AI1110 ASSIGNMENT 4

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Abstract—**This assignment contains the solution to the question number 13 from the Chapter PROBABILITY, from class 12 CBSE board syllabus.**

1. 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?

2. SOLUTION

Let X be a random variable assigned to the difficulty of the question. $X \in \{0, 1\}$.
if $X = 0$, the question is easy. Else difficult.
Let Y be a random variable assigned to the type of question asked. $Y \in \{0, 1\}$.
if $Y = 0$, the question is a multiple choice question.
Else, it is a True/ False question.

$$\Pr(X = k) = \begin{cases} \frac{8}{14}, & k = 0 \\ \frac{6}{14}, & k = 1 \end{cases} \quad (2.0.1)$$

$$\Pr(Y = k) = \begin{cases} \frac{5}{14}, & k = 0 \\ \frac{9}{14}, & k = 1 \end{cases} \quad (2.0.2)$$

We require the probability that it is an easy question given that it is a Multiple Choice Question. i.e., We require $\Pr(X = 0 \mid Y = 1)$. We know that

$$\Pr(X = 0) = \frac{8}{14} \quad (2.0.3)$$

$$\Pr(Y = 1) = \frac{9}{14} \quad (2.0.4)$$

$$\Pr(X = 0, Y = 1) = \frac{5}{14} \quad (2.0.5)$$

Using the general formula for conditional probability, we have

$$\Pr(X = 0 \mid Y = 1) = \frac{\Pr(X = 0, Y = 1)}{\Pr(Y = 0)} \quad (2.0.6)$$

Substituting the values, we have:

$$\implies \Pr(X = 0 \mid Y = 1) = \frac{5/14}{9/14} \quad (2.0.7)$$

$$\implies \Pr(X = 0 \mid Y = 1) = \frac{5}{9} \quad (2.0.8)$$

Therefore, the probability that the question will be an easy one, given that it is a multiple choice question is $\frac{5}{9}$
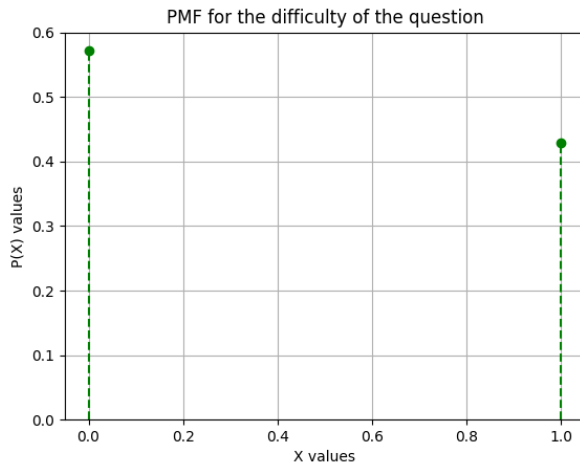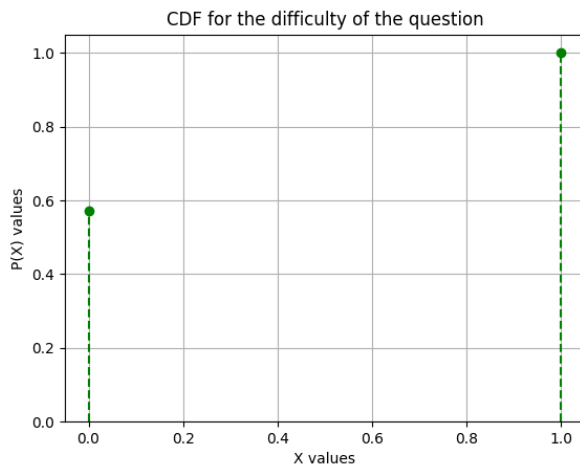
Fig. 0. Question Difficulty P.M.F
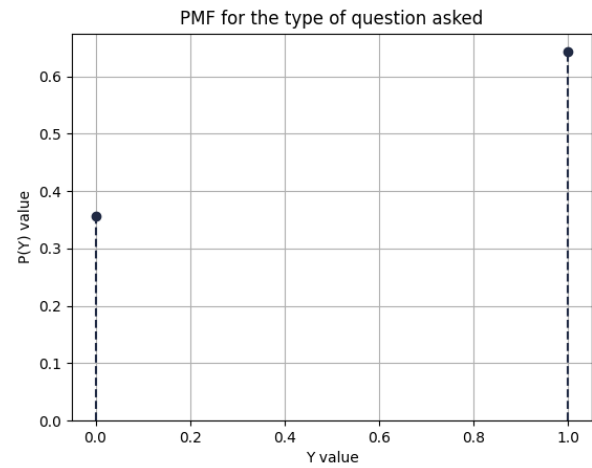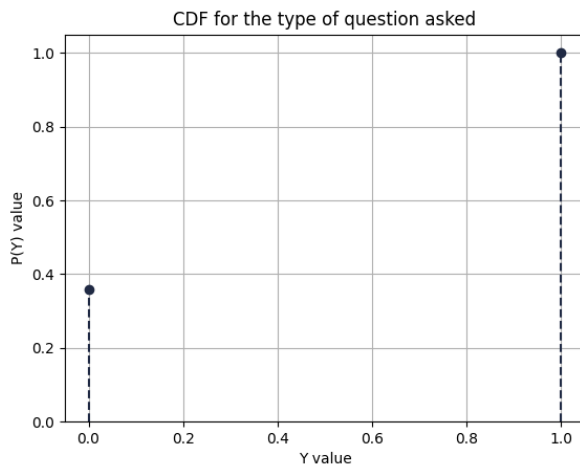

Fig. 0. Question Difficulty C.D.F

Fig. 0. Question Type P.M.F

Fig. 0. Question Type C.D.F