Statistics Yue Dec. 25, 2025

Assignment #4, Due 2025/12/16

1. Ahmadi, Inc. has been manufacturing small automobiles that have averaged 50 miles per gallon of gasoline in highway driving. The company has developed a more efficient engine for its small cars and now advertises that its new small cars average more than 50 miles per gallon in highway driving. An independent testing service road-tested 64 of the automobiles. The sample showed an average of 51.5 miles per gallon with a standard deviation of 4 miles per gallon.
   (a) Formulate the hypotheses to determine whether the manufacturer's advertising campaign is legitimate.
   (b) What is the appropriate distribution to conduct the statistical test? Compute the test statistic and the p-value.
   (c) Using $\alpha=0.05$, draw a conclusion. (State it clearly)

2. A sample of 30 cookies is taken to test the claim that each cookie contains at least 9 chocolate chips. The average number of chocolate chips per cookie in the sample was 7.8 with a standard deviation of 3.
   (a) State the null and alternative hypotheses.
   (b) Using the critical value approach, test the hypotheses at the 5% level of significance.
   (c) Using the p-value approach, test the hypotheses at the 5% level of significance.
   (d) Compute the probability of a Type II error if the true number of chocolate chips per cookie is 8.

3. A volleyball coach claims that that a team member can force more than 3.4 liters out of her lungs (more than the claimed average for female college students). A sample of nine observations yields the following results

   3.4, 3.6, 3.8, 3.3, 3.4, 3.5, 3.7, 3.6, 3.7

   Is there reason to believe that women that play volleyball can force more air out of their lungs then other female college students?
   (a) Write down the null hypothesis and alternative hypothesis.

(b) Construct a 95% confidence interval for the mean air out of the lungs from the female volley team members.

(c) Compute the p-value of the statistical test and give your conclusion if $\alpha = .01$.

4. Student advisors are interested in determining if the variances of the scores of day students and night students are the same. The following samples are drawn:

Day	Night
$n_1 = 25$	$n_2 = 31$
$s_1 = 9.8$	$s_2 = 14.7$

Test the equality of the variances of the populations. Let $\alpha = 0.05$.

5. In class, we use the court as an example to explain the null and alternative hypotheses. Based on the case of People vs. Collins (1969), discuss the following topics:

(a) What are the null hypothesis and the alternative hypothesis?

(b) Explain your reasons for the choice of the null hypothesis.

(c) Do you think the testimony of eyewitnesses can be used to charge the couples? Explain.