

## **What Is Confidence Interval ?**

- A confidence interval is a range of values, bounded above and below the statistic's mean, that likely would contain an unknown population parameter. Confidence level refers to the percentage of probability, or certainty, that the confidence interval would contain the true population parameter when you draw a random sample many times.
- the confidence interval tells you more than just the possible range around the estimate. It also tells you about how stable the estimate is. A stable estimate is one that would be close to the same value if the survey were repeated.

## **where would you use a confidence interval in everyday life?**

- Confidence intervals are often used in clinical trials to determine the mean change in blood pressure, heart rate, cholesterol, etc. produced by some new drug or treatment. For example, a doctor may believe that a new drug is able to reduce blood pressure in patients.

### **4 Examples of Confidence Intervals in Real Life :-**

#### **Example 1: Biology**

Confidence intervals are often used in biology to estimate the mean height, weight, width, diameter, etc. of different plant and animal species.

#### **Example 2: Clinical Trials**

Confidence intervals are often used in clinical trials to determine the mean change in blood pressure, heart rate, cholesterol, etc. produced by some new drug or treatment.

#### **Example 3: Advertising**

Confidence intervals are often used by marketing departments within companies to determine if some new advertising technique, method, tactic, etc. produces significantly higher revenue.

#### **Example 4: Manufacturing**

Confidence intervals are often used by engineers in manufacturing plants to determine if some new process, technique, method, etc. causes a meaningful change in the number of defective products produced by the plant.

## **Why do we use 95% confidence interval?**

- The 95% confidence interval defines a range of values that you can be 95% certain contains the population mean. With large samples, you know that mean with much more precision than you do with a small sample, so the confidence interval is quite narrow when computed from a large sample .

## **How to Write a Confidence Interval Conclusion ?**

- Confidence Interval = [lower bound, upper bound]
- We can use the following sentence structure to write a conclusion about a confidence interval :

*We are [% level of confidence] confident that [population parameter] is between [lower bound, upper bound].*

- **Example 1: Confidence Interval Conclusion for a Mean**

- Suppose a biologist wants to estimate the mean weight of dolphins in a population. She collects data for a simple random sample of 50 different dolphins
- constructs the following 95% confidence interval:

*95% confidence interval = [480.5, 502.5]*

- Here's how to write a conclusion for this confidence interval:

*The biologist is 95% confident that the mean weight of dolphins in this population is between 480.5 pounds and 502.5 pounds.*

- **Example 2: Confidence Interval Conclusion for a Difference in Means**

- Suppose a zoologist wants to estimate the difference in mean weights between two different species of turtles. He collects data for a simple random sample of 25 of each species
- constructs the following 90% confidence interval:

*90% confidence interval = [3.44, 12.33]*

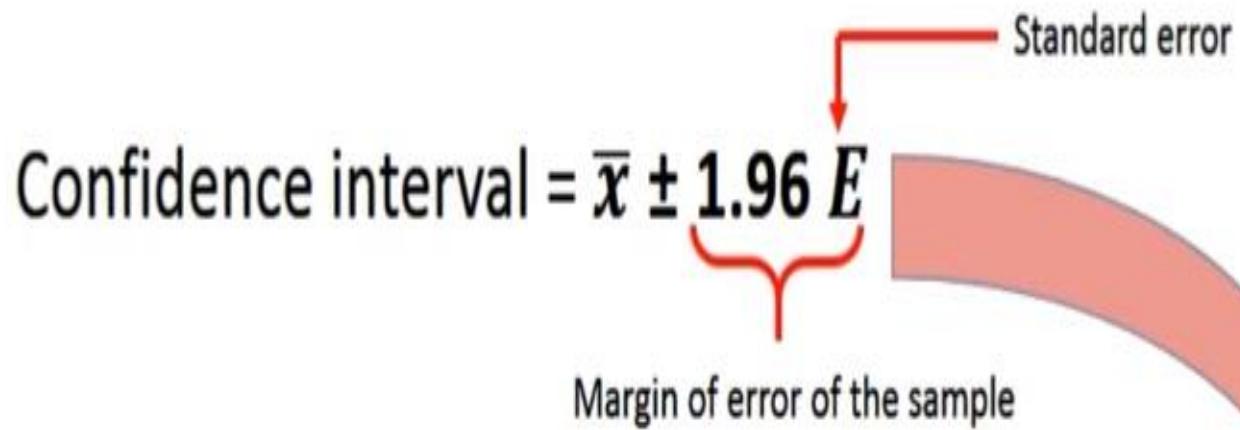
- Here's how to write a conclusion for this confidence interval:

*The zoologist is 90% confident that the difference in mean weight between these two species of turtles is between 3.44 pounds and 12.33 pounds.*

Confidence interval =  $\bar{x} \pm 1.96 E$

Standard error

Margin of error of the sample



$\bar{x}$  is the sample mean

Standard error  $E = \frac{\sigma}{\sqrt{n}}$

$\sigma$  is the standard deviation of the population  
 $n$  is the sample size