**STA 6166 – Exam 4 – Spring 2016 PRINT Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Conduct all tests at the  = 0.05 significance level.**

Q.1. A study considered mortality among fire-setters and matched controls (non-fire-setters) in Finland. Among a sample of 435 fire-setters, 91died of unnatural causes during the study period. Among 1740 controls, 66 died of unnatural causes during the study period. Compute the sample odds ratio of death by unnatural causes (fire-setters relative to non-fire-setters), and compute a 95% Confidence Interval for the population odds ratio).

 95% CI for OR: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.2. If 2 populations have the same probability of a success, then the Odds Ratio and the Relative Risk for the 2 populations will both be what value?

OR = RR = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.3. In simple linear regression, if the estimated slope is 0, then the correlation will be \_\_\_\_\_\_\_\_\_\_\_

Q.4. In multiple regression with 2 predictors, it is possible to reject H0:  but fail to reject either H0:  or H0:  **True** / **False**

Q.5. A regression model is fit, based on n = 25 subjects and k=4 predictor variables. How large will R2 need to be to reject H0: = 0?

R2 ≥ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.6. In a regression model, if R2 = 1, then SSE = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.7. A study was conducted to determine the effects of daily temperature (X, in ○C) on Electricity Consumption (Y, in 1000s of Wh) in an experimental house over a period of n = 31 days. Consider the following model:



p.7.a. What proportion of the variation in Electricity consumption is “explained” by daily temperature (X)?

p.7.b. Compute the residual standard deviation, *se*

p.7.c. Obtain the estimated **mean** electricity consumption when x\* = 27.0 degrees, and the 95% Confidence Interval.

Estimated Mean: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 95% CI: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.8. A study involved measuring head size (x, in cm3) and brain weight (y, in grams) among a sample of n = 77 adult males over 45 years old. The following summary statistics were obtained:



p.8.a. Compute the sample correlation between head size and brain weight, *ryx*:

p.8.b. Test whether there is a positive association in the corresponding population: H0: yx ≤ 0 HA: yx >0

Test Statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rejection Region: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

p.8.c. If the measurements had been made in ounces (1 ounce = 28.35 grams) and inches3 (1 inch = 2.54cm) , what would be the sample correlation between brain weight and head size?

Q.9. A study related subsidence rate (Y) to water table depth (X1) for 3 crops: pasture (X2 = 0, X3 = 0), truck crop (X2 = 1, X3 = 0), and sugarcane (X2 = 0, X3 = 1). Note the total sum of squares is TSS = 35.686, and n = 24.

p.9.a. The following model allows **separate intercepts** for each crop type, with a **common slope for water table depth** among crop types. For this model, SSE = 1.853. Give SSR, R2, and the error degrees of freedom.



SSR1 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ R12 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dfERR1 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

p.9.b. The following model allows **separate intercepts** for each crop types, with **separate slopes for water table depth** among crop types. For this model, SSE = 1.261. Give SSR, R2, and the error degrees of freedom.



SSR2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ R22 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dfERR2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

p.9.c. Test whether the slopes are the same for the 3 crop types. H0: 12 = 13 = 0

Test Statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rejection Region: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_