Assignment 4

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Download all python codes from

https://github.com/tyagio/AI1103/tree/main/assignment4/codes

and latex-tikz codes from

https://github.com/tyagio/AI1103/tree/main/assignment4/assignment4.tex

1 Problem

P and Q are considering to apply for a job.The probability that P applies for the job is 1/4 ,the probability that P applies for the job given that Q applies for the job is 1/2, and the probability that Q applies for the job given that P applies for the job is 1/3.Then the probability that P does not apply for the job given that Q does not apply for the job is

(A) 4/5 (B)5/6 (C)7/8 (D)11/12

2 Solution

Let $A \in \{0, 1\}$ represent the random variable, where 0 represents P applying for the job, 1 represents P not applying for the job.
Let $B \in \{0, 1\}$ represent the random variable, where 0 represents Q applying for the job, 1 represents Q not applying for the job.

Using values given in question

$$\Pr(B = 1|A = 1) = \frac{\Pr(A = 1, B = 1)}{\Pr(A = 1)} \quad (2.0.1)$$

$$\implies \Pr(A = 1, B = 1) = \frac{1}{12} \quad (2.0.2)$$

$$\Pr(A = 1|B = 1) = \frac{\Pr(A = 1, B = 1)}{\Pr(B = 1)} \quad (2.0.3)$$

$$\implies \Pr(B = 1) = \frac{1}{6} \quad (2.0.4)$$

TABLE 0: Probability for random variables

$\Pr(A = 1)$	1/4	$\Pr(B = 1)$	1/6
$\Pr(A = 1\|B = 1)$	1/2	$\Pr(B = 1\|A = 1)$	1/3
$\Pr(A = 1, B = 1)$	1/12		

Now using above values and De Morgan's Laws

$$\Pr(A = 0|B = 0) = \frac{\Pr(A = 0, B = 0)}{\Pr(B = 0)} \quad (2.0.5)$$

$$\implies \frac{1 - \Pr(A = 1 + B = 1)}{1 - \Pr(B = 1)} \quad (2.0.6)$$

$$\implies \frac{1 - \Pr(A = 1) - \Pr(B = 1) + \Pr(A = 1, B = 1)}{1 - \Pr(B = 1)} \quad (2.0.7)$$

$$\implies \Pr(A = 0|B = 0) = \frac{4}{5} \quad (2.0.8)$$

The probability that P doesn't apply given Q doesn't apply is 0.8