

Worksheet for the t-test

This test can only be used on normally distributed data. You should have a minimum of 10 (but not necessarily the same number of observations) in each data set and a maximum of 24 observations in each data set. You need to set **null** and **alternative** hypotheses.

Null Hypothesis

Alternative Hypothesis

Enter your two sets of 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	Data set 1 (x_1)		Data set 2 (x_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				
21				
22				
23				
24				
Σ (sum)				
	Σx_1	Σx_1^2	Σx_2	Σx_2^2

Σ = the sum of, so to calculate the Σx_1 , Σx_1^2 , Σx_2 and Σx_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:

$$\bar{x}_1 = \frac{\Sigma x_1}{n_1} = \underline{\hspace{2cm}} \quad \bar{x}_1 =$$

$$\bar{x}_2 = \frac{\Sigma x_2}{n_2} = \underline{\hspace{2cm}} \quad \bar{x}_2 =$$

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

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So far we have calculated

Sum of x_1 values	Sum of squares of x_1 values	Sum of x_2 values	Sum of squares of x_2 values	Mean of x_1 values	Mean of x_2 values
Σx_1	Σx_1^2	Σx_2	Σx_2^2	\bar{x}_1	\bar{x}_2

Now calculate the variance of each data set s_1^2 and s_2^2 to 3 decimal places in the boxes below.

$$s_1^2 = \frac{\Sigma x_1^2 - \frac{(\Sigma x_1)^2}{n_1}}{n_1 - 1} = \frac{\quad}{\quad} =$$

$$s_2^2 = \frac{\Sigma x_2^2 - \frac{(\Sigma x_2)^2}{n_2}}{n_2 - 1} = \frac{\quad}{\quad} =$$

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

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

For the top part of the last formula, the vertical line | each side of the symbols 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 and compare it with your calculated t value

Critical value of t =
Calculated value of t =

If your calculated t value is **greater than or equal to** the critical value of t, you can reject your null hypothesis and accept your alternative hypothesis. If the calculated t value is smaller than the critical value then you must accept your null hypothesis. Remember that your decision is **based on the available data**.

We therefore accept/fail to accept our Null Hypothesis we therefore accept/reject our alternative hypothesis

Critical values of t at the 5% probability level							
Combined degrees of freedom	Critical value of t	Combined degrees of freedom	Critical value of t	Combined degrees of freedom	Critical value of t	Combined degrees of freedom	Critical value of 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	46	2.014
10	2.228	18	2.101	26	2.056		
11	2.201	19	2.093	27	2.052		
12	2.179	20	2.086	28	2.049		