What is the probability of at least two successes occurring?

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June 30, 2024

The probability of at least two successes occurring refers to the likelihood of achieving two or more successful outcomes in a given event or scenario. It is a measure of the likelihood that there will be multiple successful occurrences rather than just one. This probability can be calculated by considering the total number of possible outcomes and the number of successful outcomes. It is an important concept in probability and statistics and is often used to make informed decisions and predictions in various fields such as business, finance, and science.

Find the Probability of "At Least Two" Successes

We can use the following general formula to find the probability of at least two successes in a series of trials:

P(at least two successes) = 1 - P(zero successes) - P(one success)

In the formula above, we can calculate each probability by using the following formula for the :

P(X=k) = nCk * pk * (1-p)n-k

where:

n: number of trialsk: number of successesp: probability of success on a given trialnCk: the number of ways to obtain *k* successes in *n* trials

The following examples show how to use this formula

to find the probability of "at least two" successes in different scenarios.

Example 1: Free-Throw Attempts

Ty makes 25% of his free-throw attempts. If he attempts 5 free-throws, find the probability that he makes at least two.

First, let's calculate the probability that he makes exactly zero free throws or exactly one free throw:

$P(X=0) = 5C0 * .250 * (1-.25)5-0 = 1 * 1 * .755 = 0.2373$

$P(X=1) = 5C1 * .251 * (1-.25)5-1 = 5 * .25 * .754 = 0.3955$

Next, let's plug these values into the following formula to find the probability that Ty makes at least two free-throws:

$P(X \geq 2) = 1 - P(X=0) - P(X=1)P(X \geq 2) = 1 - 0.2372 - 0.3955P(X \geq 2) = 0.3673$

The probability that Ty makes at least two free-throw in five attempts is 0.3673.

Example 2: Widgets

At a given factory, 2% of all widgets are defective. In a random sample of 10 widgets, find the probability that at least two are defective.

P(X=0) = 10C0 * .020 * (1-.02)10-0 = 1 * 1 * .9810 = 0.8171

P(X=1) = 10C1 * .021 * (1-.02)10-1 = 10 * .02 * .989 = 0.1667

Next, let's plug these values into the following formula to find the probability that at least two widgets are defective:

P(X≥2) = 1 - P(X=0) - P(X=1)P(X≥2) = 1 - 0.8171 - 0.1667P(X≥2) = 0.0162

The probability that at least two widgets are defective in this random sample of 10 is 0.0162.

Example 3: Trivia Questions

Bob answers 60% of trivia questions correctly. If we ask him 5 trivia questions, find the probability that he answers at least two correctly.

First, let's calculate the probability that he answers exactly zero or exactly one correctly:

P(X=0) = 5C0 * .600 * (1-.60)5-0 = 1 * 1 * .405 = 0.01024

P(X=1) = 5C1 * .601 * (1-.60)5-1 = 5 * .60 * .404 = 0.0768

Next, let's plug these values into the following formula to find the probability that he answers at least two questions correctly:

P(X≥2) = 1 - P(X=0) - P(X=1)P(X≥2) = 1 - 0.01024 - 0.0768P(X≥2) = 0.91296

The probability that he answers at least two questions correctly out of five is 0.91296.

Bonus: Probability of "At Least Two" Calculator

Use to automatically find the probability of "at least two" successes, based on the probability of success in a given trial and the total number of trials.