

QUIZ2 2 STAT4352

Name (Please Print):

*Instructions: Each problem/question is of equal value (2 points). You solve problems with closed books, notes, etc.; please use your tables.*

1. A major truck stop has kept extensive records on various transactions with its customers. A random sample of 25 sales of gas is chosen. It is assumed that sales are samples from a normal distribution with a historically known population variance 36. The observations yielded the sample mean sale  $\bar{X} = 100$  and the sample variance 36.

- a. Find 95% confidence interval for the population mean using the historically known population variance.
- b. The same only using the sample variance.
- c. Using the sample, find 95% confidence interval for the population variance.

2. Eight randomly selected pigs from Farm 1 have a sample mean weight of 21 pounds with a known population standard deviation 2 pounds. Seventeen randomly selected pigs from Farm 2 have a sample mean weight of 25 pounds with a known population standard deviation of 3 pounds. Assuming that the two populations are independent and normal, construct a 98% confidence interval for the difference between the population means. Do you think that the farms perform similarly?

3. Assume that the age of pigs on two different farms has the same variance. For the first farm, a sample of 9 pigs gave the sample mean age 5 months and the sample variance 2, while for the second farm a sample of 12 pigs gave the sample mean 7 and the sample variance 3. Find a 99% confidence interval for the difference between the population mean ages.

4. A sample of subscribers to Verizon new dish-TV showed that 70 of 100 subscribers satisfied with the service. Construct a 98% confidence interval for the corresponding true proportion.

5. In a car dealership “Denver” only 80 of 100 buyers return to make regular oil-changes, while in a dealership “Plano” 90 of 120 buyers do this. Construct a 96% confidence interval for the difference between the underlying population proportions.

6. A sample of 37 trees has shown that the sample variance of their heights is 8. Assuming that the heights are normally distributed, construct a 95% confidence interval for the population variance.

7. Two laboratories compare their daily expenses on using printers. The first laboratory got a sample variance 5 for the period of 25 days, while the second got a sample variance 7 for the period of 23 days. Assume that the samples are independent and the underlying populations are normal. Find a 99% confidence interval for the ratio of the population variances.

9. Suppose that  $f_{\beta,k,m}$  is known. Can you calculate  $f_{1-\beta,m,k}$ ? Prove your assertion.

10. Consider the case of two samples of sizes  $n_1$  and  $n_2$  from two independent normal populations. Suppose that the corresponding sample variances are  $S_1^2$  and  $S_2^2$ . Write down a  $1 - \alpha$  confidence interval for the ratio between population variances and then prove that this is indeed the desired confidence interval.