What is the probability of at least one success occurring?

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The probability of at least one success occurring refers to the likelihood of an event or outcome happening at least once within a given set of trials or occurrences. It is a measure of the likelihood that at least one instance of success will happen, even if there may be multiple trials or opportunities for success. This concept is often used in statistical and mathematical analysis to determine the likelihood of a desired outcome happening, and is important in decision making and risk assessment. The probability of at least one success occurring can be calculated using various mathematical formulas, and is influenced by factors such as sample size, success rate, and number of trials.

Find the Probability of "At Least One" Success

Probability tells us the likelihood that some event occurs.

For example, suppose 4% of all students at a certain school prefer math as their favorite subject. If we randomly select one student, the probability that they prefer math would be 4%.

But often we're interested in probabilities involving *several* trials. For example, if we randomly select three students, what is the probability that at least one prefers math?

We can use the following steps to answer this:

1. Find the probability that a student does not prefer math.

We know the probability that a student prefers math is P(prefers math) = .04.

Thus, the probability that a student does not prefer math is P(does not prefer math) = .96.

2. Find the probability that all students selected do not prefer math.

Since the probability that each student prefers math is independent of each other, we can simply multiply the individual probabilities together:

P(all students do not prefer math) = .96 * .96 * .96 = .8847.

This represents the probability that all three students do not prefer math as their favorite subject.

3. Find the probability that at least one student prefers math.

Lastly, the probability that at least one student prefers math is calculated as:

P(at least one prefers math) = 1 - P(all do not prefer

math) = 1 - .8847 = .1153.

It turns out that we can use the following general formula to find the probability of at least one success in a series of trials:

P(at least one success) = 1 - P(failure in one trial)n

In the formula above, *n* represents the total number of trials.

P(at least one student prefers math) = 1 - (.96)3 = .1153.

This matches the answer that we got using the three-step process above.

Use the following examples as additional practice for finding the probability of "at least one" success.

Example 1: Free-Throw Attempts

Mike makes 20% of his free-throw attempts. If he attempts 5 free-throws, find the probability that he makes at least one.

Solution:

P(makes at least one) = 1 - P(misses a given attempt)nP(makes at least one) = 1 - (0.80)5P(makes at least one) = 0.672

The probability that Mike makes at least one free-throw in five attempts is 0.672.

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 one is defective.

Solution:

P(at least one defective) = 1 - P(given widget is not defective)nP(at least one defective) = 1 - (0.98)10P(at least one defective) = 0.183

The probability that at least one widget is defective in a random sample of 10 is 0.183.

Example 3: Trivia Questions

Bob answers 75% of trivia questions correctly. If we ask him 3 trivia questions, find the probability that he answers at least one incorrectly.

Solution:

P(at least one incorrect) = 1 - P(given answer is correct)nP(at least one incorrect) = 1 - (0.75)3P(at least one incorrect) = 0.578

The probability that he answers at least one incorrectly is 0.578.

Bonus: Probability of "At Least One" Calculator

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