

TI 83/84 Hypothesis Testing: Two Independent Sample Means

The TI-83 and 84 families of calculators can be used to conduct two sample hypothesis tests for means from independent samples with sigma known and unknown.

Compare two means from independent samples with KNOWN σ :

Example: A random sample of 50 AACC online statistics students scored an average of 74.3 on the final exam. It is known that the standard deviation on the final exam for all AACC online statistics students is 5.4. A random sample of 40 AACC traditional students scored an average of 71.7 on the final exam. It is known that the standard deviation on the final exam for all AACC traditional students is 6.1. Is there enough evidence at the 5% level of significance to show that there is a difference in performance on the final exam between the two groups of statistics students?

Procedure: For this test we will be using a 2-sample z-test since the standard deviations for the populations that the samples are taken from are known. In this case $H_0: \mu_1 = \mu_2$ and $H_a: \mu_1 \neq \mu_2$. To test:

- Press the **STAT** button on your calculator
- Use the arrow key to move over to the **TESTS** menu
- From this menu select **3:2-SampZTest** by typing **3** or highlighting the 3 and pressing **ENTER**:


```

EDIT CALC TESTS
1:Z-Test...
2:T-Test...
3:2-SampZTest...
4:2-SampTTest...
5:1-PropZTest...
6:2-PropZTest...
7:ZInterval...
            
```
- In the menu that comes up highlight Stats and press **ENTER**
- Enter the population standard deviations, sample means, and sample sizes for the two samples you would like to compare
- Select the appropriate test type based on your alternative hypothesis
- Highlight **Calculate** and press the **ENTER** key:

<pre> 2-SampZTest Inpt:Data Stats σ1:5.4 σ2:6.1 x̄1:74.3 n1:50 x̄2:71.7 ↓n2:40 </pre>	<pre> 2-SampZTest ↑σ2:6.1 x̄1:74.3 n1:50 x̄2:71.7 n2:40 μ1:≠μ2 <μ2 >μ2 Calculate Draw </pre>
--	---

<pre> 2-SampZTest μ1≠μ2 z=2.113437013 P=.0345632575 x̄1=74.3 x̄2=71.7 ↓n1=50 </pre>	<pre> 2-SampZTest μ1≠μ2 ↑P=.0345632575 x̄1=74.3 x̄2=71.7 n1=50 n2=40 </pre>
---	---

You can now complete your hypothesis test either by comparing the test statistic (z) to critical values or by comparing the P-value to the α level given in the problem. In this case, since the P-value is less than the α level given in the problem (.05) we reject H_0 and can say that at the 5% level of significance there is enough evidence to say there is a difference in the mean final exam scores for the online and traditional statistics students at AACC.

Compare two means from independent samples with UNKNOWN σ :

Example: A sample of 16 OSU (Ohio State University) math faculty members had a mean of 14 years of teaching experience with a standard deviation of 3.5 years. A sample of 25 OSU history faculty members had a mean of 21 years of teaching experience with a standard deviation of 6.2 years. Is there sufficient evidence at the 10% level of significance to suggest that the math faculty has less experience on average than the history faculty?

Procedure: For this test we will be using a 2-sample t -test since the standard deviations for the samples are known (and the population standard deviations are unknown). In this case $H_0: \mu_1 = \mu_2$ and $H_a: \mu_1 < \mu_2$. To test:

- Press **STAT** on your calculator
- Use the arrow key to move over to the **TESTS** menu
- From this menu select **4:2-SampTTest** by typing **4** or highlighting the 4 and pressing **ENTER** :


```

EDIT CALC TESTS
1:Z-Test...
2:T-Test...
3:2-SampZTest...
4:2-SampTTest...
5:1-PropZTest...
6:2-PropZTest...
7↓ZInterval...

```
- In the menu that comes up highlight **Stats** and press **ENTER**
- Enter the sample standard deviations, sample means, and sample sizes for the two samples you would like to compare
- Select the appropriate test type based on your alternative hypothesis
- Select **No** by highlighting No and pressing **ENTER** when asked if you would like to use Pooled standard deviation
- Highlight **Calculate** and press the **ENTER** key:

<pre> 2-SampTTest Inpt:Data STAT x̄1:14 Sx1:3.5 n1:16 x̄2:21 Sx2:6.2 ↓n2:25 </pre>	<pre> 2-SampTTest ↑n1:16 x̄2:21 Sx2:6.2 n2:25 μ1≠μ2 μ1 > μ2 Pooled:No Yes Calculate Draw </pre>
<pre> 2-SampTTest μ1<μ2 t=-4.612430732 P=2.1530727E-5 df=38.55610689 x̄1=14 ↓x̄2=21 </pre>	<pre> 2-SampTTest μ1<μ2 ↑x̄2=21 Sx1=3.5 Sx2=6.2 n1=16 n2=25 </pre>

You can now complete your hypothesis test either by comparing the test statistic (t) to critical values or by comparing the P-value to the α level given in the problem. In this case, since the P-value is less than the α level given in the problem (.10) we reject H_0 and can say that at the 10% level of significance there is enough evidence to say that OSU math faculty have less experince than OSU history faculty.