**Inferential statistics**

Inferential statistics is a branch of statistics that focuses on making predictions or inferences about a population based on a sample of data drawn from that population. Unlike descriptive statistics, which simply describes the characteristics of a sample, inferential statistics uses this data to make generalizations and predictions. Here are some key concepts and methods used in inferential statistics:

OR

Inferential statistics involves the use of a sample (1) to estimate some characteristic in a large population; and (2) to test a research hypothesis about a given population. To appropriately estimate a population characteristic, or parameter, a random and unbiased sample must be drawn from the population of interest.

<https://www.cuemath.com/data/inferential-statistics/>

1. **Population and Sample**:
   * **Population**: The entire group that you want to draw conclusions about.
   * **Sample**: A subset of the population that is used to gather data and make inferences about the population.
2. **Sampling Techniques**
   * **types**
3. **Central limit theorem**
4. **Estimation**:
   * **Point Estimation**: Provides a single value estimate of a population parameter (e.g., mean, proportion).
   * **Interval Estimation (Confidence Intervals)**: Provides a range of values within which the population parameter is expected to lie, with a certain level of confidence (e.g., 95% confidence interval).
5. **Hypothesis Testing**:
   * **Null Hypothesis (H0)**: A statement of no effect or no difference, which we test against an alternative hypothesis.
   * **Alternative Hypothesis (H1 or Ha)**: The statement we want to test for; it represents an effect or difference.
   * **P-value**: The probability of obtaining test results at least as extreme as the results actually observed, under the assumption that the null hypothesis is true.
   * **Significance Level (α)**: A threshold for determining whether a p-value indicates a statistically significant result (commonly set at 0.05).
6. **Types of Inferences**:
   * **Estimation of Parameters**: Estimating population parameters such as mean, variance, proportion.
   * **Prediction**: Predicting future observations or trends based on sample data.
   * **Decision Making**: Making decisions based on statistical tests, such as determining the effectiveness of a new drug.
7. **Common Techniques**:
   * **t-tests**: Used to compare means between two groups.
   * **Chi-square tests**: Used to test relationships between categorical variables.
   * **ANOVA (Analysis of Variance)**: Used to compare means across three or more groups.
   * **Regression Analysis**: Used to understand relationships between variables and make predictions.