What is the probability of event A occurring given that event B has already occurred?

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June 26, 2024

The probability of event A occurring given that event B has already occurred refers to the likelihood of event A happening after event B has already taken place. This can be expressed as a conditional probability, where the chance of event A occurring is dependent on the occurrence of event B. In other words, it is the measure of how likely it is for event A to happen, taking into account the prior knowledge that event B has already happened. This type of probability calculation is useful in making informed decisions and predicting outcomes in various scenarios.

Find the Probability of A Given B (With Examples)

Given two events, A and B, to "find the probability of A given B" means to find the probability that event A occurs, given that event B has already occurred.

We use the following formula to calculate this probability:

P(A|B) = P(A)*P(B|A) / P(B)

where:

P(A|B): The probability of event A, given event B has occurred.P(B|A): The probability of event B, given event A has occurred.P(A): The probability of event A.P(B): The probability of event B.

The following examples show how to use this formula in practice.

Example 1: Probability of A Given B (Weather)

Suppose the probability of the weather being cloudy is 40%.

Also suppose the probability of rain on a given day is 20%.

Also suppose the probability of clouds on a rainy day is 85%.

If it is cloudy outside on a given day, what is the probability that it will rain that day?

Solution:

P(cloudy) = 0.40P(rain) = 0.20P(cloudy | rain) = 0.85

Thus, we can calculate:

P(rain | cloudy) = P(rain) * P(cloudy | rain) / P(cloudy)P(rain | cloudy) = 0.20 * 0.85 / 0.40P(rain | cloudy) = 0.425

If it is cloudy outside on a given day, the probability that it will rain that day is 0.425 or 42.5%.

Example 2: Probability of A Given B (Crime)

Also suppose the probability of a police car driving by is 10%.

Also suppose the probability of a crime causing a police car to drive by is 90%.

If a police car drives by, what is the probability that a crime has been committed?

Solution:

P(crime) = 0.01P(police car) = 0.10P(police car | crime) = 0.90

Thus, we can calculate:

P(crime | police car) = P(crime) * P(police car | crime) / P(police car)P(crime | police car) = 0.01 * 0.90 / 0.10P(crime | police car) = 0.09

If a police car drives by, the probability that a crime has been committed is .09 or 9%.

Example 3: Probability of A Given B (Baseball)

Suppose the probability of a home run being hit in a baseball game is 5%.

Also suppose the probability of a crowd cheering in a stadium when you walk by is 15%.

Also suppose the probability of a crowd cheering when a home run has been hit is 99%.

If you hear a crowd cheering as you walk by the stadium, what is the probability that a home run has been hit?

Solution:

P(home run) = 0.05P(cheer) = 0.15P(cheer | home run) = 0.99

Thus, we can calculate:

P(home run | cheer) = P(home run) * P(cheer | home run) / P(cheer)P(home run | cheer) = 0.05 * 0.99 / 0.15P(home run | cheer) = 0.33

If you hear a crowd cheering as you walk by the stadium, the probability that a home run has been hit is

0.33 or 33%.

The following tutorials explain how to perform other calculations related to probabilities: