

# AI1103 : Assignment 1

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Download all python codes from

<https://github.com/BokkaRajaRaviKiranReddy/AI1103/tree/main/Assignment1/codes>

and latex codes from

<https://github.com/BokkaRajaRaviKiranReddy/AI1103/blob/main/Assignment1/Assignment1.tex>

From Bayes Theorem,

$$\begin{aligned}\Pr(X = 1|Y = 1) &= \frac{\Pr(X = 1) \times \Pr(Y = 1|X = 1)}{\sum_{i=0}^1 \Pr(X = i) \times \Pr(Y = 1|X = i)} \\ &= \frac{\frac{4}{5} \times \frac{1}{2}}{\frac{4}{5} \times \frac{1}{2} + \frac{1}{5} \times \frac{1}{2}} \\ &= \frac{4}{5}\end{aligned}$$

Probability that actually there was a head given that A reports a Head =  $\frac{4}{5}$   
So, option a) is correct.

## PROBLEM(1.14)

Probability that A speaks truth is  $\frac{4}{5}$ . A coin is tossed. A reports that a head appears. The probability that actually there was head is

- a)  $\frac{4}{5}$
- b)  $\frac{1}{2}$
- c)  $\frac{1}{5}$
- d)  $\frac{2}{5}$

## SOLUTION(1.14)

Let  $X \in \{0, 1\}$  be the random variable denoting that A tells truth when  $X=1$

$$\Pr(X = 1) = \frac{4}{5} \quad (1.14.1)$$

$$\Pr(X = 0) = 1 - \Pr(X = 1)$$

$$\Pr(X = 0) = \frac{1}{5} \quad (1.14.2)$$

Let  $Y \in \{0, 1\}$  be the random variable denoting that Head appears on the coin when  $Y=1$

As the coin is unbiased,

$$\Pr(Y = 1|X = 1) = \frac{1}{2} \quad (1.14.3)$$

$$\Pr(Y = 1|X = 0) = \frac{1}{2} \quad (1.14.4)$$

Probability that actually there was a head given that A reports a Head  
 $= \Pr(X = 1|Y = 1)$