Student's t-test

Student t test is a **statistical test** which is widely used to compare the mean of two groups of samples. It is therefore to evaluate whether the means of the two sets of data are statistically **significantly** different from each other.

There are many types of **t test** :

1.The **one-sample t-test**, used to compare the mean of a population with a theoretical value.

2.The **unpaired two sample t-test**, used to compare the mean of two **independent samples**.

3.The **paired t-test**, used to compare the means between two related groups of samples.

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One-sample t-test :

The one sample t test compares the mean of your sample data to a known value. For example, you might want to know how your sample mean compares to the population mean. You should run a one sample t test when you don't know the population standard deviation or you have a small sample size.

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

Solved Example :

A professor wants to know if her introductory statistics class has a good grasp of basic math. Six students are chosen at random from the class and given a math proficiency test. The professor wants the class to be able to score above 70 on the test. The six students get scores of 62, 92, 75, 68, 83, and 95. Can the professor have 90 percent confidence that the mean score for the class on the test would be above 70?

<u>Solution :</u>

Step1: **null hypothesis**: H_0: μ = 70

alternative hypothesis: H_a : μ > 70

Step2: compute the sample mean and standard deviation:

$$\begin{array}{r} 62 \\ 92 \\ 75 \\ 68 \\ 83 \\ +\ 95 \\ \hline 475 \end{array}$$

$$\bar{x} = \frac{475}{6} = 79.17$$

$$s = 13.17$$

Step3: compute the *t*-value:

$$t = \frac{79.17 - 70}{\frac{13.17}{\sqrt{6}}} = \frac{9.17}{5.38} = 1.71$$

To test the hypothesis, the computed *t*-value of 1.71 will be compared to the critical value in the *t*-table. if the computed *t*-value is larger than the critical *t*-value from the table, the null hypothesis can be rejected.

A 90 percent confidence level is equivalent to an alpha level of 0.10.

This is a one-tailed test, and you do not divide the alpha level by 2. The number of degrees of freedom for the problem is 6 – 1 = 5. The value in the *t*-table for $t_{.10,5}$ is 1.476. Because the computed *t*-value of 1.71 is larger than the critical value in the table, the null hypothesis can be rejected, and the professor has evidence that the class mean on the math test would be at least 70.