Assignment-1

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Download all latex codes from:

https://github.com/PrasannaLanka/Assignment1/blob/main/Assignment1/main.tex

PROBLEM 2.15

Consider the experiment of tossing a coin. If the coin shows head, toss it again but if it shows tail, then throw a die. Find the conditional probability of the event that "the die shows a number greater than 4" given that "there is at least one tail".

SOLUTION

Given that a coin is tossed. If coin shows head, it is tossed again. If it shows tail, then a die is thrown. Let X $\in \{0, 1\}$ be the random variable such that 1 represents occurrence of tail,0 represents occurrence of head when coin is tossed.

TABLE I: Probability distribution for values of X

X	P(X)
1	$\frac{1}{2}$
0	$\frac{1}{2}$

Let Y denotes random variable for the getting a number on the die thrown, then the probability distribution is

TABLE II: Probability distribution for values of Y

Y	1	2	3	4	5	6
P(Y)	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

$$\Pr(X=1) = \sum_{i=1}^{6} \Pr(X=1, Y=i) + \Pr(X=0, X=1) \tag{0.0.1}$$

$$= \frac{1}{4} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} \tag{0.0.2}$$

$$= \frac{1}{4} + \frac{6}{12} \tag{0.0.3}$$

$$= \frac{3}{4} \tag{0.0.4}$$

Smilarly,

$$\Pr(X=1, Y>4) = \Pr(X=1, Y=5) + \Pr(X=1, Y=6) \tag{0.0.5}$$

$$= \frac{1}{12} + \frac{1}{12} \tag{0.0.6}$$

$$= \frac{1}{6} \tag{0.0.7}$$

$$\tag{0.0.8}$$

$$\Pr(Y>4|X=1) = \frac{\Pr(Y>4, X=1)}{\Pr(X=1)} \tag{0.0.9}$$

$$= \frac{2}{9} \tag{0.0.10}$$

$\therefore$ The required probability is $\boxed{\frac{2}{9}}$