

**Instructions:** Answer each question as thoroughly as possible. Round answers to 4 decimal places as needed. Exact answers are best when possible. Be sure to answer all parts of each question.

1. A pharmaceutical company conducts an experiment to test the effect of a new cholesterol medication. The company selects 15 subjects randomly from a larger population. Each subject is randomly assigned to one of three treatment groups. Within each treatment group, subjects receive a different dose of the new medication. In Group 1, subjects receive 0 mg/day; in Group 2, 100 mg/day; and in Group 3, 250 mg/day. After 30 days, doctors measure the cholesterol level of each subject. The results for all 15 subjects appear in the table below and in the file 325quiz4data.xlsx.

Dosage		
Group 1, 0 mg	Group 2, 100 mg	Group 3, 250 mg
230	230	180
290	265	210
280	265	220
300	290	210
320	290	250

- a. Conduct a one-way ANOVA test to see if there are effects to the medication and dosage level (groups, as a factor), under the assumption that no other levels of the medication are of interest. Clearly state your hypothesis, check your normality assumptions and state your conclusion in the context of the problem.  $H_0: \mu_i = \mu_j \forall i \neq j$   $H_a: \mu_i \neq \mu_j$  for some  $i \neq j$

*p-value = 0.00121 reject null. Dosage does affect cholesterol*

- b. State the general linear model from your ANOVA analysis.

*$y(\text{cholesterol}) = -0.2863158 (\text{Dosage level}) + 288.7368421$*

- c. Redo the problem as a simple linear regression using the dosages as the explanatory variable (x) and cholesterol as the response variable (y). Conduct a model test. Clearly state your assumptions and conclusion in context.

*$y(\text{cholesterol}) =$*

*$-16 (\text{Dosage } 100) - 70 (\text{Dosage } 250) + 284$*

*$H_0: \beta_1 = 0$   $H_a: \beta_1 \neq 0$*

*$p\text{-value} = 0.00497$*

- d. What is the regression model for this data that you found? How does the regression model compare to the (linear) ANOVA model?

*the ANOVA model appears nonlinear to me w/ Dosage = 250 having a bigger affect.*

- e. Create an appropriate residual plot.

- f. If you had to predict the effects of a dosage of 150 mg dosage, which model would be more appropriate and why? Would using either model be appropriate? If not, why not?

*Regression model better, no way in ANOVA to estimate values between categories*

- g. In general, which model do you think is best for this data and why? Explain.

*ANOVA is better for this data*

*Since it appears somewhat nonlinear*

