

Probability Exercise 13.5, Q2

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Outline

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Question

A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of two successes.

Solution

On throwing a pair of dice, getting doublet is success and we are throwing the pair of dice 4 times.

Doublets: (1,1), (2,2), (3,3), (4,4), (5,5), (6,6)

Consider one event of getting success represented by random variable X as shown

Table: Events for X

Event	Discription
$X = 0$	no doublet
$X = 1$	Doublet

$$P_X(1) = \frac{1}{6} \quad (2.0.1)$$

$$P_X(0) = \frac{5}{6} \quad (2.0.2)$$

Now consider another event of throwing this pair of dice 4 times and represent the corresponding outcomes by the Bernoulli Random Variable Y as shown

Table: Events for 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

The corresponding Probabilities is given by,

$$P_Y(k) = \begin{cases} {}^nC_k p^k q^{n-k}, & k = 1, 2, \dots, n \\ 0, & \text{otherwise} \end{cases} \quad (2.0.3)$$

Where n is number of trials = 4

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

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

Hence the probability of getting success twice is given by,

$$P_Y(2) = {}^4C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^{4-2} \quad (2.0.4)$$

$$P_Y(2) = \frac{25}{216} \quad (2.0.5)$$

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

Now the Probability Mass Function of Y is as follows

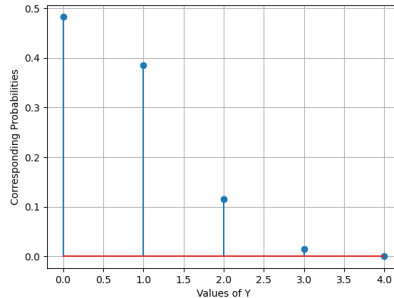


Figure: Probability Mass Function of Y