AI1110 Assignment 5

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Probablility Exercise 13.5, Q2 A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of two successes.
Solution: A pair of dice is thrown 4 times,
Let us consider the event of throwing a pair of dice for obtaining a doublet $(Success)$. Let us represent the outcomes of this event by the random variable X such that $X \in \{0, 1\}$

TABLE I
EVENTS FOR X

Event	Discription
X = 0	no doublet
X = 1	Doublet

Doublets : $\{1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)\}$
Hence the probability of getting a doublet is given by $P_X(1) = \frac{6}{36} = \frac{1}{6}$
And the probablility of not getting doublet is given by $P_X(0) = 1 - \frac{1}{6} = \frac{5}{6}$

Now consider throwing this pair of dice for 4 times, and let the outcomes of this event are represented by the Bernouli Random Variable Y such that $Y \in \{0, 1, 2, 3, 4\}$ The corresponding

TABLE III
EVENTS OF Y

Event	Discription
Y = 0	Getting 0 doublets
Y = 1	Getting 1 doublets
Y = 2	Getting 2 doublets
Y = 3	Getting 3 doublets
Y = 4	Getting 4 doublets

probablilities of this Bernouli Random Variable is given as follows,

$$P_Y(k) = \begin{cases} {}^nC_k p^k q^{n-k}, & k = 1, 2, \ldots, n \\ 0, & otherwise \end{cases} \tag{0.0.1}$$

Here n = no. of trails = 4
p = getting success = $P_X(1) = \frac{1}{6}$
p = getting failure = $P_X(0) = \frac{5}{6}$
Now the probability of getting two successes means Y = 2

$$P_Y(2) = {}^4C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^{4-2} \tag{0.0.2}$$

$$P_Y(2) = \frac{25}{216} \tag{0.0.3}$$

Hence the required probablility is $\frac{25}{216}$
Corresponding PMF

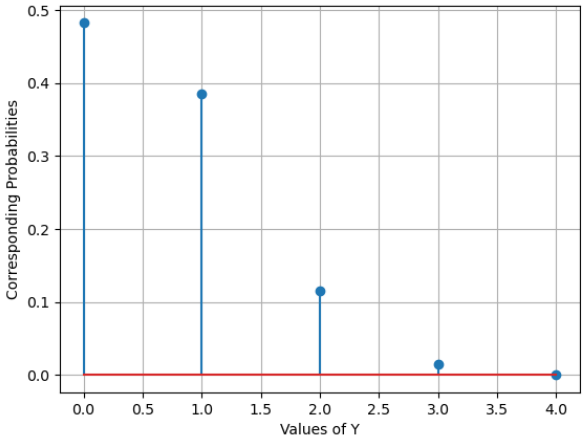

Fig. 0. Probability Mass Function of Y