

How can I perform t-tests in Google Sheets?

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T-tests are commonly used statistical tests to determine the significance of the difference between two means. In Google Sheets, t-tests can be performed by using the built-in function "TTEST". This function allows users to specify the range of data for the two samples and the type of t-test (either paired or unpaired). The result of the test will provide the t-statistic, degrees of freedom, and the p-value. This allows users to easily analyze their data and make informed decisions based on the significance of the difference between the two samples. Additionally, Google Sheets also offers a variety of resources and tutorials to help users understand and utilize the TTEST function effectively.

Perform t-Tests in Google Sheets

Broadly speaking, there are three types of t-tests:

One sample t-test Two sample t-test Paired samples t-test

This tutorial provides examples of how to perform each of these tests in Google Sheets.

Example: One Sample t-Test

Definition: A one sample t-test is used to test whether or not the mean of a population is equal to some value.

Example: A botanist wants to know if the mean height of a certain species of plant is equal to 15 inches. She collects a random sample of 12 plants and records each of their heights in inches.

The following screenshot shows how to perform a one

sample t-test to determine if the true population mean height is equal to 15 inches:

	A	B	C	D	E
1	Plant height (inches)				
2	14		Sample size	12	=COUNT(A2:A13)
3	14		Sample mean	14.3333	=AVERAGE(A2:A13)
4	16		Sample std. dev	1.3707	=STDEV.S(A2:A13)
5	13				
6	12		Hypothesized mean	15	
7	17		Test statistic <i>t</i>	-1.684847078	=(D3-D6)/(D4/SQRT(D2))
8	15				
9	14		Degrees of freedom	11	=D2-1
10	15		p-value	0.120145	=T.DIST.2T(ABS(D7),D9)
11	13				
12	15				
13	14				
14					
15					
16					
17					
18					
19					
20					

The two hypotheses for this particular one sample t test are as follows:

$H_0: \mu = 15$ (the mean height for this species of plant is 15 inches)

$H_A: \mu \neq 15$ (the mean height is *not* 15 inches)

Because the p-value of our test (0.120145) is greater

than $\alpha = 0.05$, we fail to reject the null hypothesis of the test. We do not have sufficient evidence to say that the mean height for this particular species of plant is different from 15 inches.

Example: Two Sample t-Test

Definition: A two sample t-test is used to test whether or not the means of two populations are equal.

Example: Researchers want to know whether or not two different species of plants in a particular country have the same mean height. They collect a random sample of 20 plants from each species and record each plant height in inches.

The following screenshot shows how to perform a two sample t-test using the T.TEST() function to determine if the two population mean heights are equal:

fx | =T.TEST(A2:A21, B2:B21, 2, 2)

	A	B	C	D	E	F
1	Species 1 Height	Species 2 Height			E2	
2	14	15		0.530047	=T.TEST(A2:A21, B2:B21, 2, 2)	
3	15	17				
4	15	14				
5	16	17				
6	13	14				
7	8	8				
8	14	12				
9	17	19				
10	16	19				
11	14	14				
12	19	17				
13	20	22				
14	21	24				
15	15	16				
16	15	13				
17	16	16				
18	16	13				
19	13	18				
20	14	15				
21	12	13				
22						
23						
24						
25						

The two hypotheses for this two sample t test are as follows:

H0: $\mu_1 = \mu_2$ (the two population means are equal)

H1: $\mu_1 \neq \mu_2$ (the two population means are not equal)

Because the p-value of our test (0.530047) is greater than alpha = 0.05, we fail to reject the null hypothesis of the test. We do not have sufficient evidence to say that

the mean height for this particular species of plant is different from 15 inches.

Example: Paired Samples t-Test

Definition: A paired samples t-test is used to compare the means of two samples when each observation in one sample can be paired with an observation in the other sample.

Example: We want to know whether a study program significantly impacts student performance on a particular exam. To test this, we have 20 students in a class take a pre-test. Then, we have each of the students participate in the study program for two weeks. Then, the students retake a test of similar difficulty.

The following screenshot shows how to perform a paired sample t-test to compare the difference between the mean scores on the first and second test:

fx =T.TEST(B2:B21, C2:C21, 2, 1)

	A	B	C	D	E	F	G
1	Student	Pre-test Score	Post-test Score				
2	1	88	91		0.011907	=T.TEST(B2:B21, C2:C21, 2, 1)	
3	2	82	84				
4	3	84	88				
5	4	93	90				
6	5	75	79				
7	6	78	80				
8	7	84	88				
9	8	87	90				
10	9	95	90				
11	10	91	96				
12	11	83	88				
13	12	89	89				
14	13	77	81				
15	14	68	74				
16	15	91	92				
17	16	94	93				
18	17	95	97				
19	18	88	90				
20	19	84	84				
21	20	82	80				
22							
23							
24							
25							
26							

Note: It's also possible to perform a one-tailed two sample t-test with or without the assumption that both samples have the same variance. Refer to the [T.TEST documentation](#) to see how to adjust the assumptions for the test.

The two hypotheses for this paired samples t test are as follows:

H0: $\mu_1 = \mu_2$ (the two population means are equal)

H1: $\mu_1 \neq \mu_2$ (the two population means are not equal)

Because the p-value of our test (0.011907) is less than alpha = 0.05, we reject the null hypothesis of the test. We have sufficient evidence to say that there is a statistically significant difference between the mean pre-test and post-test score.

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