**數理統計(二) 作業4** **Due: Oct. 28, 2014**

#5.6.5 Assume that the weight of cereal in a “10-ounce box” is . To test  against , we take a random sample of size  and observe that  and .

1. Do we accept or reject  at the 5% significance level?
2. What is the approximate p-value of this test?

#5.6.6 Each of 51 golfers hit tree golf balls of brand  and three golf balls of brand  in a random order. Let  and  equal the averages of the distances traveled by the brand  and brand  golf balls hit by the ith golfer, . Let . To test  against , where  is the mean of the differences. If  and , would  be accepted or rejected at an ? What is the p-value of this test?

#5.6.7 Among the data collected for the World Health Organization air quality monitoring project is a measure of suspended particles in . Let  and  equal the concentration of suspended particles in  in the city center (commercial district) for Melbourne and Houston, respectively. Using  observations of  and  observations of , we shall test  against .

1. Define the test statistic and critical region, assuming that the unknown variances are equal. Let .
2. If , , , and , calculate the value of the test statistic and state your conclusion.

#5.6.8 Let *p* equal the proportion of drivers who use a seat belt in a state that does not have a mandatory seat belt law. It was claimed that . An advertising campaign was conducted to increase this proportion. Two months after the campaign,  out of a random sample of  drivers were wearing their seat belts. Was the campaign successful?

1. Define the null and alternative hypotheses.
2. Define a critical region with an .
3. Determine the approximate p-value and state your conclusion.

課外題:

* + 1. Assume that IQ scores for a certain population are approximately . To test  against , we take a random sample of size  from this population and observe . Do we accept or reject  at the

1. 5% significance level?
2. 10% significance level?
3. What is the p-value of this test?
   * 1. Let  equal the thickness of spearmint gum manufactured for vending machines. Assume that the distribution of  is . The target thickness is 7.5 hundredths of an inch. We shall test the null hypothesis  against a two-tailed alternative hypothesis using 10 observations.
4. Define the test statistic and critical region for an  significance level. Sketch a figure illustrating this critical region.
5. Calculate the value of the test statistic and clearly give your decision using the following  thicknesses in hundredths of an inch for pieces of gum that were selected randomly from the production line:
   1. 7.60 7.65 7.70 7.55
   2. 7.40 7.40 7.50 7.50
6. Is  contained in a 95% confidence interval for ?
   * 1. Let  equal the forced vital capacity (FVC) in liters for a female college student. (This is the amount of air that a student can force out of her lungs.) Assume that the distribution of  is (approximately) . Suppose it is known that  liters. A volleyball coach claims that the FVC of volleyball player is greater than 3.4. She plans to test her claim using a random sample of size .
7. Define the null hypothesis.
8. Define the alternative (coach’s) hypothesis.
9. Define the test statistic.
10. Define a critical region for which . Draw a figure illustrating your critical region.
11. Calculate the observed value of the test statistic given that the random sample yielded the following forced vital capacities: 3.4, 3.6, 3.8, 3.3, 3.4, 3.5, 3.7, 3.6, 3.7.
12. What is your conclusion?
13. What is the approximate p-value of this test?
    * 1. Vitamin  is one of the vitamins in a multiple vitamin pill manufactured by a pharmaceutical company. The pills are produced with a mean of 50 milligrams of vitamin  per pill. The company believes that there is a deterioration of 1 milligram per month, so that after 3 months they expect that . A consumer group suspects that  after 3 months.
14. Define a critical region to test  against  at  based on a random sample of size .
15. If the 20 pills yielded a mean of  with a standard deviation of , what is your conclusion?
16. What is the approximate p-value of this test?
17. What assumptions are needed in order to perform the above test?
    * 1. Let  equal the proportion of women who agree that “men are basically selfish and self-centered.” Suppose that in the past, it was believed that . It is now claimed that  has increased.
18. Define the null and alternative hypotheses, a test statistic and critical region that has an approximate . Sketch a standard normal pdf and illustrate this critical region.
19. The *Detroit Free Press* (April 26, 1990) reported that  out of a random sample of  women agree with the statement. What is the conclusion of your test? Locate the calculated value of your test statistic on the pdf in part (a).
    1. Many students suffer from math anxiety. A professor who teaches statistics offered her students a two-hour lecture on math anxiety and ways to overcome it. The following table gives the test scores in statistics of 7 students before and after they attended this lecture.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Before | 56 | 69 | 48 | 74 | 65 | 71 | 58 |
| After | 62 | 73 | 44 | 85 | 71 | 70 | 69 |

1. Construct a 99% C.I. for the mean  of the population paired differences where a paired difference is equal to the score before attending this lecture minus the score after attending this lecture.
2. Test at  if attending this lecture increases the average score in statistics.

Assume that the population of paired differences is (approximately) normally distributed.