

AI1103 : Assignment 1

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1 Problem

A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both diamonds. Find the probability of the lost card being a diamond.

$$P(A) = P(A1).P\left(\frac{A}{A1}\right) + P(A2).P\left(\frac{A}{A2}\right)$$

Now we know that:
eq 2.3

$$P(A1) = \left(\frac{1}{4}\right)$$

2 Solution

eq 2.4

Let A1 be the probability that a diamond card is lost.

$$P(A2) = \left(\frac{3}{4}\right)$$

Let A2 be the probability that a card other than diamond is lost.

eq 2.5

Let A be the probability that two cards are drawn and both are found to be diamonds.

$$P\left(\frac{A}{A1}\right) = \left(\frac{12C2}{51C2}\right)$$

We know by Bayes's Formula:
eq 2.1

eq 2.6

$$P\left(\frac{A1}{A}\right) = \frac{P(A1).P\left(\frac{A}{A1}\right)}{P(A)}$$

$$P\left(\frac{A}{A2}\right) = \left(\frac{13C2}{51C2}\right)$$

From eq 2.2,2.3,2.4,2.5,2.6 we get:
eq 2.7

Also we know by the theorem of total probability that :
eq 2.2

$$P(A) = \left(\frac{1}{4}\right).\left(\frac{12C2}{51C2}\right) + \left(\frac{3}{4}\right).\left(\frac{13C2}{51C2}\right)$$

Now by using Bayes theorem (eq 2.1)
we get:

$$P\left(\frac{A1}{A}\right) = \frac{\frac{1}{4} \cdot \left(\frac{12C2}{51C2}\right)}{P(A)}$$

$$P\left(\frac{A1}{A}\right) = \frac{\frac{1}{4} \cdot \left(\frac{12C2}{51C2}\right)}{\left(\frac{1}{4}\right) \cdot \left(\frac{12C2}{51C2}\right) + \left(\frac{3}{4}\right) \cdot \left(\frac{13C2}{51C2}\right)}$$

Now after simplifying we get:

$$P\left(\frac{A1}{A}\right) = \left(\frac{12C2}{12C2 + 3.13C2}\right)$$

Hence after simplifying we get:

Ans

$$P\left(\frac{A1}{A}\right) = \left(\frac{11}{50}\right) = 0.22$$