

Assignment 1

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Download all python codes from

<https://github.com/gaureeshk/AI1103/blob/main/Codes/assignment1.py>

and latex-tikz codes from

<https://github.com/gaureeshk/AI1103/assignment1.tex>

$pr(B|A)$ is probability of selecting 2 diamond cards given that one diamond card is lost.

$$\Rightarrow pr(B|A) = \frac{\binom{12}{2}}{\binom{51}{2}} = \frac{12! 49!}{10! 51!} \quad (2.0.5)$$

$pr(B|A')$ is probability of selecting 2 diamond cards given that the card lost is not a diamond.

$$\Rightarrow pr(B|A') = \frac{\binom{13}{2}}{\binom{51}{2}} = \frac{13! 49!}{11! 51!} \quad (2.0.6)$$

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.

2 SOLUTION

Let **A** be the event of a diamond card becoming lost

Then **A'**, which is the complement of A will be the event of a card which is not diamond becoming lost.

Let **B** be the event of getting 2 diamonds in the 2 draws.

The required probability is $pr(A|B)$.

Since there are 13 diamond cards,

$$pr(A) = \frac{13}{52} = \frac{1}{4} \quad (2.0.1)$$

$$\Rightarrow pr(A') = 1 - pr(A) = \frac{3}{4} \quad (2.0.2)$$

AB is the event of a diamond card getting lost and getting 2 diamond cards in the 2 draws.

Hence,

$$pr(AB) = \frac{\binom{13}{3}}{\binom{52}{3}} = \frac{13! 49!}{10! 52!} \quad (2.0.3)$$

We also know that,

$$pr(B) = pr(B|A)pr(A) + pr(B|A')pr(A') \quad (2.0.4)$$

by using equation 2.0.4,

$$\begin{aligned} pr(B) &= \frac{12! 49!}{10! 51! 4} + \frac{13! 49! 3}{11! 51! 4} \\ &= \frac{12! 49! 11}{11! 51! 4} + \frac{12! 49! 39}{11! 51! 4} \\ &= \frac{12! 49! 50}{11! 51! 4} \end{aligned} \quad (2.0.7)$$

by definition,

$$\begin{aligned} pr(A|B) &= \frac{pr(AB)}{pr(B)} \\ &= \frac{13! 49! 11! 51! 4}{10! 52! 12! 49! 50} \\ &= \frac{13 * 11 * 4}{52 * 50} \\ &= \frac{11}{50} \\ &= 0.22 \end{aligned} \quad (2.0.8)$$

Hence the probability of the lost card being a diamond (given that the 2 cards drawn are diamonds) is **0.22**.