

Probability Assignment

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Abstract—This document contains the solution to Question 15 of Exercise 1 in Chapter 13 of the class 12 NCERT textbook.

- 1) Consider the experiment of throwing a die, if a multiple of 3 comes up, throw the die again and if any other number comes, toss a coin. Find the conditional probability of the event ‘the coin shows a tail’, given that ‘at least one die shows a 3’.

Solution: Let X denote the die roll for the first trial. The pmf of X is

$$\Pr(X = k) = \begin{cases} \frac{1}{6} & 1 \leq i \leq 6 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

Let Y be the random variable denoting the outcome of the coin toss in the second trial. The pmf of Y is

$$\Pr(Y = k) = \begin{cases} \frac{1}{2} & 0 \leq i \leq 1 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

We are required to find $\Pr(Y = 1|X = 3)$. However, from the given data,

$$\Pr(Y = 1, X = k) = \begin{cases} \frac{1}{12} & k \in \{1, 2, 4, 5\} \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

Therefore, from (3),

$$\Pr(Y = 1|X = 3) = \frac{\Pr(X = 3, Y = 1)}{\Pr(X = 3)} = 0 \quad (4)$$