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 \( \mu \) and 2: T–Test for small sample \( (n < 30) \) hypothesis testing for the population mean \( \mu \). We will use 5:1–PropZTest for hypothesis testing for the population proportion \( p \).

Hypothesis testing for the population mean \( \mu \) (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 \( \mu \) 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 $\mu$ (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 $H_0: \mu \geq 4.8$ 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 $\mu$ 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 ($\overline{x} = 4.0667$), 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.

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.