# Q SCI 381 Dr. Bare

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Final Examination**

*Closed book. May use calculator and formula card. Show all work for full credit. This means show which formula is used; plug in a few representative data points to demonstrate that you know how to use the formula; provide the correct numerical answer.*

**(200 points)**

(25) 1. A physician claims that adult Americans who smoke more than two packs of cigarettes per day weigh less than the average weight of all American adults. A random sample of 25 two pack a day smokers has a mean of 140.6 lbs. and a standard deviation of 5 lbs. The weight of all adult Americans is approximately normally distributed. If the average weight of all adult Americans is 145 lbs., is there enough evidence to support the claim at α=.01?

1. Provide a mathematical description of the null and alternative hypotheses.
2. Calculate the test statistic.

c) Find the critical value (s).

1. Make a decision.
2. State your conclusion in words.

(25) 2. A local brewery claims that the variance of the sugar content of its India Pale Ale (IPA) is less than or equal to 10 milligrams per 12 ounces. A random sample of 16, 12-ounce bottles is selected and the sugar content is measured. Sugar content of IPA is approximately normally distributed. The variance of the sample is found to be 20 mg. At α = .05, is there enough evidence to reject the claim?

1. Provide a mathematical description of the null and alternative hypotheses.
2. Calculate the test statistic.

c) Find the critical value (s).

d) Make a decision.

e) State your conclusion in words.

f) Give the range for the approximate P-value for this test.

(30) 3. A researcher wishes to determine if there is a linear relationship between the energy efficiency rating (EER) of an air condition ner and its cost. The Appliance Manufacturer’s Association determines the EER. The data are shown below.

EER (x) $ Cost (y)

9.5 370

1. 360
2. 400
3. 400
   1. 420
   2. 350
   3. 310

Σx=67.5 Σx2= 653.11 Σy=2610 Σy2= 981500 Σxy=25292

a) Calculate the sample correlation coefficient between EER and cost.

b) Interpret the meaning of the sample correlation coefficient (i.e., what can you conclude?)

c) Test the claim that there is a significant correlation between EER and cost at the α = .05 level.

1. State the null and alternative hypotheses in mathematical terms.

ii) Find the critical value (s).

iii) Calculate the test statistic.

iv) State your conclusion in words.

(30) 4. Given the data shown above in the previous problem calculate the best simple linear regression equation. That is:

1. Calculate the slope of the regression equation.

b) Calculate the intercept of the regression equation.

c) Verify that the se = 16.68. Note: Σ(Y-ŷ)2 = 1391.8

d) How much of the total variation is explained by your equation?

e) Calculate the 95% prediction interval for an EER of 9.

(25) 5. A local polling company claims that 85% of the adult American population opposes replacing $1 bills with $1 coins. To test this claim, we take a random sample of 120 American adults and find that 110 are opposed to replacing the $1 bills. At α=.01, do we have sufficient evidence to refute the claim?

1. Provide a mathematical description of the null and alternative hypotheses.
2. Calculate the test statistic.

c) Find the critical value (s).

d) Make a decision.

e) State your conclusion in words.

f) Determine the approximate P-value.

(15) 6. Using the same data from the previous problem,

a) What is the maximum error of estimate of the adult American population that opposes replacing $1 bills with $1 coins? Recall that α=.01, n=120, and x=110.

1. What sample size is required if we wish our maximum error of estimate to be 4%?

(10) 7. If 2% of all eastern Washington August wild fires burn in excess of 5,000 acres, find the probability that in a random sample of 100 fires, 4 will burn I excess of 5,000 acres.

(15) 8. The miles per gallon for 10 randomly selected 4-wheel drive SUVs in city driving are shown below:

12 18 15 16 16 14 12 15 16 17

1. Construct a frequency distribution with three classes such that the mid-point of the first class is 13.

b) What is the class width?

1. What are the class boundaries of the second class?
2. If the data were presented to you in the form of the frequency distribution developed in part (a), what would be your estimate of the mean miles per gallon?

(25) 9. A medical researcher wishes to see whether the variances of the heart rates (beats/minute) of smokers are different from the variances of heart rates of people who do not smoke. Heart rate is approximately normally distributed. Two independent random samples are selected with the following results. At α=.05 is there enough evidence to support the claim?

Smokers Non-smokers

n1 = 32 n2 = 28

s12 = 34 s22 = 15

a) Provide a mathematical description of the null and alternative hypotheses.

1. Calculate the test statistic.

c) Find the critical value (s).

d) Make a decision.

e) State your conclusion in words.

BONUS. (20) Using Doppler echocardiography, a cardiac researcher wishes to determine if two observers record the same cardiac output for five patients. Her claim is that they do. The results are shown below. Can you conclude that the two observers agree at the α=.10 level? Doppler echocardiography measurements are approximately normally distributed.

Subject 1 2 3 4 5

Observor 1 4.8 5.6 6 6.4 6.5

Observor 2 5.8 6.1 7.7 6.8 7

1. Provide a mathematical description of the null and alternative hypotheses.
2. Calculate the test statistic.

c) Find the critical value (s).

d) Make a decision.

e) State your conclusion in words.