

# Assignment 3

## AI1110 : Probability and Random Variables

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**Question:12.3.1.15:** 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:**

TABLE I  
RANDOM VARIABLE DECLARATION

Random Variable	Event	Value
X	Not getting multiple of 3 on throwing die and tossing a coin	1
	Getting multiple of 3 on throwing die and throwing die again	0
Y	Number of times die shows 3	0
		1
		2
Z	Getting tail on coin toss	1
	Getting head on coin toss	0

Given, conditional probability of the event ‘the coin shows a tail’, given that ‘at least one die shows a 3’ =  $\Pr(Z = 1|Y = 1) + \Pr(Z = 1|Y = 2)$

$$Z = 1 \subseteq X = 1$$

$$Y = 1 \subseteq X = 0$$

$$Y = 2 \subseteq X = 0$$

$$\Pr(Z = 1|Y = 1) = \frac{\Pr(Z = 1) \Pr(Y = 1)}{\Pr(Y = 1)} \quad (1)$$

$$= \frac{0}{\Pr(Y = 1)} \quad (2)$$

$$= 0 \quad (3)$$

Similarly,

$$\Pr(Z = 1|Y = 2) = \frac{\Pr(Z = 1) \Pr(Y = 2)}{\Pr(Y = 2)} \quad (4)$$

$$= \frac{0}{\Pr(Y = 2)} \quad (5)$$

$$= 0 \quad (6)$$

Therefore,  $\Pr(Z = 1|Y = 1) + \Pr(Z = 1|Y = 2) = 0$

The conditional probability of the event ‘the coin shows a tail’, given that ‘at least one die shows a 3’ = 0