

AI1103: Assignment 6

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Download all python codes from

[https://github.com/tanmaygar/AI-Course/blob/main/Assignment6/codes/GATE_2013_\(ME\)_Q45.py](https://github.com/tanmaygar/AI-Course/blob/main/Assignment6/codes/GATE_2013_(ME)_Q45.py)

and latex-tikz codes from

<https://github.com/tanmaygar/AI-Course/blob/main/Assignment6/Assignment6.tex>

PROBLEM GATE 2013 (ME), Q.45:

The probability that a student knows the correct answer to a multiple choice question is $\frac{2}{3}$. If the student does not know the answer, then the student guesses the answer. The probability of the guessed answer being correct is $\frac{1}{4}$. Given that the student has answered the question correctly, the conditional probability that the student knows the correct answer is

- 1) $\frac{2}{3}$ 2) $\frac{3}{4}$ 3) $\frac{5}{6}$ 4) $\frac{8}{9}$

SOLUTION:

Let the following random variables and their values denote:

A : Knows correct answer = 1

B : Marks correct answer = 1

$$\therefore \Pr(A = 1) = \frac{2}{3} \quad (0.0.1)$$

$$\Pr(B = 1|A = 1) = 1 \quad (0.0.2)$$

$$\Pr(B = 1|A = 0) = \frac{1}{4} \quad (0.0.3)$$

Applying Bayes Theorem, the value of $\Pr(B = 1)$ is :

$$\Pr(B = 1) = \Pr(B = 1|A = 1) \Pr(A = 1) \quad (0.0.4)$$

$$+ \Pr(B = 1|A = 0) \Pr(A = 0) \quad (0.0.5)$$

$$= 1 \cdot \frac{2}{3} + \frac{1}{4} \cdot \frac{1}{3} = \frac{3}{4} \quad (0.0.6)$$

Applying Bayes Theorem, calculating the value of $\Pr(B = 1, A = 1)$ is:

$$= \Pr(B = 1|A = 1) \Pr(A = 1) \quad (0.0.7)$$

$$= 1 \cdot \frac{2}{3} \quad (0.0.8)$$

Applying Bayes Theorem, we need to find the value of $\Pr(A = 1|B = 1)$. Upon substituting from (0.0.8) and (0.0.6), we get

$$= \frac{\Pr(B = 1, A = 1)}{\Pr(B = 1)} \quad (0.0.9)$$

$$= \frac{8}{9} \quad (0.0.10)$$

The correct answer is **Option 4**.

