**How are p-value and confidence interval related?**

* **P-value** is a measure of strength. It indicates the probability of obtaining the observed result if the null hypothesis is true. If the p-value is less than the chosen significance level (such as 0.05 or 0.01), we reject the null hypothesis in favor of the alternative hypothesis.
* A **confidence interval** is a range of values that is likely to contain the true value of a parameter. It provides information about the precision of our estimate.
* If a confidence interval contains the null hypothesis value, we fail to reject the null hypothesis.
* If a confidence interval does not contain the null hypothesis value, we reject the null hypothesis.
* If you are testing whether or not the population mean is a particular value *x*, and you use the 5% cutoff for the p-value, then you will reject the null hypothesis if *x* is not in your 95% confidence interval for the mean.
* If you were using the 1% cutoff for the P-value, you would have to check if the value specified in the null hypothesis lies in a 99% confidence interval for the population mean.

**Example:**

Our approximate 95% confidence interval for the average age in the population goes from 26.9 years to 27.6 years. Suppose someone wants to test the following hypotheses:

**Null hypothesis:** The average age in the population is 30 years.

**Alternative hypothesis:** The average age in the population is not 30 years.

Then, if you were using the 5% cutoff for the p-value, you would reject the null hypothesis. This is because 30 is not in the 95% confidence interval for the population average. At the 5% level of significance, 30 is not a plausible value for the population average.

This can be established by statistical theory. In practice, it just boils down to checking whether or not the value specified in the null hypothesis lies in the confidence interval.