What is the General Multiplication Rule and how can it be applied in various scenarios? Can you provide some examples of its usage?

Authored by

stats writer

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The General Multiplication Rule is a mathematical principle that states that the probability of the simultaneous occurrence of two or more independent events is equal to the product of their individual probabilities. This rule is often used in probability and statistics to calculate the likelihood of multiple events occurring together.

This rule can be applied in various scenarios, such as calculating the probability of rolling a particular number on two dice, the chances of winning a lottery with multiple entries, or the likelihood of both the stock market and the housing market rising at the same time.

For example, if you roll two dice, the probability of getting a 5 on one die and a 2 on the other is 1/6 x 1/6 = 1/36. Similarly, if you buy two lottery tickets with a 1 in 100 chance of winning each, the probability of winning both is 1/100 x 1/100 = 1/10,000.

In real-life scenarios, the General Multiplication Rule can also be applied to predict the likelihood of multiple events occurring together, such as in weather forecasting or predicting the success of a marketing campaign.

In summary, the General Multiplication Rule is a useful tool for calculating the probability of multiple independent events occurring together and can be applied in various scenarios to make predictions and informed decisions.

The General Multiplication Rule (Explanation & Examples)

The general multiplication rule states that the probability of any two events, A and B, both happening can be calculated as:

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

The vertical bar | means "given." Thus, P(B|A) can be read as "the probability that B occurs, *given* that A has occurred."

If events A and B are independent, then P(B|A) is simply equal to P(B) and the rule can be simplified to:

P(A and B) = P(A) * P(B)

Let's walk through a few examples of both independent and dependent events to see how we can apply this general multiplication rule in practice.

The General Multiplication Rule for Dependent Events

The following examples illustrate how to use the general multiplication rule to find probabilities related to two dependent events. In each example, the probability that the second event occurs is affected by the outcome of the first event.

Example 1: Balls in an Urn

An urn contains 4 red balls and 3 green balls. Bob is going to randomly select 2 balls from the urn, without replacement. What is the probability that he chooses 2 red balls?

Solution: The probability that he selects a red ball on the first attempt is 4/7. Once that ball is then removed, the probability that he selects a red ball on the second

attempt is 3/6. Thus, the probability that he selects 2 red balls can be calculated as:

P(Both red) = 4/7 * 3/7 ≈ 0.2249

Example 2: Cards in a Deck

A deck of cards contains 26 black cards and 26 red cards. Debbie is going to randomly select 2 cards from the deck, without replacement. What is the probability that she chooses 2 red cards?

Solution: The probability that she selects a red card on the first attempt is 26/52. Once that card is then removed, the probability that she selects a red card on the second attempt is 25/51. Thus, the probability that she selects 2 red cards can be calculated as:

P(Both red) = 26/52 * 25/51 ≈ 0.2451

The General Multiplication Rule for Independent Events

Example 1: Flipping Two Coins

Suppose we flip two coins. What is the probability that both coins land on heads?

Solution: The probability that the first coin lands on

heads is 1/2. No matter which side the first coin lands on, the probability that the second coin lands on heads is also 1/2. Thus, the probability that both coins land on heads can be calculated as:

P(Both land on heads) = 1/2 * 1/2 = 0.25

Example 2: Rolling Two Dice

Suppose we roll two dice at once. What is the probability that both dice land on the number 1?

Solution: The probability that the first dice lands on "1" is 1/6. No matter which side the first dice lands on, the probability that the second dice lands on "1" is also 1/6. Thus, the probability that both dice land on "1" can be calculated as:

P(Both land on "1") = 1/6 * 1/6 = 1/36 ≈ 0.0278