Probability Assignment - Arif Aygun

1. If a list of people has 24 women and 21 men, then the probability of choosing a man from the list is 21/45.What is the probability of not choosing a man?

a) 24/45
b) 1-(21/24)
c) 21/24
d) 24/21

Solution:

probability of choosing a woman = number of women / total number of people
= 24 / (24 + 21)
= 24 / 45

The answer is (a)

2. The probability that Bernice will travel by plane sometime in the next year is 10%. The probability of a plane crash at any time is 0.005%.

What is the probability that Bernice will be in a plane crash sometime in the next year?

a) 50%
b) 0.0010%
c) 10%
d) 0.0005%

Solution:

A = the event that Bernice travels by plane in the next year
B = the event that there is a plane crash

The probability of Bernice being in a plane crash in the next year is given by:

P(A and B) = P(A) * P(B)
P(A) = 0.10 (given), and P(B) = 0.00005 (given)
P(A and B) = 0.10 * 0.00005 = 0.000005 or 0.0005%.

The probability that Bernice will be in a plane crash sometime in the next year is 0.0005%.
The answer is (d)

3. A data scientist wants to study the behavior of users on the company website. Each time a user clicks on a link on the website, there is a 5% chance that the user will be asked to complete a short survey about their behavior on the website.

The data scientist uses the survey data to conclude that, on average, users spend 15 minutes surfing the company website before moving on to other things. What is wrong with this conclusion?

a) Customers should be asked to complete surveys 25% of the time.
b) People who surf longer are likely to click more links, increasing the odds of getting a survey.
c) The average internet user only surfs a site for 12 minutes, on average.
d) The data scientist is not considering mobile applications.

Solution:

- Option (a) suggests a change in the frequency of surveys, which may or may not be appropriate depending on the purpose of the study.

- Option (c) provides information about the average time spent on a website by internet users in general, which may or may not be relevant to the company's website.

- Option (d) suggests that the data scientist may not be considering mobile applications, but it does not address the specific issue with the conclusion drawn from the survey data.

Then, the conclusion of the data scientist that users spend 15 minutes surfing the company website before moving on to other things may not be accurate due to reason -*people who surf longer are likely to click more links, increasing the odds of getting a survey*- in option (b).

This is because the probability of a user being asked to complete a survey is only 5% for each click on the website, and users who spend more time on the website are likely to click on more links, which increases the likelihood of them being asked to complete a survey. Therefore, the survey data may be biased towards users who spend more time on the website, and may not be representative of the behavior of all users on the website.

As a result, the answer of this question is (b),

4. A diagnostic test has a 98% probability of giving a positive result when applied to a person suffering from Thripshaw's disease and a 10% probability of giving a (false) positive when applied to a nonsufferer. It is estimated that 0.5% of the population has the disease.

Suppose that the test is now administered to a person whose disease status is unknown. Calculate the probability that the test will be positive.

a) 0.0049
b) 0.0995
c) 0.1044
d) 0.995

Solution:

A = the person has Thripshaw's disease
A' = the person does not have Thripshaw's disease
B = the test result is positive
B'= the test result is negative

P(A|B) = 0.98 (the probability of a positive test result given that the person has the disease)
P(A|B') = 0.10 (the probability of a positive test result given that the person does not have the disease)
P(B) = 0.005 (the prior probability of a person having the disease)

P(A) = P(A|B) * P(B) + P(A|B') * P(B')
P(B') = 1 - P(B) = 1 - 0.005 = 0.995
P(A) = 0.98 * 0.005 + 0.10 * 0.995
= 0.0049 + 0.0995
= 0.1044

The answer is (c)