

Due Wednesday, Nov. 19

Red ID: \_\_\_\_\_

1. We are interested in whether there is a difference in the proportion of adults that are employed full time between Washington residents and California residents. We take a sample of Washington residents, and another sample of California, and from each sample calculate the proportion of adults that are employed full time. A 99% confidence interval for the parameter of interest is calculated to be:  $(-0.82, -0.31)$ . Based on this confidence interval, if we were to conduct a hypothesis test using  $\alpha = 0.01$ , state whether we would reject the null hypothesis or fail to reject the null hypothesis, and interpret your decision.

2. We would like to test whether there is a difference in the verbal ability of males vs females. We take 4 randomly selected males and 5 randomly selected females, and give each a test of verbal ability. Scores are below:

male: 46 46 41 50

female: 52 58 52 50 60

- State the null and alternative hypotheses

- Find the p-value

- Make a decision using  $\alpha = 0.05$

- Interpret your decision

- Based on the results of your hypothesis test, if you had created a 95% confidence interval for the parameter of interest, would your confidence interval include 0?

- Verify your answer above by creating a 95% confidence interval

3. We would like to know if the percentage of adults with a high school diploma is different today than it was in 2000. In 2000 86% of adults had a high school diploma. We take a sample of 350 adults this year, and find that 315 have a high school diploma.

- State the null and alternative hypotheses

- Find the p-value

- Make a decision using  $\alpha = 0.10$

- Interpret your decision

- Based on the results of your hypothesis test, if you had created a 90% confidence interval for the parameter of interest, would your confidence interval include 0.86?

- Verify your answer above by creating a 90% confidence interval

4. We would like to know if the mean petal length of *Iris setosa* is different than that of *Iris versicolor*. Assume it is known that the mean petal length of *Iris versicolor* is 1.9. Assume further that the true standard deviation of *Iris setosa* petal lengths is 0.6. We take a random sample of *Iris setosa*, measure their petal lengths in cm, and obtain the following data:

petal length: 1.4 1.3 1.5 1.4

- State the null and alternative hypotheses

- Find the p-value

- Make a decision using  $\alpha = 0.01$

- Interpret your decision

- Based on the results of your hypothesis test, if you had created a 99% confidence interval for the parameter of interest, would your confidence interval include 1.9?

- Verify your answer above by creating a 99% confidence interval

5. We are interested in whether philosophy majors have a different average GRE score than the overall average. The overall average GRE score for all majors is 300. We take a sample of the GRE score of several philosophy majors and obtain the following data:

GRE score: 319 329 309 326 326

- State the null and alternative hypotheses

- Find the p-value

- Make a decision using  $\alpha = 0.05$

- Interpret your decision

- Based on the results of your hypothesis test, if you had created a 95% confidence interval for the parameter of interest, would your confidence interval include 300?

- Verify your answer above by creating a 95% confidence interval

6. We would like to know whether fasting has any effect on white blood cell count. 6 randomly selected rats have their white blood cell count measured before and after 24 hours of fasting, resulting in the data below:

	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
White blood cell count before fasting	300	307	280	287	292	316
White blood cell count after fasting	304	314	278	287	298	313

- State the null and alternative hypotheses

- Find the p-value

- Make a decision using  $\alpha = 0.05$

- Interpret your decision

- Based on the results of your hypothesis test, if you had created a 95% confidence interval for the parameter of interest, would your confidence interval include 0?

- Verify your answer above by creating a 95% confidence interval

7. We take a group of rats, and separate them into two groups, raising one on a regular diet, and the other on an alternate day fasting diet. After 3 years we record how many in each group have developed tumors. We are interested in whether there is a difference in the rate at which rats develop tumor between the 2 diets. 150 rats are given the regular diet. In this group 45 develop tumors within 3 years. 80 rats are raised on an alternate day fasting diet. In this group 12 develop tumors.

- State the null and alternative hypotheses

- Find the p-value

- Make a decision using  $\alpha = 0.05$

- Interpret your decision

- Based on the results of your hypothesis test, if you had created a 95% confidence interval for the parameter of interest, would your confidence interval include 0?

- Verify your answer above by creating a 95% confidence interval

8. We are interested in estimating the true percentage of adults who currently have a landline connection. We would like to have an estimate to within 3% of the true percentage with 99% confidence.

- How many adults should we sample without using any prior estimates?

- We found that in 2005 74% of adults had a landline connection. If we use this prior estimate, how many should we sample?

9. We would like to have an estimate of the average number of hours teenagers spend online on a daily basis with 90% confidence, and have an estimate within 0.1 hours of the true mean. Assuming we know the standard deviation of hours spent online daily by teenagers is 0.3, how many should we include in our sample?

10. We would like to have an estimate of the average number of hours teenagers sleep per night this year, with 95% confidence, and have an estimate within 0.1 hours of the true mean. In a study conducted 5 years ago, the number of hours slept in a sample of teenagers was recorded, and the standard deviation from this sample was calculated to be 0.26. How many should we include in our sample?