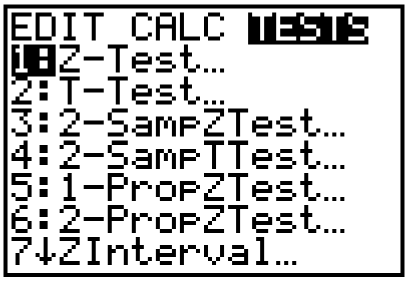
Using The TI-83 for Hypothesis Testing

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.

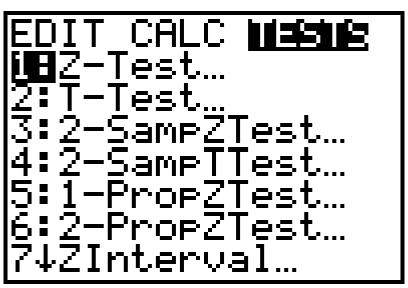


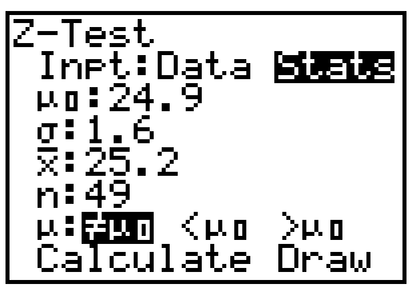
Hypothesis testing for the population mean μ (Large Samples)

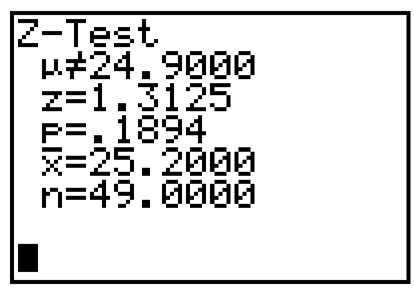
Example: *USA Today* reported that automobile plants in the United States required an average of 24.9 hours to assemble a new car. In order to reduce inventory costs, a new "just-in-time" parts availability has been introduced on the assembly line. Suppose that a random of 49 cars showed a sample mean time under the new system was $\overline{X}$ = 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 α = 0.05.

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

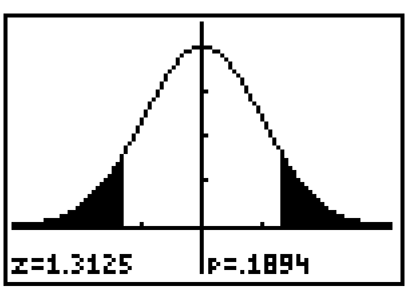
Select 1: Z–Test from the TESTS menu. Select Stats from the Z–Test menu and input the mean μ you are testing, the standard deviation, sample mean, sample size, and the type of test you are conducting (either two-tail, right tail, or left tail depending upon the alternate hypothesis Ha). Highlight Calculate 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 ($\overline{X}$ = 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 Ho.







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)

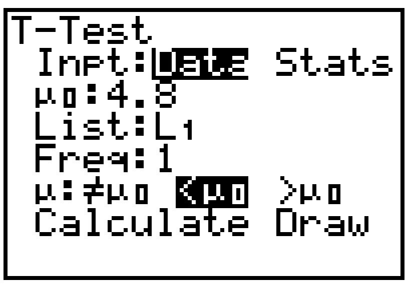
Example: Let x be a random variable that represents red blood cell count (RBC) in millions per cubic millimeter of whole blood. Then x has a distribution that is approximately normal, and for the population of healthy adult females, the mean of x distribution is about 4.8 (based on information from *Diagnostic 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:

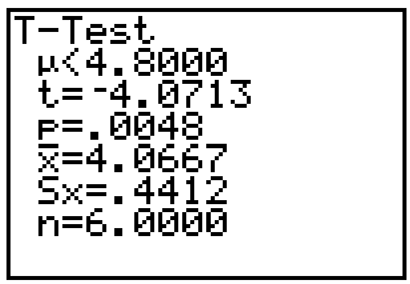
3.5	4.2	4.5	4.6	3.7	3.9

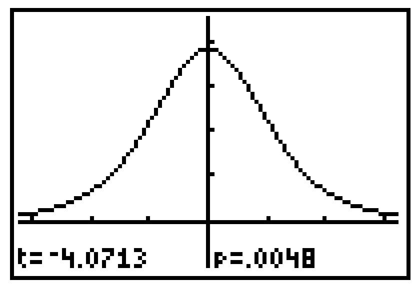
Do the given data indicate that the population mean RBC for this patient is lower than 4.8? Use $\alpha = 0.05$.

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

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 Ha). 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 ($\overline{X}$ = 4.0667), the sample standard deviation (Sx = .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 Ho. 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.







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 Ho: p = 0.94 and the alternate hypothesis is Ha: 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 Ha). 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 Ho. 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.