

Assignment 4

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Abstract—This document contains the solution for Assignment 4 (NCERT Class 12 Exercise 13.3 Problem 4)

∴ The probability that she threw 1,2,3 or 4 with the die is $\frac{8}{11}$

Question : Suppose a girl throws a die.if she gets a 5 or 6,she tosses a coin three times and notes the number of heads.if she gets 1,2,3 or 4 ,she tosses a coin once and notes whether a head or tail is obtained.If she obtained exactly one head,what is the probability that she threw 1,2,3 or 4 with the die?

SOLUTION: Let us define random variables X,Y, where $X, Y \in \{0, 1\}$,such that

Random variable	Value	Description
X	0	dice shows 5,6
X	1	dice shows 1,2,3 or 4
Y	0	number of heads is 1
Y	1	number of heads are more than 1

TABLE I
RANDOM VARIABLES

From the given data ,

$$\Rightarrow P_X(0) = \frac{2}{6} \quad (1)$$

$$\Rightarrow P_X(1) = \frac{4}{6} \quad (2)$$

$$\Rightarrow P_Y(0) = \frac{1}{2} \quad (3)$$

$$\Rightarrow P_Y(1) = \frac{3}{8} \quad (4)$$

$$\Rightarrow P_{X/Y}(1/0) = \frac{P(X = 1 \cap Y = 0)}{P_Y(0)} \quad (5)$$

$$\Rightarrow P_{X/Y}(1/0) = \frac{P_X(1) \times P_{Y/X}(0/1)}{P_Y(0)} \quad (6)$$

$$\Rightarrow P_{X/Y}(1/0) = \frac{P_X(1) \times P_{Y/X}(0/1)}{P_X(1) \times P_{Y/X}(0/1) + P_X(1) \times P_{Y/X}(1/1)} \quad (7)$$

$$\Rightarrow P_{X/Y}(1/0) = \frac{\frac{4}{6} \times \frac{1}{2}}{\frac{4}{6} \times \frac{1}{2} + \frac{2}{6} \times \frac{3}{8}} \quad (8)$$

$$\Rightarrow P_{X/Y}(1/0) = \frac{8}{11} \quad (9)$$