

Question 1.

Suppose that a researcher, using data on class size (CS) and average test scores from 100 third-grade classes, estimates the following OLS regression:

```
> mo1 <- lm(TestScore~CS)
> summary(mo1)

Call:
lm(formula = TestScore ~ CS)

Residuals:
    Min       1Q   Median       3Q      Max
-272.574  -67.444   -7.171   71.305  313.671

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  509.384     38.244  13.319  < 2e-16 ***
CS           -5.614      1.862   -3.015  0.00327 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 105.8 on 98 degrees of freedom
Multiple R-squared:  0.0849,    Adjusted R-squared:  0.07556
F-statistic: 9.092 on 1 and 98 DF,  p-value: 0.003269
```

- A classroom has 22 students. What is the regression's prediction for that classroom's average test score?
- Last year a classroom had 19 students, and this year it has 23 students. What is the regression's prediction for the change in the classroom average test score?
- The sample average class size for the 100 classrooms is 21.4. What is the sample average of the test score across the 100 classrooms?
- Interpret the regression R-squared and the standard error of the regression. What are the units measurement for R-squared and SER.
- What is the sample standard deviation of test scores across the 100 classrooms?
- Summarizing CS gives you the following descriptive statistics for the classroom size. Will the prediction give a reliable value for a CS of 35? Why and Why not?

```
> summary(CS)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  10.00  15.00   20.00   19.74  24.00   30.00
```

- Conduct a two-sided hypothesis test with using all the 3-steps that you learned to determine if there is enough statistical evidence to indicate whether the classroom room size has any impact on test scores at 1% significance level?
- Conduct a one-sided hypothesis test with using all the 3-steps that you learned to determine if there is enough statistical evidence to indicate whether the larger classroom room size has **negative** impact on test scores at 1% significance level?
- Construct a 99% confidence interval for the estimated association between classroom size and test scores.

```
> confint.lm(mo1,level=0.99)
              0.5 %      99.5 %
(Intercept) 408.91905 609.8496076
CS          -10.50496  -0.7231212
\ |
```