

# AI1110 Assignment 5

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**Probability 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 Bernoulli random variable  $X$  such that  $X \in \{0, 1\}$

given as follows,

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

Here  $n = \text{no. of trials} = 4$

$p = \text{getting success} = P_X(1) = \frac{1}{6}$

$q = \text{getting failure} = P_X(0) = \frac{5}{6}$

Now the probability of getting two successes means  $Y = 2$

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

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

Hence the required probability is  $\frac{25}{216}$

Corresponding PMF

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 probability 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 Binomial Random Variable  $Y$  such that  $Y \in \{0, 1, 2, 3, 4\}$  The corresponding

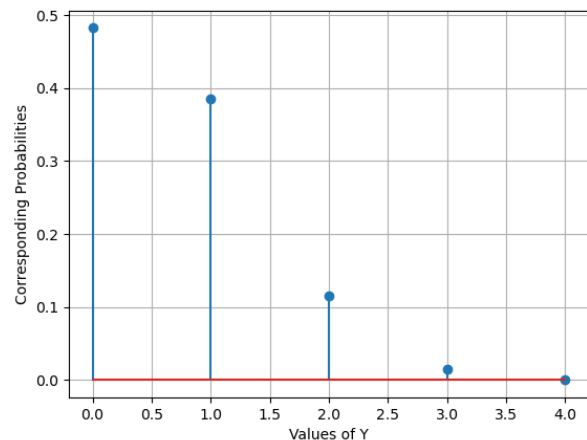


Fig. 0. Probability Mass Function of Y

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

probabilities of this Binomial Random Variable is