Assignment 2

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Download all python codes from

https://github.com/spdanda/AI1103/blob/main/Assignment2/Assignment2.py

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.

$$\implies \text{Pr(X=0)} = \frac{48_{C_2}}{52_{C_2}} = \frac{188}{221}$$
$$\text{Pr(X=1)} = \frac{4_{C_1} \text{ x } 48_{C_1}}{52_{C_2}} = \frac{32}{221}$$
$$\text{Pr(X=2)} = \frac{4_{C_2}}{52_{C_2}} = \frac{1}{221}$$

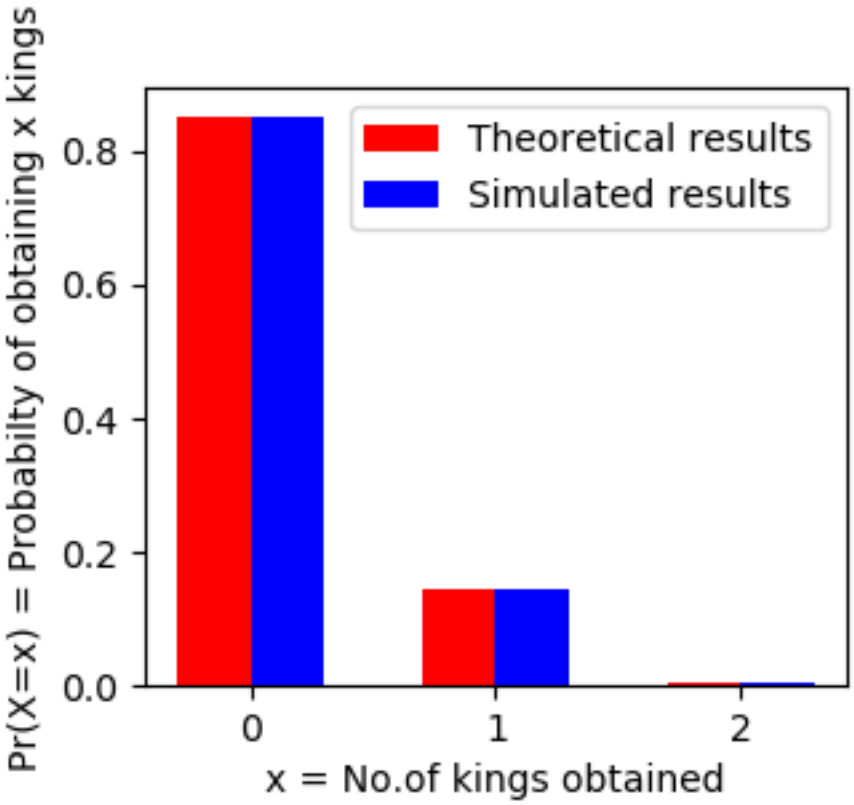
X	0	1	2
Pr(X)	$\frac{188}{221}$	$\frac{32}{221}$	$\frac{1}{221}$

Above is the probability distribution table of the no.of Kings obtained when two cards are drawn simultaneously from a deck of 52 cards.

$$\text{Now, Mean of X} = \text{E(X)} = \sum_{\text{k=0}}^{2} \text{k Pr(X=k)}$$
$$= 0 \text{ x } \frac{188}{221} + 1 \text{ x } \frac{32}{221} + 2 \text{ x } \frac{1}{221}$$
$$= \frac{34}{221} = 0.154$$

$$\text{Variance} = \text{E}\left(\text{X}^2\right) - \left[\text{E}\left(\text{X}\right)\right]^2 = \sum_{\text{k=0}}^{2} \text{k}^2 \text{ Pr(X=k)} - \frac{34^2}{221^2}$$
$$= 1^2 \text{ x } \frac{32}{221} + 2^2 \text{ x } \frac{1}{221} - \frac{34^2}{221^2}$$
$$= \frac{6800}{48841} = 0.139$$

$$\text{Standard Deviation } \sigma = \sqrt{\text{Var(X)}} = \sqrt{0.139} = 0.373$$



Above is the bar graph showing both the simulated and the theoretical results. Both represent almost the same values.