Assignment 2

AI1110: Probability and Random Variables
Indian Institute of Technology Hyderabad

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12.13.1.13 Question: An instructor has a question bank consisting of 300 easy True / False questions, 200 difficult True / False questions, 500 easy multiple choice questions and 400 difficult multiple choice questions. If a question is selected at random from the question bank, what is the probability that it will be an easy question given that it is a multiple choice question?

Solution:

Let A be the event that it is an easy question and B be the event that it is a multiple choice question

The required probability is $\Pr(A|B)$

From the definition of conditional probability, We know that

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \tag{1}$$

Here, AB is the event of getting an easy multiple choice question

$$\Pr(B) = \frac{500+400}{300+200+500+400} \tag{2}$$
$$= \frac{900}{1400} \tag{3}$$
$$= \frac{9}{14} \tag{4}$$
$$\therefore \quad \Pr(B) = \frac{9}{14} \tag{5}$$

$$\Pr(AB) = \frac{500}{300+200+500+400} \tag{6}$$
$$= \frac{500}{1400} \tag{7}$$
$$= \frac{5}{14} \tag{8}$$
$$\therefore \quad \Pr(AB) = \frac{5}{14} \tag{9}$$

From (1), (5) and (9),

$$\Pr(A|B) = \frac{\frac{5}{14}}{\frac{9}{14}} \tag{10}$$
$$= \frac{5}{9} \tag{11}$$
$$\therefore \quad \Pr(A|B) = \frac{5}{9} \tag{12}$$