**Probability and Statistics**

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# What is probability?

Probability is the branch of mathematics that deals with the study of **random phenomena**. It provides a framework for quantifying the likelihood or chance of an event occurring. The basic idea behind probability is to assign a number between 0 and 1 to an event, with 0 indicating that the event is impossible and 1 indicating that the event is certain.

Some of the key concepts and topics studied in probability include:

* **Sample spaces and events**: The set of all possible outcomes of a random experiment is called a sample space, and the subset of outcomes of interest is called an event.
* **Probability axioms and rules**: Probability is a mathematical concept, and it follows certain axioms and rules. These include the probability of an event being between 0 and 1, and the probability of the sample space being 1.
* **Conditional probability**: The probability of an event occurring given that another event has occurred.
* **Independence and dependence**: Two events are independent if the occurrence of one does not affect the probability of the other.
* **Random variables and probability distributions**: A random variable is a variable whose value is determined by a random experiment. Probability distributions describe the probability of different outcomes of a random variable.
* **Discrete and continuous distributions**: Discrete distributions such as the binomial and Poisson distributions are used to model the number of occurrences of an event in a fixed number of trials. Continuous distributions such as the normal and exponential distributions are used to model continuous variables.
* **Expectation, variance, and other measures**: Expectation, variance, and other measures are used to describe the properties of a probability distribution.
* **Common distributions**: Some of the common distributions studied in probability include the Bernoulli, binomial, Poisson, normal, and exponential distributions.
* **Limit theorem**: Central Limit theorem, law of large numbers are some examples of limit theorem which are important concept in probability.

These are just a few of the many topics that are studied in probability. Understanding these concepts and topics is essential for understanding statistical theory and methods and being able to use probability in real-world applications.

# What are statistics?

Statistics is the branch of mathematics that deals with the collection, analysis, interpretation, presentation, and organization of data. It is a branch of mathematics that is used to draw conclusions from data. It involves the use of mathematical models and methods to analyse and make inferences about data and to communicate the results of data analysis clearly and concisely.

Statistics is used in a wide range of fields, including business, economics, medicine, engineering, and the social sciences. It provides a set of tools and techniques that can be used to understand and interpret data, make predictions and decisions, and address real-world problems.

There are two main branches of statistics: descriptive statistics and inferential statistics. Descriptive statistics is the branch that deals with summarizing and describing data, while inferential statistics is the branch that deals with making inferences about a population based on a sample of data.

Statistics is also a science that is constantly evolving, new techniques and methods are being developed to deal with the increasing complexity and amount of data, and the new areas of application that arise.

# What to study first – Probability OR Statistics

It's generally recommended to start with probability when studying statistics. **Probability is the foundation of statistics**, and understanding probability concepts and rules are essential for understanding statistical theory and methods.

Probability theory deals with the study of random phenomena and provides the mathematical framework for statistical analysis.

Probability concepts such as random variables, probability distributions, and probability density functions are fundamental to statistics. Additionally, the probability is used in the calculation of statistics such as means, variances, and standard errors.

After gaining a solid understanding of probability, you can move on to study statistics. This will give you the necessary foundation to understand statistical concepts such as estimation, hypothesis testing, and data analysis.

It's also worth noting that many introductory statistics courses cover both probability and statistics together, which can be helpful in understanding the connections and how probability is used in statistics.