Math 114 ACTIVITY 10: Hypothesis tests on one parameter (μ or p)

Why

The basic outline of a hypothesis test is the same for all cases; understanding this logic is a major goal of this course. For our "nice cases" (means and proportions) the calculations are very similar, but with enough difference that you can see why it matters what parameter we are testing, as well as the overall pattern and the logic. We need to be sure the outline and the conditions are clear before we proceed.

LEARNING OBJECTIVES

1. Be able to set up the formal structure of a test to make a decision about a population mean or proportion.
2. Know the requirements for use of our normal distribution methods (Z and t).
3. Be able to distinguish tests on proportions from tests on means and carry out the appropriate calculations.
4. Be able to interpret the results of a test–including the context, the level of significance, and the possible error.

CRITERIA

1. Success in working as a team and in fulfilling the team roles.
2. Success in involving all members of the team in the conversation.
3. Success in completing the exercises.

RESOURCES

1. Your text, chapter 10 and Table VI p.A-13 [critical values for t - use bottom row for Z]
2. The team role desk markers (handed out in class for use during the semester)
3. Your class notes.
4. Your calculator
5. Minitab, running on the College network, and the data file "hardness-Act10.MTW" available through Blackboard.
6. 40 minutes

PLAN

1. Select roles, if you have not already done so, and decide how you will carry out steps 2 and 3 (5 minutes)
2. Work through the exercises given here - be sure everyone understands all results & procedures(30 minutes)
3. Assess the team's work and roles performances and prepare the Reflector's and Recorder's reports including team grade (5 minutes).

EXERCISES

Part A
Answer each of these–with an explanation

1. If we carry out a test and have evidence of a difference (can support H_1) at the .05 level, would we also be able to support H_1 at the .10 level? at the .01 level?
2. A student wants to decide if the average height of the 24 students in her statistics class is more than 5ft 6in, so she measures the heights of all the students, calculates the mean and standard deviation of the heights, and sets up a hypothesis test. Why does this not make sense?
3. When we decrease the α level for a test do we make it easier or harder to reject the null (to support H_1)? What effect does this have on the risk of type II error (risk of *not* supporting a true alternative)?

Part B
Carry out (show all steps) the test to answer each of these questions. (Minitab and/or calculator can be used for calculations—there is a Minitab file available on Blackboard with data for #3—but show the steps). Carry out the necessary checks to be sure your methods are appropriate (for tests on a mean, with a small sample, this will involve a graph). Show the p-value for your result. Identify the type of error (Type I or type II) that is possible with your conclusion, and say what it would mean if such an error has occurred.

1. The manager of a restaurant that provides pizza delivery to college dormitory rooms has just changed the delivery process in an attempt to reduce delivery times below the previous mean time of 35 minutes. A sample of 36 orders gives a mean delivery time 30 minutes with standard deviation 10 minutes. Does this indicate that the mean delivery time has been decreased?

2. In a survey of 1010 randomly selected U. S. adults, the subjects were asked what they believed was their best chance to obtain more than $500,000 in their lifetime, and 283 responded “win a lottery or sweepstakes”. Does this indicate that more than one-quarter of U.S. adults see a lottery or sweepstakes as their best chance of accumulating $500,000?

3. A pharmaceutical manufacturer forms tablets (pills) by compressing a granular material that contains the active ingredient and various fillers. The hardness of a sample from each lot (batch) of tablets is measured in order to control the process. The hardness should average 11.5 units. The 20 hardness values below are obtained from a random sample of 20 lots. Do these values indicate that the mean hardness is different from 11.5 units (so the process needs adjustment)? (Use $\alpha = .05$)

   hardness for 20 lots:

11.64	11.63	11.50	11.63	11.38	11.40	11.61	11.47	11.57	11.49
11.40	11.75	11.50	11.54	11.45	11.51	11.59	11.65	11.49	11.56

READING ASSIGNMENT (in preparation for next class)
Section 11.1 - Inference about two means–dependent samples (This deals with estimation and testing when we have *matched pairs* data)

SKILL EXERCISES:(hand in - individually - at next class meeting) Sullivan **p. 504** #11–12, 14–17