

# AI1103 Assignment-2

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Download all python codes from

<https://github.com/vrahul02/AI1103-Probability-and-Random-Variables/tree/main/Assignment-2/Codes>

and latex-tikz codes from

<https://github.com/vrahul02/AI1103-Probability-and-Random-Variables/tree/main/Assignment-2/Assignment-2.tex>

Possible outcomes of the event are

$$S = \{(0, 0), (0, 1), (0, 2), (1, 0), (1, 1), (1, 2), (2, 1), (2, 2), (2, 3)\} \quad (0.0.1)$$

The outcomes where  $X+Y=2$  is given by set

$$A = \{(0, 2), (1, 1), (2, 0)\} \quad (0.0.2)$$

The outcomes where  $X-Y=0$  is given by set

$$B = \{(0, 0), (1, 1), (2, 2)\} \quad (0.0.3)$$

$$A + B = \{(1, 1)\} \quad (0.0.4)$$

$$\Pr(A + B) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16} \quad (0.0.5)$$

$$\begin{aligned} \Pr(B) &= \frac{1}{2} \times \frac{1}{2} + \frac{1}{4} \times \frac{1}{4} + \frac{1}{4} \times \frac{1}{4} \\ &= \frac{1}{4} + \frac{1}{16} + \frac{1}{16} = \frac{6}{16} \end{aligned} \quad (0.0.6)$$

$$\Pr(A/B) = \frac{\Pr(A + B)}{\Pr(B)} = \frac{\frac{1}{16}}{\frac{6}{16}} = \frac{1}{6} \quad (0.0.7)$$

Thus option c) is correct

## PROBLEM GATE-28

Consider two independent random variables  $X$  and  $Y$  with identical distributions. The variables  $X$  and  $Y$  take value 0,1 and 2 with probabilities  $\frac{1}{2}$ ,  $\frac{1}{4}$  and  $\frac{1}{4}$  respectively. What is the conditional probability  $\Pr\left(\frac{X+Y=2}{X-Y=0}\right)$ ?

- a) 0
- b)  $\frac{1}{16}$
- c)  $\frac{1}{6}$
- d) 1

## SOLUTION

The values that the random variable  $X$  can take along with its probabilities are given by

$X$	0	1	2
$\Pr(X)$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$

The values that the random variable  $Y$  can take along with its probabilities are given by

$Y$	0	1	2
$\Pr(Y)$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$

$X$  and  $Y$  are independent random variables