

Using The TI-83 for Hypothesis Testing

You can use the TI-83 calculator to conduct hypothesis testing for population means (both large and small samples) as well as population proportions.

Hit STAT and arrow over to the TESTS menu. We will use 1: Z-Test for large sample ($n \geq 30$) hypothesis testing for the population mean μ and 2: T-Test for small sample ($n < 30$) hypothesis testing for the population mean μ . We will use 5:1-PropZTest for hypothesis testing for the population proportion p .

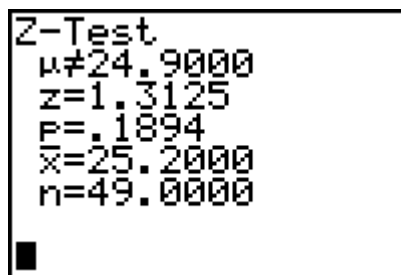
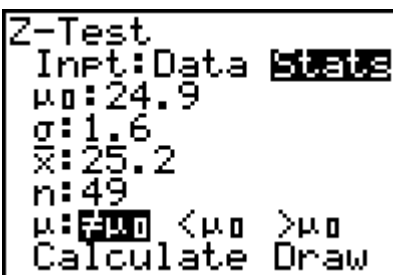
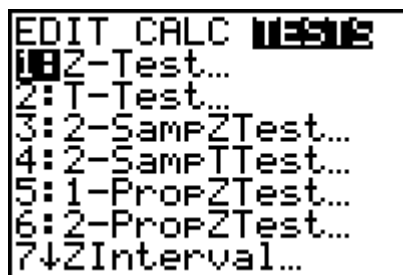


Hypothesis testing for the population mean μ (Large Samples)

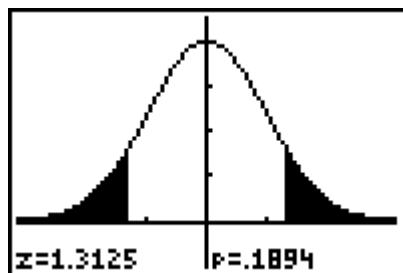
Example: *USA Today* reported that automobile plants in the United States required an average of 24.9 hours to assemble a new car. In order to reduce inventory costs, a new “just-in-time” parts availability has been introduced on the assembly line. Suppose that a random of 49 cars showed a sample mean time under the new system was $\bar{X} = 25.2$ hours with sample standard deviation $s = 1.6$ hours. Does this information indicate that the population mean assembly time is different (either higher or lower) under the new system? Use $\alpha = 0.05$.

Since our sample size is $n = 49$, we will use the normal distribution. For this test, the null hypothesis is $H_0: \mu = 24.9$ and the alternate hypothesis is $H_a: \mu \neq 24.9$

Select 1: Z-Test from the TESTS menu. Select Stats from the Z-Test menu and input the mean μ you are testing, the standard deviation, sample mean, sample size, and the type of test you are conducting (either two-tail, right tail, or left tail depending upon the alternate hypothesis H_a). Highlight Calculate and hit the ENTER key. The hypothesis testing results are displayed. These are: the Z test statistic ($z = 1.3125$), the p-value ($p = .1894$), the sample mean ($\bar{X} = 25.2$), and the sample size ($n = 49$). You can compare your test statistic to the critical value(s), or use the p-value to make a decision about the null hypothesis H_0 .



If you select the DRAW option from the Z-Test menu, the TI-83 will draw a picture of the normal sampling distribution with the test statistic ($z = 1.3125$) and the p-value ($p = .1894$) displayed.



Hypothesis testing for the population mean μ (Small Samples)

Example: Let x be a random variable that represents red blood cell count (RBC) in millions per cubic millimeter of whole blood. Then x has a distribution that is approximately normal, and for the population of healthy adult females, the mean of x distribution is about 4.8 (based on information from *Diagnostic Test with Nursing Implications*, Springhouse Corporation, 1994). Suppose that a female patient has taken six laboratory blood tests over the past several months and the RBC data sent to the patient's doctor were:

3.5	4.2	4.5	4.6	3.7	3.9
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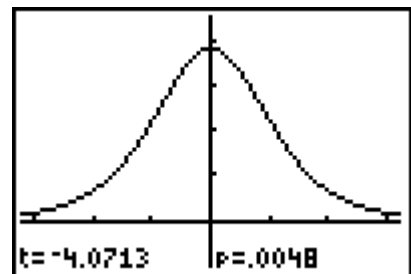
Do the given data indicate that the population mean RBC for this patient is lower than 4.8? Use $\alpha = 0.05$.

Since $n < 30$ and the population is approximately normally distributed, use the t-distribution. For this test, the null hypothesis is $H_0: \mu \geq 4.8$ and the alternate hypothesis is $H_a: \mu < 4.8$

First, enter the six RBC in list L1. Select 2: T-Test from the TESTS menu. Since we entered our data in list L1, use the data option, selecting L1 as the list. Input the mean μ you are testing and the type of test you are conducting (either two-tail, right tail, or left tail depending upon the alternate hypothesis H_a). Highlight Calculate and hit the ENTER key. The hypothesis testing results are displayed. These are: the t test statistic ($t = -4.0713$), the p-value ($p = .0048$), the sample mean ($\bar{X} = 4.0667$), the sample standard deviation ($S_x = .4412$), and the sample size ($n = 6$). You can compare your test statistic to the critical value(s), or use the p-value to make a decision about the null hypothesis H_0 . If you select the DRAW option from the T-Test menu, the TI-83 will draw a picture of the t distribution with the test statistic ($t = -4.0713$) and the p-value ($p = .0048$) displayed.

```
T-Test
Inpt: DATA Stats
μ₀:4.8
List:L1
Freq:1
μ:≠μ₀ [ ] >μ₀
Calculate Draw
```

```
T-Test
μ<4.8000
t=-4.0713
P=.0048
x̄=4.0667
Sx=.4412
n=6.0000
```



Hypothesis testing for the population proportion, p

Example: The U.S. Postal Service claims that 94% of all first-class domestic mail is delivered on time. Suppose that you mailed 350 first-class domestic letters and found that 27 arrived more than a week late. Would this indicate that the actual proportion of on-time letters is different (either higher or lower) from 94%. Use a 0.01 level of significance.

Select 5:1-PropZTest for hypothesis testing for the population proportion p . For this test, the null hypothesis is $H_0: p = 0.94$ and the alternate hypothesis is $H_a: p \neq 0.94$

Input the proportion p you are testing, the number of successes x (in this case 323 out of 350), sample size, and the type of test you are conducting (either two-tail, right tail, or left tail depending upon the alternate hypothesis H_a). Highlight Calculate and hit the ENTER key. The hypothesis testing results are displayed. These are: the Z test statistic ($z = -1.3504$), the p-value ($p = .1769$), the sample proportion ($\hat{p} = .9229$), and the sample size ($n = 350$).

You can compare your test statistic to the critical value(s), or use the p-value to make a decision about the null hypothesis H_0 . If you select the DRAW option from the 1-PropZTest menu, the TI-83 will draw a picture of the normal sampling distribution with the test statistic ($z = -1.3504$) and the p-value ($p = .1769$) displayed.

```
1-PropZTest
P₀:.94
x:323
n:350
PROP≠P₀ <P₀ >P₀
Calculate Draw
```

```
1-PropZTest
PROP≠.9400
z=-1.3504
P=.1769
p̂=.9229
n=350.0000
```

