**Math 155, Fall 2016**

**Practice Problems – Testing Claims about Population Means or Medians**

For each problem in this problem set, write your answer to each of the following. (We will discuss these problems in class as well, but you will get much more out of them by trying them yourself first!)

1. Determine the study design: is it a one-sample test, a matched pairs design, or two independent samples? Briefly explain.
2. Correctly identify the correct type of test to use. Justify your choice.
3. Write the null hypothesis and the alternative hypothesis for your test.   
   Two reminders:
   1. The null hypothesis is always an equality statement; the alternate hypothesis is always either a less-than, greater-than, or a not-equal-to statement
   2. Your hypotheses will be about population *means* when you use parametric tests (that is, t-tests); otherwise, your hypotheses will be about population *medians*
4. Enter the data into Minitab, and use it to carry out the testing method you selected in part (a) to calculate a P-value for the test, and interpret the result relative to the given significance level. Write your conclusion using non-technical language, in a way that makes it clear to a general audience what we are (or are not) able to conclude based on the test.

1. An automobile maker claims that its new (2009) model can accelerate from 0 to 60 mph faster than its previous (2008) model. To test this claim, a random sample of ten cars of each model is selected, and the time required to accelerate each car from 0 to 60 mph is recorded. The results (in seconds) are as follows:

2009 model: 5.5, 5.6, 6.2, 5.5, 5.2, 5.9, 6.1, 5.9, 5.7, 5.9

2008 model: 5.5, 6.3, 6.1, 5.7, 5.9, 5.6, 6.5, 6.8, 5.8, 5.7

From previous years’ test results, it has been observed that the acceleration times for each model were always normally distributed, so we may safely assume this to be the case for the current model as well.

Using a 5% significance level, can we conclude that the mean acceleration time for the 2009 model is less than the average acceleration time of the 2008 model?

2. According to a basketball coach, the mean height of all male college basketball players is 74 inches. A random sample of 25 players produced the following data on their heights.

68 76 74 83 77 76 69 67 71 74 79 85 69 78 75 78 68 72 83 79 82 76 69 70 81

Assuming that height is a normally distributed random variable, test at the 10% significance level whether the mean height of all male college basketball players is *different from* 74 inches.

3. A psychology experiment was designed to determine whether female students who suffer from bulimia have a higher “fear of negative evaluation” than female students who do not suffer from bulimia. (“Fear of negative evaluation” measures one’s fear of other’s negative opinions of them, and/or one’s general expectation that others will tend to view them negatively.)   
  
Two randomly selected samples of female students participated in the experiment. One sample consisted of 11 students known to suffer from bulimia; the other sample consisted of 14 students with normal eating habits. Each student completed a questionnaire from which her “fear of negative evaluation” score, also called an “FNE score” was determined. A higher FNE score corresponds to a greater fear of negative evaluation.

The numbers below are the FNE scores for the two samples of students:

Bulimic students’ FNE scores: 21, 13, 10, 20, 25, 19, 16, 21, 24, 13, 14

Non-bulimic students’ FNE scores: 13, 6, 16, 13, 8, 19, 23, 18, 11, 19, 7, 10, 15, 20

Testing at a 5% significance level, can we conclude that the average FNE score for bulimic female students is higher than the average score for non-bulimic female students?

[Note: this problem is adapted from an exercise in McClave & Sincich’s *Statistics*, using data from *The American Statistician* (May 2001)]

4. A researcher compared results of standardized tests in two high schools, to determine whether they would reveal a significant difference between the schools’ average results over this time span. Each year, a new test was written, and this test was given to all of the students at both schools.

Each school’s average test score over each of the last 15 years is shown in the table below:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year: | 1994 | ‘95 | ‘96 | ‘97 | ‘98 | ‘99 | 2000 | ‘01 | ‘02 | ‘03 | ‘04 | ‘05 | ‘06 | ‘07 | ‘08 |
| Marvadel High: | 76 | 78 | 81 | 77 | 68 | 75 | 85 | 80 | 81 | 70 | 65 | 74 | 73 | 73 | 76 |
| Delvamar High: | 77 | 81 | 84 | 81 | 66 | 75 | 90 | 76 | 83 | 76 | 71 | 75 | 77 | 78 | 82 |

Testing at a 10% significance level, can we conclude that the average test score for Delvamar High is significantly different from than the average test score for Marvadel High?