# Student's t Test

**Null Hypothesis**______________________________________________________________________________

______________________________________________________________________________________

**Alternative Hypothesis**________________________________________________________________________

______________________________________________________________________________________

Enter your data in the table below ($x_1$ and $x_2$) then square the individual observations to give $x_1^2$ and $x_2^2$ values.

| **Observation number** | Site 1 | | Site 2 | |
|---|---|---|---|---|
| | **$x_1$** | **$x_1^2$** | **$x_2$** | **$x_2^2$** |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| Σ (sum) | | | | |
| | $\Sigma x_1$ | $\Sigma x_1^2$ | $\Sigma x_2$ | $\Sigma x_2^2$ |

Σ = the sum of, so to calculate the $\Sigma x_1$, $\Sigma x_1^2$, $\Sigma x_2$, $\Sigma x_2^2$ values add up the values in each column.

Calculate the means of the $x_1$ and $x_2$ values to 3 decimal places:

$\bar{x}_1 = \dfrac{\sum x_1}{n_1}$ = ______________________________ =

$\bar{x}_2 = \dfrac{\sum x_2}{n_2}$ = ______________________________ =

**Note that n =** the number of observations and $\bar{x}$ = the mean of the observations.

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| $\Sigma x_1$ | $\Sigma x_1^2$ | $\Sigma x_2$ | $\Sigma x_2^2$ | $\bar{x}_1$ | $\bar{x}_2$ |

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Calculate the Variances $s_1^2$ and $s_2^2$ to 3 decimal places in the boxes below.

$$\mathbf{S_1^2} = \frac{\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}}{n_1 - 1} = \underline{\hspace{10em}} =$$

$$\mathbf{S_2^2} = \frac{\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}}{n_2 - 1} = \underline{\hspace{10em}} =$$

Calculateyour t value by using the equation below (to 3 decimal places)

$$t = \frac{|\bar{x}_1 - \bar{x}_2|}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \underline{\hspace{10em}} =$$

For the top part of the last formula, the vertical line indicates that you take the positive value of the

difference between the means.

Calculate your combined degrees of freedom **$n_1 + n_2 - 2$=**

Now look up you critical value of t on the table below **Critical value of t =**

**Calculated value of t =**

If your calculated t value is greater than or equal to your critical value of t, you can reject your null hypothesis and accept your alternative Hypothesis

We therefore Accept/Reject our Null Hypothesis We therefore Accept/Reject our Alternative Hypothesis

| **Critical values at the 5% significance level** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Combined degrees of freedom | Critical valueof t | Combined degrees of freedom | Critical valueof t | Combined degrees of freedom | Critical valueof t | Combined degrees of freedom | Critical valueof t |
| 5 | 2.571 | 13 | 2.160 | 21 | 2.080 | 29 | 2.045 |
| 6 | 2.447 | 14 | 2.145 | 22 | 2.074 | 30 | 2.042 |
| 7 | 2.365 | 15 | 2.132 | 23 | 2.069 | 35 | 2.030 |
| 8 | 2.306 | 16 | 2.120 | 24 | 2.064 | 40 | 2.021 |
| 9 | 2.262 | 17 | 2.110 | 25 | 2.060 | 45 | 2.014 |
| 10 | 2.228 | 18 | 2.101 | 26 | 2.056 | 50 | 2.010 |
| 11 | 2.201 | 19 | 2.093 | 27 | 2.052 | 60 | 2.000 |
| 12 | 2.179 | 20 | 2.086 | 28 | 2.049 | 70 | 1.994 |