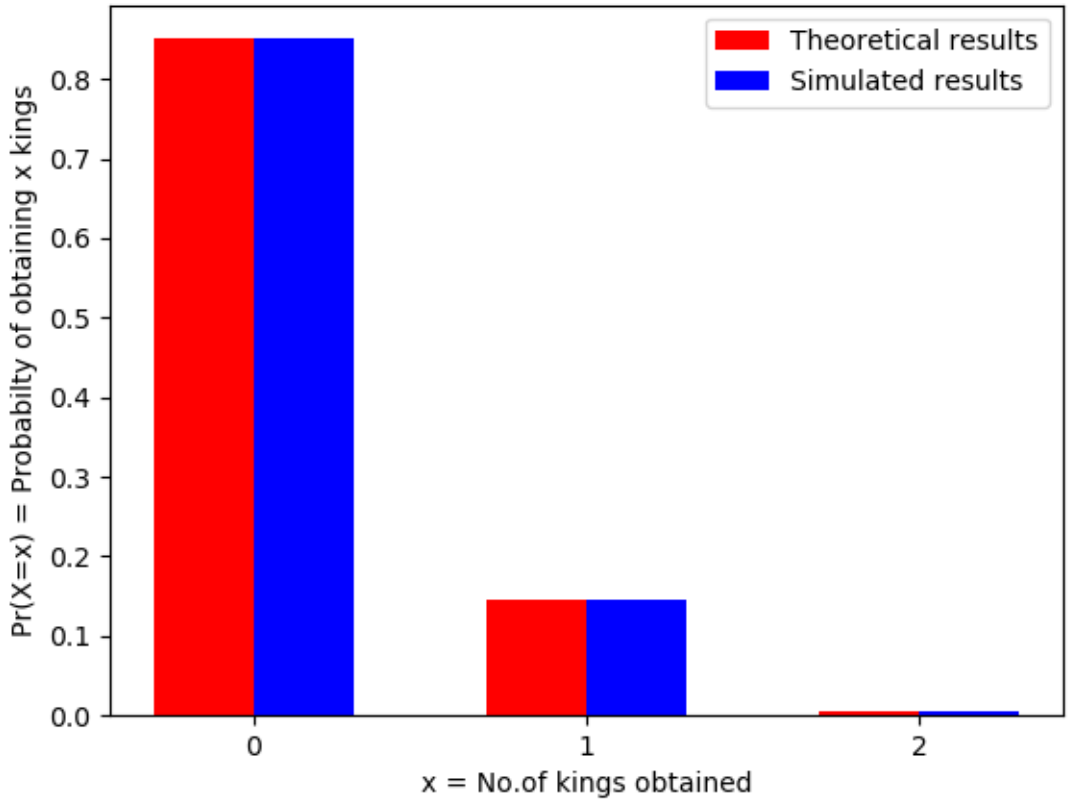

Fig. 0: Theoretical and Simulated probability results