Name Jerry

Student Number

STA 302f 2015 Quiz 9

In homework, you analyzed the `statclass` data. Please base your answers on your R printout.

1. (1 point) Write $\widehat{\beta}_2$ in the space below. The answer is a number from your printout. Circle $\widehat{\beta}_2$ on your printout, and write "$\widehat{\beta}_2$" beside it.

   $\hat{\beta}_2 = -2.9343$

2. (5 points) We want to know whether, controlling for quiz average and score on the midterm test, computer average is related to score on the final exam.

   (a) In symbols, what is the null hypothesis?

   $H_0: \beta_2 = 0$

   (b) What is the value of the test statistic? The answer is a number from your printout.

   $t = -1.538$

   (c) What is the p-value? The answer is a number from your printout.

   $p = 0.12977$

   (d) Do you reject the null hypothesis at $\alpha = 0.05$? Answer Yes or No.

   No

   (e) In plain, non-statistical language, what do you conclude from this test? Use the words "Allowing for" instead of "Controlling for."

   Allowing for midterm mark and quiz average there is not enough evidence to conclude that computer average is related to mark on the final exam.

   In Question 2, answers to any two parts must be consistent with one another or they are both wrong.

3. (2 points) What is SSE? Show the calculations based on numbers from your printout. The answer is a number. **Circle your answer.**

   $14.54 = \sqrt{MSE} = \sqrt{\frac{SSE}{54}} \Rightarrow 14.54^2 = \frac{SSE}{54}$

   $\Rightarrow SSE = 11416.23$

4. (2 points) What is the predicted final exam score for a student with a Quiz average of 10/10, a midterm mark of 100%, and Computer average of 0/10? The answer is a number. Show a little work; **Circle your answer.** It's okay if it's a little strange.

   $\hat{y} = 9.1368 + 5.8710(10) - 2.9343(0) + 0.3246(100)$

   $= 100.3068$

Attach your *complete* R printout to your quiz. Make sure your name and student number are written clearly on the printout.

A little strange.

```
R version 3.0.0 (2013-04-03) -- "Masked Marvel"
Copyright (C) 2013 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin10.8.0 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[R.app GUI 1.60 (6476) x86_64-apple-darwin10.8.0]

[Workspace restored from /Users/brunner/.RData]
[History restored from /Users/brunner/.Rapp.history]

> statclass = read.table("http://www.utstat.utoronto.ca/~brunner/data/legal/
LittleStatclassdata.txt")
> head(statclass); attach(statclass)
  QuizAve CompAve MidTerm FinalExam
1     4.9     4.6      55        43
2     8.2     9.3      66        79
3     9.0     9.9      94        67
4     9.1     9.8      81        65
5     7.5     7.9      57        52
6     7.5     7.2      77        64
> mod = lm(FinalExam ~  QuizAve + CompAve + MidTerm)
> summary(mod)

Call:
lm(formula = FinalExam ~ QuizAve + CompAve + MidTerm)

Residuals:
    Min      1Q  Median      3Q     Max
-27.260 -10.293   1.302   7.221  42.218

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   9.1368    16.3011   0.560  0.57746
QuizAve       5.8710     2.1407   2.743  0.00825 **
CompAve      -2.9343     1.9073  -1.538  0.12977
MidTerm       0.3246     0.1385   2.343  0.02283 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 14.54 on 54 degrees of freedom
```

```
Multiple R-squared:  0.2662,    Adjusted R-squared:  0.2254
F-statistic: 6.528 on 3 and 54 DF,  p-value: 0.000755

>
> summary(statclass)
    QuizAve         CompAve         MidTerm        FinalExam
 Min.   :4.600   Min.   :4.600   Min.   :10.00   Min.   :15.00
 1st Qu.:6.800   1st Qu.:7.900   1st Qu.:57.25   1st Qu.:39.00
 Median :7.400   Median :8.650   Median :71.00   Median :51.00
 Mean   :7.257   Mean   :8.400   Mean   :68.88   Mean   :49.45
 3rd Qu.:7.875   3rd Qu.:9.275   3rd Qu.:77.00   3rd Qu.:59.50
 Max.   :9.600   Max.   :9.900   Max.   :95.00   Max.   :87.00
> meanz = apply(statclass,2,mean); meanz
  QuizAve   CompAve   MidTerm FinalExam
 7.256897  8.400000 68.879310 49.448276
> xbar = meanz[1:3]
> # attach(statclass)
> # c(mean(QuizAve), mean(CompAve), mean(MidTerm), mean(FinalExam))
> # Q3wi) Point estimate
> #       The easy way
>         ybar = mean(FinalExam); ybar
[1] 49.44828
> #       The hard way
>         sum(mod$coefficients*c(1,xbar))  #$
[1] 49.44828
> # Q3wii)
> crit = qt(0.975,54) ; crit  # t-sub-alpha/2 from Q3t
[1] 2.004879
> V= vcov(mod); a = c(1,xbar)
> se = sqrt(t(a) %*% V %*% a); se
         [,1]
[1,] 1.908678
> ci = c(ybar-crit*se, ybar+crit*se); ci
[1] 45.62161 53.27495
>
>
```