

# AI1103 - Assignment - 1

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Download all python codes from

<https://github.com/VamsiPreetham-21/AI1103-Assignment---1/blob/main/Assignment1.py>

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<https://github.com/VamsiPreetham-21/AI1103-Assignment---1/blob/main/Assignment1.tex>

Question - 5.5

If each element of a second order determinant is either zero or one , what is the probability that the value of the determinant is positive ? (Assume that the individual entries are chosen independently each value being assumed with probability  $1/2$  )

Solution :

Total number of entries in the matrix are 4.  
Let  $X = 0,1$  be a random variable denoting the possible value for each entry.

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

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

For the determinant of the matrix to be positive first and fourth entries should be 1 and at least one among the other two should be zero

$$\begin{aligned} &= \Pr(X = 1) \Pr(X = 1) (1 - (\Pr(X = 1) \Pr(X = 1))) \\ &= \frac{1}{4} \left(1 - \frac{1}{4}\right) \\ &= \frac{3}{16} \end{aligned} \quad (3)$$