

AI1103 : Assignment 3

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main/Assignment-3.tex](https://github.com/srivatsav01/Assignment-3/blob/main/Assignment-3.tex)

GATE 1999(MA) QUESTION 1.29

A box contains two coins, one of which is fair and the other is two headed. One coin is chosen at random and tossed twice. If two heads appear, then the probability that the chosen coin is two headed is?

SOLUTION

Let A be the event that chosen coin is two headed.

Let B be the event that chosen coin is fair.

Let X be the random variable representing no of heads.

if event A occurs

$$\Pr(X = 2) = \Pr(A)$$

if event B occurs Probability of getting a head is $\frac{1}{2}$

$$\therefore \Pr(X = 2) = \Pr(B) \times \left(\frac{1}{2}\right)^2$$

As events A and B are exclusive

$$\therefore \Pr(X = 2) = \left(\Pr(B) \times \left(\frac{1}{2}\right)^2 \right) + (\Pr(A))$$

$$\Pr(X = 2) = \left(\frac{1}{2} \times \left(\frac{1}{2}\right)^2 \right) + \left(\frac{1}{2}\right) \quad (1)$$

$$\Pr(X = 2) = \frac{5}{8} \quad (2)$$

$$\Pr(A|X = 2) = \frac{\Pr(A, (X = 2))}{\Pr(X = 2)} \quad (3)$$

$$\Pr(A|X = 2) = \frac{\left(\frac{1}{2}\right)}{\left(\frac{5}{8}\right)} \quad (4)$$

$$\Pr(A|X = 2) = \frac{4}{5} \quad (5)$$