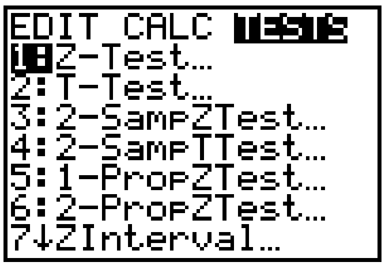
<u>TI-83/84 Hypothesis Testing</u>

You can use the TI-83/84 calculator to conduct hypothesis testing for population means (both when σ is known and unknown) and population proportions.

Press 

and arrow over to the **TESTS** menu. Scroll down to find:

1: Z–Test for hypothesis testing for the population mean μ when σ is known and/or the sample size is large.
2: T–Test for hypothesis testing for the population mean μ when σ is unknown and/or the sample size is small.
5:1–PropZTest for hypothesis testing for the population proportion *p*.



The tests on means can be conducted using statistics, or raw data.

Hypothesis testing for the population mean μ (when σ is Known)

Example: *USA Today* reported that automobile plants in the United States require 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 24.6 hours. Assume that the population standard deviation is 1.6 hours. Does this information indicate that the population mean assembly time is different under the new system? Use $\alpha = 0.02$.

H_0: $\mu = 24.9$
H_a: $\mu \neq 24.9$

Since the population standard deviation is known, use the normal distribution
Select **1: Z-Test** from the **TESTS** menu. Highlight **Stats** since you don’t have the raw data and input the mean μ you are testing, the population 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 press 

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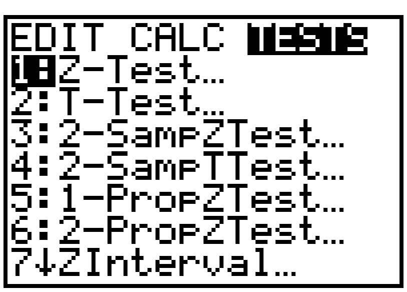
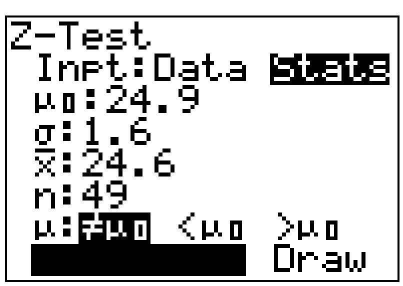
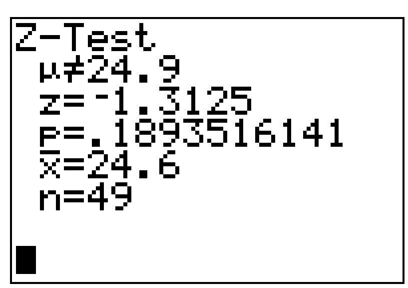






The test results displayed include the Z sample test statistic (z = -1.313), the p–value (p = .189), the sample mean ($\overline{X}$ = 24.6), and the sample size (n = 49). To make the conclusion, compare your P-value to the significance level (α).

Conclusion: Since the P-value is higher than α, Fail to Reject H_o. There is NOT sufficient evidence to suggest that the mean assembly time is different under the new system.

Hypothesis testing for the population mean μ (when σ is Unknown / sample size is small)

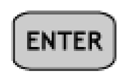
Example: Let x be a random variable that represents red blood cell count (RBC) in millions per cubic millimeter of whole blood. Suppose the distribution is approximately normal and for the population of healthy adult females, the average RBC is 4.8. Suppose a doctor has recorded the following RBC for 6 female patients:

3.8	4.5	4.5	4.6	3.8	3.9

Do the given data indicate that the population mean RBC is lower than 4.8? Use $\alpha = 0.10$.

Since σ is unknown, the sample size is small, and the population is approximately normally distributed, use the t-distribution (T-Test).

H_0: μ = 4.8
H_a: $\mu < 4.8$

First enter the six RBC in **L_1**. Then select **2: T-Test** from the **TESTS** menu. Since we entered our data in list L_1, use the data option, selecting L_1 as the list. Input the mean μ you are testing and the type of test you are conducting (left-tail since H_a is less than). Highlight Calculate and press 

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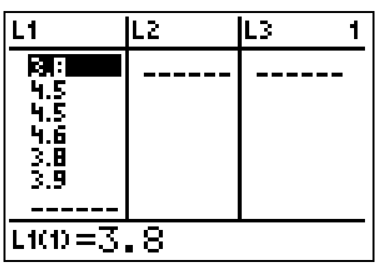
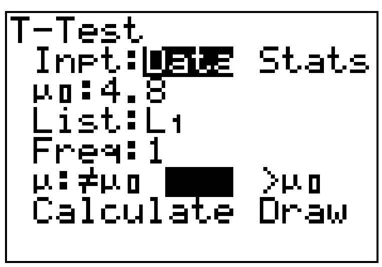
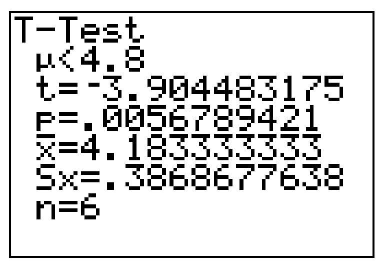






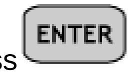
The test results displayed include the test statistic (t = -3.904), the P–value (p = .006), the sample mean ($\overline{X}$ = 4.183), and the sample size (n = 6). To make the conclusion, compare your P-value to the significance level (α).

Conclusion: Since 0.005 is less than α, then Reject H_o. There **is** sufficient evidence to suggest that this patient's RBC is less than 4.8.

Hypothesis testing for the population proportion, p

Example: An instructor claims that only 60% of students ask questions when they have them. Suppose that 30 out of 45 randomly selected students reported that they ask questions when they have them. Does this suggest that the proportion is higher than the instructor claims? Use a 0.03 level of significance.

H_0: p = .60
H_a: p>.60

Since we are testing a population proportion select **5: 1-PropZTest** from the **TESTS** menu. Input the proportion *p* you are testing, the number of successes *x*, sample size, and the type of test you are conducting (right tail since H_a is greater than). Highlight Calculate and press 

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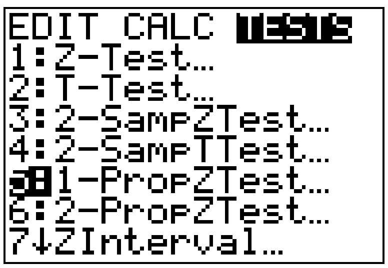

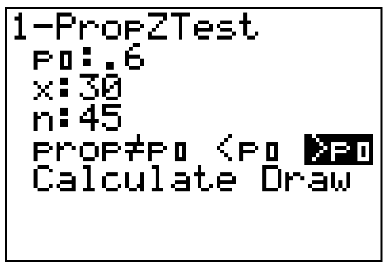

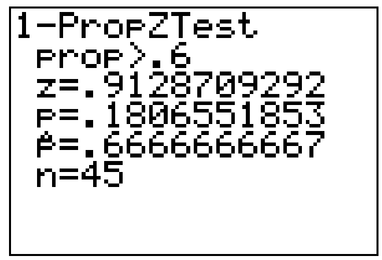

The test results displayed include the test statistic (z=.913), the p–value (p = .181), the sample proportion ($\hat{p}$ = .667), and the sample size (n = 45). To make the conclusion, compare your P-value to the significance level (α). We fail to reject H_0 since the P-value is larger than α.

Conclusion: We fail to reject H0 since 0.181 is greater than α.

Note about hypothesis testing with proportions:

Some problems will provide you $\hat{p}$ in the problem statement instead of x. You can calculate $x = n\hat{p}$ However, if the $\hat{p}$ figure is rounded, the value you calculate here may produce a number with a decimal. You will need to round this value to the nearest whole number in order to conduct the 1-PropZTest. You will receive an error if you do not round. Proportions for p_0 must be entered as decimals.