Math 3339

Homework 6 (Chapters 8, 10)

Name:_____ PeopleSoft ID:_____

Instructions:

- Homework will NOT be accepted through email or in person. Homework must be submitted through CourseWare BEFORE the deadline.
- Print out this file and complete the problems or you can complete it using your computer.
- Use blue or black ink or a dark pencil if completing this by hand.
- Write your solutions in the space provided. You must show all work for full credit.
- Submit this assignment at http://www.casa.uh.edu under "Assignments" and choose **HW6**.
- Total possible points: **15.**

---

1. *Water samples are taken from water used for cooling as it is being discharged from a power plant into a river. It has been determined that as long as the mean temperature of the discharged water is at most 150̊ F, there will be no negative effects on the river's ecosystem. To investigate whether the plant is in compliance with regulations that prohibit a mean discharge-water temperature above 150̊ , 50 water sample will be tank at randomly selected times, and the temperature of each sample recorded.

   a. Determine an appropriate null and alternative hypothesis for this test.
   b. In the context of this situation, describe type I and type II errors.

2. Section 8.4.2, Problem 1

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

3. Section 8.4.2, Problem 2.

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

4. A sample of 12 radon detectors of a certain type was selected, and each was exposed to 100 pCI/L of radon. The resulting readings were as follows:

105.6, 90.9, 91.2, 96.9, 96.5, 91.3, 100.1, 105.0, 99.6, 107.7, 103.3, 92.4

Does this data suggest that the population mean reading under these conditions differs from 100? Set up an appropriate hypothesis test to answer this question.

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

5. *For healthy individuals the level of prothrombin in the blood is approximately normally distributed with mean 20 mg/100 mL and standard deviation 4 mg/100 mL. Low levels indicate low clotting ability. In studying the effect of gallstones on prothrombin, the level of each patient in a sample is measured to see if there is a deficiency. Let μ be the true average level of prothrombin for gallstone patients.
   a. What are the appropriate null and alternative hypotheses?
   b. Let $\bar{X}$ denote the sample average level of prothrombin in a sample of n = 20 randomly selected gallstone patients. Consider the test procedure with test statistic $\bar{X}$ and rejection region $\bar{x} \leq 17.92$. What is the probability distribution of the test statistic when H_0 is true (i.e. determine center, spread, and shape of $\bar{X}$)? What is the probability of a type I error for this test procedure?
   c. What is the probability distribution of the test statistic, $\bar{X}$ when μ = 16.7? Using the test procedure of part (b), what is the probability that gallstone patients will be judged not deficient in prothrombin, when in fact μ = 16.7 (a type II error)?
   d. How would you change the test procedure of part (b) to obtain a test with significance level 0.05? What impact would this change have on the error probability of part (c)?

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

6. An experiment on the side effects of pain relievers assigned arthritis patients to take one of several over-the-counter pain medications. Of the 440 patients who took one brand of pain reliever, 23 suffered some "adverse symptom."
   a. If 10% of all patients suffer adverse symptoms, what would be the sampling distribution of the proportion with adverse symptoms in a sample of 440 patients?
   b. Does the experiment provide strong evidence that fewer than 10% of patients who take this medication have adverse symptoms? Verify that the conditions for inference are met. State the hypothesis, calculate the test statistic, then obtain and interpret the P-value.

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

7. Section 8.5.1
    a. Problem 4
    b. Problem 5

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

8. *Some college students did a study of textbook pricing. They compared pries at the campus bookstore and Amazon.com for the same price. To be fair, they included the sales tax for the local store and the added shipping form Amazon. Here are the prices for a sample of 10 books.

Campus	**Amazon**
99.34	113.94
51.53	61.44
20.45	31.59
97.22	108.29
61.89	78.44
58.17	65.74
61.63	63.49
44.63	40.39
96.69	117.99
48.88	58.94

   a. We want to determine if there is a significant difference in the price of textbooks from the campus bookstore and from Amazon.com. Which type of test would we use for this data?
   b. Determine a 95% confidence interval for the difference of the population means.
   c. Interpret your results. Is there a substantial difference between the two ways to be textbook? Assuming that the populations remain unchanged and you have just these two sources, where would you buy?

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

9. *An article wanted to look at the compression strength of aluminum cans filled with strawberry drink and another sample filled with cola. Does the following data suggest that the extra carbonation of cola results in a higher average compression strength? Base your answer on a *P*-value. What assumptions are necessary for your analysis?

Beverage	**Sample Size**	**Sample Mean**	**Sample SD**
Strawberry drink	15	540	21
Cola	15	554	15

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

10. Section 10.5.3
    a. Problem 1
    b. Problem 2

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.