Assignment 3

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Download all latex-tikz codes from

https://github.com/ImNamitaKumari/Probability−and−Random−Variables/blob/main/Assignment3/Assignment3.tex

1 Problem

Let P(E) denote the probability of the event E. Given P(A)=1, P(B)=$\frac{1}{2}$, the values of P(A|B) and P(B|A) respectively are

1) $\frac{1}{4}, \frac{1}{2}$
2) $\frac{1}{2}, \frac{1}{4}$
3) $\frac{1}{2}, 1$
4) $1, \frac{1}{2}$

2 Solution

Let X∈{0,1} be the random variable denoting the non-occurrence or occurrence of event A and Y∈{0,1} be the random variable denoting the non-occurrence or occurrence of event B.

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

TABLE I: Random Variables and their probabilities

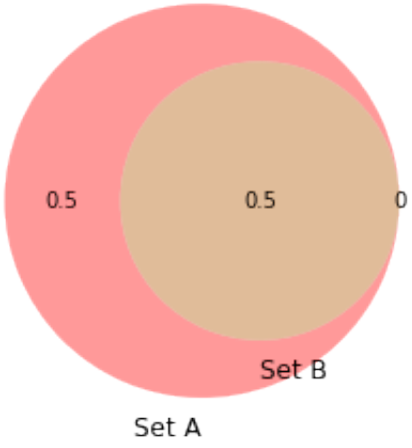

Fig. 0: Venn diagram

As evident from the venn diagram,

$$\Pr(\{X=1\}\{Y=1\}) = P(AB) = \frac{1}{2} \tag{2.0.1}$$

$$P(A|B) = \Pr(X=1|Y=1) = \frac{\Pr(\{X=1\}\{Y=1\})}{\Pr(Y=1)} = \frac{\frac{1}{2}}{\frac{1}{2}} = 1 \tag{2.0.2}$$

$$P(B|A) = \Pr(Y=1|X=1) = \frac{\Pr(\{Y=1\}\{X=1\})}{\Pr(X=1)} = \frac{\frac{1}{2}}{1} = \frac{1}{2} \tag{2.0.3}$$

Hence the correct answer is option 4).