What is the probability of event A and event B occurring together?

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April 24, 2024

The probability of event A and event B occurring together refers to the likelihood of both events happening simultaneously. This can be calculated by multiplying the individual probabilities of each event. In other words, it represents the chance that both events will happen at the same time. This concept is important in statistics and probability theory, as it allows us to understand the likelihood of multiple events happening together, and to make informed decisions based on those probabilities.

Find the Probability of A and B (With Examples)

Given two events, A and B, to "find the probability of A and B" means to find the probability that event A and event B both occur.

We typically write this probability in one of two ways:

P(A and B) - Written formP(A∩B) - Notation form

The way we calculate this probability depends on whether or not events A and B are independent or dependent.

If A and B are independent, then the formula we use to calculate P(A∩B) is simply:

Independent Events:P(A∩B) = P(A) * P(B)

If A and B are dependent, then the formula we use to calculate P(A∩B) is:

Dependent Events: $P(A \cap B) = P(A) * P(B|A)$

Note that P(B|A) is the conditional probability of event B occurring, *given* event A occurs.

The following examples show how to use these formulas in practice.

Examples of P(A∩B) for Independent Events

The following examples show how to calculate P(A∩B) when A and B are independent events.

Example 1: The probability that your favorite baseball team wins the World Series is 1/30 and the probability that your favorite football team wins the Super Bowl is 1/32. What is the probability that both of your favorite teams win their respective championships?

Solution: In this example, the probability of each event occurring is independent of the other. Thus, the probability that they both occur is calculated as:

$P(A \cap B) = (1/30) * (1/32) = 1/960 = .00104.$

Example 2: You roll a dice and flip a coin at the same

time. What is the probability that the dice lands on 4 and the coin lands on tails?

Solution: In this example, the probability of each event occurring is independent of the other. Thus, the probability that they both occur is calculated as:

Examples of P(A∩B) for Dependent Events

The following examples show how to calculate P(A∩B) when A and B are dependent events.

Example 1: An urn contains 4 red balls and 4 green balls. You randomly choose one ball from the urn. Then, without replacement, you select another ball. What is the probability that you choose a red ball each time?

Solution: In this example, the color of the ball that we choose the first time affects the probability of choosing a red ball the second time. Thus, the two events are dependent.

Let's define event A as the probability of selecting a red ball the first time. This probability is P(A) = 4/8. Next, we have to find the probability of selecting a red ball again, *given* that the first ball was red. In this case, there are

only 3 red balls left to choose and only 7 total balls in the urn. Thus, P(B|A) is 3/7.

Thus, the probability that we select a red ball each time would be calculated as:

$P(A \cap B) = P(A) * P(B|A) = (4/8) * (3/7) = 0.214$.

Example 2: In a certain classroom there are 15 boys and 12 girls. Suppose we place the names of each student in a bag. We randomly choose one name from the bag. Then, without replacement, we choose another name. What is the probability that both names are boys?

Solution: In this example, the name we choose the first time affects the probability of choosing a boy name during the second draw. Thus, the two events are dependent.

Let's define event A as the probability of selecting a boy first time. This probability is P(A) = 15/27. Next, we have to find the probability of selecting a boy again, *given* that the first name was a boy. In this case, there are only 14 boys left to choose and only 26 total names in the bag. Thus, P(B|A) is 14/26.

Thus, the probability that we select a boy name each time would be calculated as:

$P(A \cap B) = P(A) * P(B|A) = (15/27) * (14/26) = 0.299$.