## Answer on Question \#42088, Math, Statistics and Probability

An unbiased coin is tossed twice. The four possible outcomes are equiprobable. If $A$ is the event "both head or tail have occurred" and $B$ is the event: "at most one tail is observed", then find $P(A), P(B), P(A / B)$ and $P(B / A)$ ?

## Solution:

Experiment - a set of conditions:

1) Coin is unbiased
2) Coin is tossed twice

Denote events: head $=1$

$$
\text { tail }=0
$$

Elementary events: $\omega=(a, b)$, where $a, b \in\{0,1\}$ - permutation with repetitions
Then space of elementary events: $\Omega=\{\omega=(a, b)\} \Rightarrow|\Omega|=2^{2}=4<\infty$
Take the maximal $\sigma$ - algebra $\mathfrak{A}=\mathfrak{A}_{\text {max }}$
Then probability $\mathbb{P}(\cdot)$ - classical type.

$$
\begin{gathered}
A=\{(0,1),(1,0)\} \Rightarrow|A|=2 \Rightarrow \mathbb{P}(A)=\frac{|A|}{|\Omega|}=\frac{2}{4}=\frac{1}{2} \\
B=\{(0,1),(1,0),(0,0)\} \Rightarrow|B|=3 \Rightarrow \mathbb{P}(B)=\frac{|B|}{|\Omega|}=\frac{3}{4} \\
A \cap B=\{(0,1),(1,0)\} \Rightarrow|A \cap B|=2 \Rightarrow \mathbb{P}(A \cap B)=\frac{|A \cap B|}{|\Omega|}=\frac{2}{4}=\frac{1}{2} \\
\mathbb{P}(A / B)=\frac{\mathbb{P}(A \cap B)}{\mathbb{P}(B)}=\frac{\frac{1}{2}}{\frac{3}{4}}=\frac{4}{6}=\frac{2}{3} \\
\mathbb{P}(B / A)=\frac{\mathbb{P}(A \cap B)}{\mathbb{P}(A)}=\frac{\frac{1}{2}}{\frac{1}{2}}=1
\end{gathered}
$$

## Answer:

1) $\mathbb{P}(A)=\frac{1}{2}$
2) $\mathbb{P}(B)=\frac{3}{4}$
3) $\mathbb{P}(A / B)=\frac{2}{3}$
4) $\mathbb{P}(B / A)=1$
