Assignment 5

Parvez Alam : AI21RESCH01005

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Python Code link :

1 Prob. 4.8 :

A die is thrown 6 times. If getting an odd number is a success, what is the probability of
(1). 5 successes ?
(2). at least 5 successes ?
(3) at most 5 successes ?

Solution: let X is random variable of getting success or failure.

$$X \in \{0, 1\}$$

$$P(X = 1) = \frac{3}{6} = \frac{1}{2} = p$$

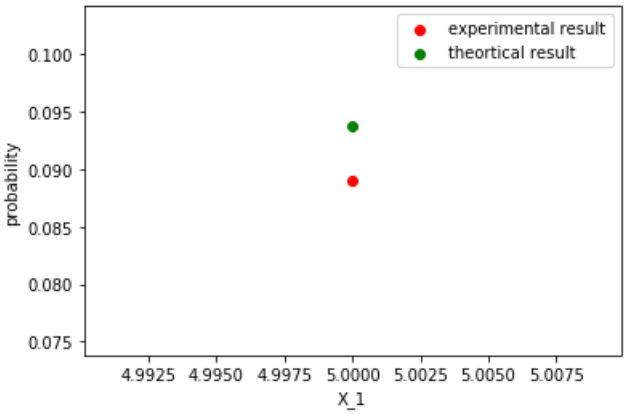
X_1 is a Bernoulli random variable

(1)

$$P(X_1 = 5) = \binom{6}{5} \times \left(\frac{1}{2}\right)^5 \times \left(1 - \frac{1}{2}\right)^{(6-5)}$$

$$= 6 \times \frac{1}{32} \times \frac{1}{2}$$

$$= 0.09375$$



(2) At least 5 success

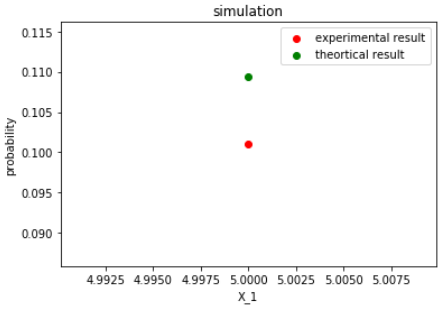
$$P(X_1 >= 5) = P(X_1 = 5) + P(X_1 = 6)$$

$$= \binom{6}{5} \times \left(\frac{1}{2}\right)^5 \times \left(\frac{1}{2}\right)^{6-5} + \binom{6}{6} \times \left(\frac{1}{2}\right)^6 \times \left(\frac{1}{2}\right)^0$$

$$= 0.09375 + 1/64$$

$$= 0.09375 + 0.015625$$

$$= 0.109375$$



(3) At most 5 successes

$$P(X_1 <= 5) = 1 - P(X_1 >= 6)$$

$$= 1 - \binom{6}{6} \times \left(\frac{1}{2}\right)^6 \times \left(\frac{1}{6}\right)^0$$

$$= 1 - 0.015625$$

$$= 0.984375$$