

How to Calculate a P-Value from a T Statistic in Three Easy Steps

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A p-value is a statistical measure used to determine the significance of a result in a hypothesis test. It represents the probability of obtaining a test statistic at least as extreme as the observed value, assuming the null hypothesis is true. There are three commonly used methods to calculate a p-value from a t statistic:

1. Look up in a t-distribution table: This method involves using a pre-calculated table that provides the critical values for different degrees of freedom and levels of significance. The t statistic is compared to the critical value and the p-value is determined based on the level of significance chosen.
2. Use a statistical software or calculator: With the advancements in technology, statistical software and calculators have made it easier to calculate p-values from t statistics. These tools use complex algorithms to determine the p-value based on the provided t statistic, degrees of freedom, and the chosen level of significance.
3. Use a formula: The final method involves using a formula to calculate the p-value directly. This method requires knowledge of the t distribution and its properties. The formula involves computing the area under the t-distribution curve from the t statistic to the right or left, depending on the alternative hypothesis, and converting it to a probability.

In summary, these three methods provide different ways to determine the p-value from a t statistic, giving researchers and statisticians flexibility in choosing the most suitable approach for their analysis.

Three Ways to Find a P-Value from a t Statistic

A is a formal statistical test we use to reject or fail to reject a statistical hypothesis.

Whether we conduct a hypothesis test for a mean, a proportion, a difference in means, or a difference in proportions, we often end up with a t statistic for our test.

Once we have a t statistic, we can then find a corresponding p-value that we can use to reject or fail to reject the null hypothesis of our test.

This tutorial explains three different ways to find a p-value from a t statistic.

Three Ways to Find a P-Value from a t Statistic

In each of the following examples, we'll find the p-value for a right-tailed test with a t statistic of 1.441 and 13 degrees of freedom.

Technique 1: t Score to P Value Calculator

The first way to find a p-value from a t statistic is to use an online calculator like the . We can simply enter the value for t and the degrees of freedom, then select "one-tailed", then click the Calculate" button:

T Score to P Value Calculator

t score

1.441

Degrees of freedom

13

One-tailed or two-tailed hypothesis?

One-tailed



Two-tailed



CALCULATE

P-value: 0.08662

The corresponding p-value is 0.08662.

Technique 2: t Distribution Table

Another way to find the p-value for a given t statistic is to use the.

Using the table, look up the row that has degrees of freedom (DF) = 13, then find the values that 1.441 lies between. It turns out to be 1.35 and 1.771. Next, look up at the top of the table for "one-tail" and you'll notice that these values correspond with 0.1 and 0.05. This tells us that the corresponding p-value is somewhere between 0.05 and 0.1.

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	P						
one-tail	0.1	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	0.2	0.1	0.05	0.02	0.01	0.002	0.001
DF							
1	3.078	6.314	12.706	31.821	63.656	318.289	636.578
2	1.886	2.92	4.303	6.965	9.925	22.328	31.6
3	1.638	2.353	3.182	4.541	5.841	10.214	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.61
5	1.476	2.015	2.571	3.365	4.032	5.894	6.869
6	1.44	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.86	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.25	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.93	4.318
13	1.35	1.771	2.16	2.65	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.14
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.12	2.583	2.921	3.686	4.015
17	1.333	1.74	2.11	2.567	2.898	3.646	3.965
18	1.33	1.734	2.101	2.552	2.878	3.61	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.85
21	1.323	1.721	2.08	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.5	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.06	2.485	2.787	3.45	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.689
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.66
30	1.31	1.697	2.042	2.457	2.75	3.385	3.646
60	1.296	1.671	2	2.39	2.66	3.232	3.46
120	1.289	1.658	1.98	2.358	2.617	3.16	3.373
1000	1.282	1.646	1.962	2.33	2.581	3.098	3.3
Inf	1.282	1.645	1.96	2.326	2.576	3.091	3.291

Notice the drawback of using the t distribution table: it does not tell us the exact p-value; it only gives us a range of values.

Technique 3: TI-83 or TI-84 Calculator

On your calculator, click 2ND VARS (to get to DISTR),

scroll down, and click the tcdf function. The syntax to use this function to find the p-value for a right-tailed test is as follows:

tcdf(smaller value, larger value, degrees of freedom)

Since we are conducting a right-tailed test, we can use 1.441 as the smaller value, 9999 as the larger value, and 13 as the degrees of freedom:

tcdf(1.441, 9999, 13)

This returns a value of 0.08662, which matches the p-value that we got from the online calculator.