Assignment 1

AI1110: Probability and Random Variables
Indian Institute of Techonology Hyderabad

SURBHI
CS22BTECH11057

1 **12.13.3.4: Question: In answering a question on a multiple choice test, a student either knows the answer or guesses. Let 3/4 be the probability that he knows the answer and1/4 be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability 1/4.What is the probability that the student knows the answer given that he answered it correctly?**

Answer:

$$\frac{12}{13}$$

Solution:

Let E1 be the event that the student knows the answer
E2 be the event that the student guess the answer
A be the event that the answer is correct
Then,

$$Pr(E_1) = \frac{3}{4} \tag{1}$$

$$Pr(E_2) = \frac{1}{4} \tag{2}$$

$$Pr(\frac{A}{E1}) = 1 \tag{3}$$

$Pr(A|E_1)$ = probability of correct answer given that he knows
$Pr(A|E_2)$ = probability of correct answer given that he guesses

$$Pr(\frac{A}{E2}) = \frac{1}{4}$$

Now, the probability that he knows the answer,given that the answer is correct is P(E1/A)
By using formula :-

$$Pr(E1|A) = \frac{Pr(E1).Pr(A|E1)}{Pr(E1).Pr(A|E1) + Pr(E2).Pr(A|E2)} \tag{4}$$

$$Pr(E1|A) = \frac{\frac{3}{4}.1}{\frac{3}{4}.1 + \frac{1}{4}.\frac{1}{4}} \tag{5}$$

$$Pr(E1|A) = \frac{\frac{3}{4}}{\frac{3}{4} + \frac{1}{16}} \tag{6}$$

$$Pr(E1|A) = \frac{\frac{3}{4}}{\frac{13}{16}} \tag{7}$$

$$Pr(E1|A) = \frac{12}{13} \tag{8}$$

$$\tag{9}$$

$$Pr(E1|A) = \frac{12}{13}$$

So,12/13 is the probability that the student knows the answer given that he answered it correctly.