## Mth 102 – General Education Statistics – Practice Exam 6

NOTE: This exam should not be taken as a complete list of possible problems. It is merely intended to be an example of the length and difficulty level of the regular exam. To best utilize it as a *practice* exam, give yourself 55 minutes with no distractions. Try to emulate the classroom environment as much as possible.

1. In the U.S. court system, a defendant is assumed innocent until proven guilty. Suppose that you regard a court trial as a hypothesis test with null and alternative hypotheses

 $H_0$ : Defendant is innocent.  $H_a$ : Defendant is guilty.

- a. Explain the meaning of a Type I Error.
- b. Explain the meaning of a Type II Error.

- 2. Consider the following problem: The Food and Nutrition Board of the National Academy of Sciences states that the recommended daily allowance (RDA) of iron for adult females under the age of 51 is 18 mg. A hypothesis test is to be performed to decide whether adult females under the age of 51 are, on average, getting less than the RDA of 18 mg of iron.
  - a. Define the null and alternative hypotheses symbolically.
  - b. Find the critical value(s) if this test is performed at the 5% significance level.

- 3. The national proportion of students who pass a particular course is 65%. Suppose the math department at ECC claims that the success of students who place directly into a course with their Math ACT score is lower than 65%. Suppose a test is performed at the  $\alpha = 0.05$  significance level and the null hypothesis is not rejected.
  - a. What should the math department conclude?

- b. If, in reality, the proportion of students who pass who had placed directly into the course based on their Math ACT was 0.63, was a Type I or Type II error committed?
- 4. Suppose a two-tailed test is performed at the  $\alpha = 0.05$  level with a test statistic of Z = 2.12.
  - a. What is the *p*-value for this test?
  - b. Should we reject or not reject the null hypothesis? Why? (You must justify your answer to receive credit.)
- 5. A sociologist claims that the mean age at which women marry in Memphis, Tennessee, is greater than the mean age of 25.0 throught the US. She takes a random sample of 20 recently filed marriage certificates. Do the conditions necessary for the test to be performed hold? The plots below show a normal probability plot and box plot for the data. As usual, you must justify your answer to receive any credit.



6. A researcher maintains that the average age of a woman before she has her first child is greater than the 1990 average age, 26.4 years. She obtains a simple random sample of 40 women who recently gave birth to their first child, and found a sample mean of 26.9 years. If the researcher decides to test this hypothesis at the 5% significance level, what should she decide? Assume that the population standard deviation is 6.4 years.

7. In 2000, the average car in the United States was driven 11.9 thousand miles, as reported by the U.S. Federal Highway Administration in *Highway Statistics*. A random sample of 500 cars from last year revealed a mean of 11.7 thousand miles driven. Is there enough evidence at the 5% significance level to support the claim that the average distance was less last year than in 2000? Assume that last year's standard deviation of distances driven for all cars is 6.0 thousand miles.

8. A coffee shop claims that its fresh-brewed drinks have a mean caffeine content of 80 mg per five ounces. You work for a city health agency and are asked to test this claim. You find that a random sample of 42 five-ounce servings has a mean caffeine content of 83 mg and a standard deviation of 3.5 mg. At the 5% significance level, do you have enough evidence to state the mean caffeine content is not 80 mg per five ounces?

9. Each year, the Environmental Protection Agency (EPA) publishes reports of gas mileage for all makes and models of passenger vehicles. In a recent year, compact cars with automatic transmissions that posted the best mileage were the Chevrolet Prizm and Toyota Corolla. Each had a mean mileage of 28 mpg (city) and 36 mpg (highway). Suppose that Chevrolet believes a Prizm exceeds 36 mpg on the highway. To support its claim, it tested 34 cars on highway driving and found a sample mean of 37.2 mpg. If the standard deviation for the mileage of all Prizms is 2.3 mpg, is there evidence at the 1% significance level to support Chevrolet's claim?

10. In an advertisement, a pizza shop claims that its average delivery time is less than 30 minutes. A random selection of 36 delivery times has a sample mean of 28.5 minutes. Using a P-value, is there enough evidence to support the claim at the 1% level? Assume that the standard deviation of all delivery times is 3.5 minutes.

11. In this chapter, we learned two methods for testing a statistical hypothesis.

- a. What were the two methods?
- b. Which method gives more versatile results? Why are the results more versatile?