**Student (T) test**

The **T – Test** is used to

1. The test may also be used to test for differences between means measured on matched samples.

**Examples** can include trials of two drugs where the same person receives each drug at different times and observations are taken on their resulting condition after using each drug.

1. The test might also be employed to study a comparison of a group of students’ competencies in two areas by analyzing two sets of test results.

Studying is based on , in which two chances by **normal distribution** are used to analysis small samples. distribution uses to infinite value which is bell shaped similar to the shape of normal distribution but more spread out. As the sample size the the normal distribution.

To determine whether the distribution is normally distributed or not, we should follow the following equation

Once you are getting the value of , which called **Calculated T**, you have to compare it with the under the under significant level 5% (0.05 degree of freedom).

**T – Test** is used to test a single small sample and compare it with a population. The sample size must be **less than 50**. It is also used to determine whether the sample drawn from the normally distributed population or the value is deviated significantly.

**Application of T – Test**

1. **Compare one group to a hypothetical value ()**

**Where**

**For example,** for the following data set, when μ=207.4

|  |
| --- |
|  |
| 154.3 |
| 191 |
| 163.4 |
| 168.6 |
| 187 |
| 200.4 |
| 162.5 |

**Solution:**

1. **Level of significant** = 0.05
2. **Degree of freedom** = n – 1 = 7 – 1 = 6

 **Tabulated T. =** –**2.447**

1. **Setup of hypothesis** (Ho) m1 = m2
2. **Calculation**

1st: Population mean () = 207.4

2nd: Find of

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 154.3 | -21.01 | 441.4201 |
| 191 | 15.69 | 246.1761 |
| 163.4 | -11.91 | 141.8481 |
| 168.6 | -6.71 | 45.0241 |
| 187 | 11.69 | 136.6561 |
| 200.4 | 25.09 | 629.5081 |
| 162.5 | -12.81 | 164.0961 |
|  |  |  |
|  |  |  |
|  |  |  |

1. **Decision**

|  |  |
| --- | --- |
| **Possible action** | **Condition of Hypothesis** |
|  | Accept HA | Reject Ho |
|  | Accept Ho | Reject HA |

So, we accept our hypothesis (Ho) because has no a significant different between mean of both sample and population.

1. **Compare two unpaired groups**
2. **Type of T – Test** **(**)

The **variance**s in the two groups are **extremely different**. E.g. the two samples are of **very different sizes**. is used to test the difference between the mean of two samples which are independent from each other with the mean of the population.

**Where**

**Example;** We have two samples (or groups), taken from the serum sodium concentration μg/ml of two groups of patients, the first sample included 10 patients in which serum sodium concentrations μg/ml were as follow; 125, 130, 135, 136, 137, 139, 142, 145, 147, 148. While in the second group which included 5 patients in serum sodium concentrations μg/ml were as follow; 120, 121, 119, 118, 122.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **1st Group of Patients ()** |  |  | **2nd Group of Patients ()** |  |  |
| **125** | -13.4 | 179.56 | **120** | 0 | 0 |
| **130** | -8.4 | 70.56 | **121** | 1 | 1 |
| **135** | -3.4 | 11.56 | **119** | -1 | 1 |
| **136** | -2.4 | 5.76 | **118** | -2 | 4 |
| **137** | -1.4 | 1.96 | **122** | 2 | 4 |
| **139** | 9 | 81 |  |  |
| **142** | 3.6 | 12.96 |  |  |  |
| **145** | 6.6 | 43.56 |  |  |  |
| **147** | 8.6 | 73.96 |  |  |  |
| **148** | 9.6 | 92.16 |  |  |  |
|  |  |  |  |  |

**Solution:**

1. **Level of significant** = 0.05
2. **Degree of freedom**

**Tabulated T. = 1.771**

1. **Setup of hypothesis** (Ho)
2. **Calculation**
3. **Decision**

|  |  |
| --- | --- |
| **Possible action** | **Condition of Hypothesis** |
|  | Accept HA | Reject Ho |
|  | Accept Ho | Reject HA |

So, we reject our hypothesis (Ho) , because there is a significant different between mean of both patient group test.

1. **Type of T – Test** **(**)

 compares the mean of two small samples that are similar to each other.

**Where**

**Example**: suppose we have **11 students** to compare their degree of **Physiology** and **Cell Biology**, the two subjects for each student represent the match pair as the following table determines.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 75 | 90 | -15 | 225 |
| 85 | 10 | 75 | 5625 |
| 93 | 20 | 73 | 5329 |
| 55 | 55 | 0 | 0 |
| 75 | 60 | 15 | 225 |
| 86 | 30 | 56 | 3136 |
| 90 | 80 | 10 | 100 |
| 76 | 75 | 1 | 1 |
| 89 | 25 | 64 | 4096 |
| 59 | 75 | -16 | 256 |
| 92 | 52 | 40 | 1600 |
|  |  |  |  |
|  |  | **303** | **20593** |
|  |  | **91809** |  |

 at the level of significance is **0.05** and degree of freedom 10 equal to **2.228.** So, the  **<** , so it is not significant, because **calculated T** is less than **tabulated T** so we **accept Ho.**

**Example:** An experiment is conducted on the effect of alcohol on perceptual motor ability. Test to see if alcohol had a significant effect.

|  |  |
| --- | --- |
| **water** | **alcohol** |
| 16 | 13 |
| 15 | 13 |
| 11 | 10 |
| 20 | 18 |
| 19 | 17 |
| 14 | 11 |
| 13 | 10 |
| 15 | 15 |
| 14 | 11 |
| 16 | 16 |

**Solution:**

1. **Level of significant** = 0.01
2. **Degree of freedom** = n – 1 = 10 – 1 = 9

 **= 2.821**

1. **Setup of hypothesis** (HA)
2. **Calculation**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 16 | 13 | 3 | 9 |
| 15 | 13 | 2 | 4 |
| 11 | 10 | 1 | 1 |
| 20 | 18 | 2 | 4 |
| 19 | 17 | 2 | 4 |
| 14 | 11 | 3 | 9 |
| 13 | 10 | 3 | 9 |
| 15 | 15 | 0 | 0 |
| 14 | 11 | 3 | 9 |
| 16 | 16 | 0 | 0 |
|  |  |  |  |
|  |  |  |

1. **Decision**

So, we accept our hypothesis (HA) , because there are significant different of **alcohol on perceptual motor ability**.

**Example**: You are conducting a study to see if students do better when they study all at once or in intervals. One group of **12 participants** took a test after studying for one hour continuously. The other group of **10 participants** took a test after studying for three twenty-minute sessions. The **first group** had a **mean** score of **75** and a **variance** of **120**. The **second group** had a **mean score** of **86** and a **variance** of **100**.

What is the **calculated t value**? Are the mean test scores of these two groups significantly different at the **0.05 level**?

**Solution:**

**Example**: A new test was designed to have a **mean** of **80** and a **standard** **deviation** of **10**. A random sample of **20** **students** at your school takes the test, and the **mean score** turns out to be **85**. Does this score differ significantly from **80**?

**Example**: You perform a one sample t test and calculate a t statistic of **3.0**. The **mean** of your **sample** was **1.3** and the **standard** **deviation** was **2.6**. How many **participants** were used in this study?