

What are some real-life examples of the binomial distribution?

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The binomial distribution is a mathematical concept that is used to model the probability of a certain number of successes in a series of independent trials. It has many applications in real-life situations, such as:

1. **Coin flips:** The outcome of flipping a coin is a classic example of a binomial distribution. Each flip has a 50% chance of landing on heads or tails, and the number of heads or tails in a series of flips can be modeled using the binomial distribution.
2. **Product quality control:** In manufacturing, the binomial distribution can be used to determine the probability of a certain number of defective products in a batch. This helps companies make decisions on whether to accept or reject a batch based on their quality standards.
3. **Election outcomes:** The binomial distribution can be used to predict the results of elections by modeling the probability of a candidate winning a certain number of votes in a series of trials (i.e. voting districts).
4. **Medical trials:** In clinical trials, the binomial distribution is used to analyze the success rate of a new medication or treatment. The number of patients who positively respond to the treatment can be modeled using this distribution.
5. **Sports statistics:** The binomial distribution is commonly used in sports statistics to analyze the probability of a team winning a certain number of games in a season. It can also be used to predict the likelihood of a player making a certain number of shots or goals in a game.

Overall, the binomial distribution is a versatile tool that can be applied to various real-life scenarios to analyze and predict the likelihood of a certain outcome.

5 Real-Life Examples of the Binomial Distribution

The is a probability distribution that is used to model the probability that a certain number of "successes" occur during a certain number of trials.

In this article we share 5 examples of how the Binomial distribution is used in the real world.

Example 1: Number of Side Effects from Medications

Medical professionals use the binomial distribution to model the probability that a certain number of patients will experience side effects as a result of taking new medications.

For example, suppose it is known that 5% of adults who take a certain medication experience negative side effects. We can use a to find the probability that more than a certain number of patients in a random sample of 100 will experience negative side effects.

$P(X > 5 \text{ patients experience side effects}) = 0.38400$
 $P(X > 10 \text{ patients experience side effects}) = 0.01147$
 $P(X > 15 \text{ patients experience side effects}) = 0.0004$

And so on.

This gives medical professionals an idea of how likely it is that more than a certain number of patients will experience negative side effects.

Example 2: Number of Fraudulent Transactions

Banks use the binomial distribution to model the probability that a certain number of credit card

transactions are fraudulent.

For example, suppose it is known that 2% of all credit card transactions in a certain region are fraudulent. If there are 50 transactions per day in a certain region, we can use a to find the probability that more than a certain number of fraudulent transactions occur in a given day:

**$P(X > 1 \text{ fraudulent transaction}) = 0.26423$
 $P(X > 2 \text{ fraudulent transactions}) = 0.07843$
 $P(X > 3 \text{ fraudulent transactions}) = 0.01776$**

And so on.

This gives banks an idea of how likely it is that more than a certain number of fraudulent transactions will occur in a given day.

Example 3: Number of Spam Emails per Day

Email companies use the binomial distribution to model the probability that a certain number of spam emails land in an inbox per day.

For example, suppose it is known that 4% of all emails are spam. If an account receives 20 emails in a given

day, we can use a to find the probability that a certain number of those emails are spam:

$$P(X = 0 \text{ spam emails}) = 0.44200 \\ P(X = 1 \text{ spam email}) = 0.36834 \\ P(X = 2 \text{ spam emails}) = 0.14580$$

And so on.

Example 4: Number of River Overflows

Park systems use the binomial distribution to model the probability that rivers overflow a certain number of times each year due to excessive rain.

For example, suppose it is known that a given river overflows during 5% of all storms. If there are 20 storms in a given year, we can use a to find the probability that the river overflows a certain number of times:

$$P(X = 0 \text{ overflows}) = 0.35849 \\ P(X = 1 \text{ overflow}) = 0.37735 \\ P(X = 2 \text{ overflows}) = 0.18868$$

And so on.

This gives the parks departments an idea of how many times they may need to prepare for overflows throughout the year.

Example 5: Shopping Returns per Week

Retail stores use the binomial distribution to model the probability that they receive a certain number of shopping returns each week.

For example, suppose it is known that 10% of all orders get returned at a certain store each week. If there are 50 orders that week, we can use a to find the probability that the store receives more than a certain number of returns that week:

$$P(X > 5 \text{ returns}) = 0.18492 \\ P(X > 10 \text{ returns}) = 0.00935 \\ P(X > 15 \text{ returns}) = 0.00002$$

And so on.

This gives the store an idea of how many customer service reps they need to have in the store that week to handle returns.