Chapter 10
Hypothesis tests using a single sample

10.0 Introduction

The production of a hypothesis tests for single samples mirrors very closely the procedures for constructing confidence intervals for single samples. Specifically, recall that the user must consider the assumptions for these tests. The TI-83 will not alert you to the tenuous credibility of the truth of an assumption – that is one of those decisions you will have to make on your own.

10.1 The Large-Sample Hypothesis Test for a Population Proportion

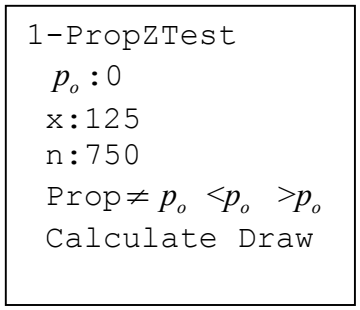
Example 10.11: Credit Card Debt.

The article "Credit Cards and College Students: Who Pays, Who Benefits?" (*J. College Student Development* (1998): 50 –56) described a study of credit card payment practices of college students. According to the authors of the article, the credit card industry asserts that at most 50% of college students carry a credit card balance from month to month. However, the authors of the article report that, in a random sample of 310 college students, 217 carried a balance each month. Does this sample provide sufficient evidence to reject the industry claim? We will answer this question by carrying out a hypothesis test using a .05 significance level.

By now the keystrokes are more or less familiar:

STAT > TESTS > 1-PropZTest… > Enter

and we will see the following:



Once again, the calculator needs the appropriate information to test the hypothesis. The x and n are leftovers from previous calculations, and we can supply the values 217 and 310 respectively from our problem context. The next line is new to us, so lets look at it in a little detail.

Prop$\neq p_o$ $<p_o$ $>p_o$

The information the calculator is requesting in this line is a specification of the alternative hypothesis. Do not be let astray by the notation being different from POD. The use of "p" rather than "π" to denote the population proportion is not uncommon, and in POD's notation you can think of this line as asking for the following choice:

$H_o: \pi \neq$ hypothesized value $H_o: \pi <$ hypothesized value $H_o: \pi >$ hypothesized value

Since our alternative hypothesis in this problem is $H_o: \pi >$ hypothesized value, arrow that cursor over to $>p_o$ and press **ENTER.**

```
1-PropZTest
Prop>.5
Z=7.042726745
P=9.488274E-13
p̂=.7
n=310
```

Comparing our results with the text, we see good agreement. (Whew!) Our z-value is a bit different, due to round off in POD. That P=9.488274E-13 is the calculated P-value. It looks strange because it is the calculator's attempt to put the value in scientific notation, $P = 9.488274 \times 10^{-13}$. Our eyes blur when we contemplate that many zeros se we'll just be happy writing P-value ≈ 0.

10.2 Hypothesis Tests for a Population Mean

Example 10.14: Personal Use of Company Technology.

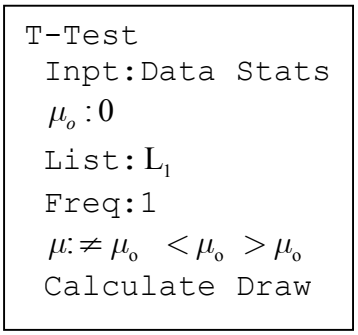
The Associated Press (Sept. 7, 1999) reported that a management consultant believes that, on average, workers spend 75 minutes a day making personal use of company technology. Suppose that the CEO of a large corporation wanted to determine whether the average amount of time spent in personal use of company technology for her employees was greater than the reported value of 75 minutes. Each person in a random sample of 10 employees was contacted and asked about daily personal use of company technology. The resulting data is given along with some summary statistics.

Employee	1	2	3	4	5	6	7	8	9	10
Time	66	70	75	88	69	89	71	71	63	86

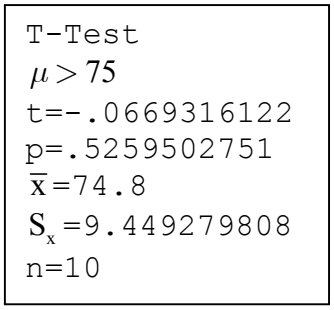
Do these data provide evidence that the mean for this company is greater than 75 minutes? To answer this question, we will take our TI in hand and carry out a hypothesis test with $\alpha = .05$. We will not carry out the assessment of the plausibility of a normal population, but will remind you that you must do this, and can use either the box plot or normal probability plot, both of which are familiar to us. Here are the keystrokes for the hypothesis test:

STAT > TESTS > T-TEST… >

and once again we see a familiar request for needed information:



For this problem the needed information is that $\mu_o = 75$ and our alternate hypothesis is $\mu: > \mu_o$. After entering this information, arrow down to **Calculate** and press **ENTER.** Here are the results of our hypothesis test:



Once again the calculated results agree with the text except for rounding error, and we have saved a great deal of work.

10.3 Conclusion

What can we say!?!? Our conclusion so far is that this calculator is fantastic.