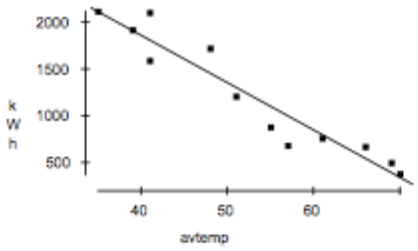
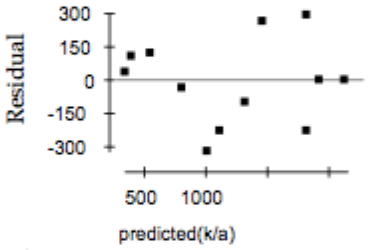
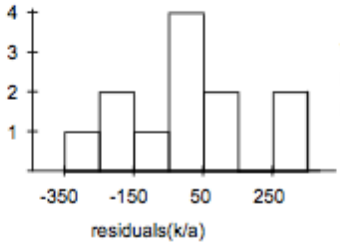
HW9 – Chapter 25 ***Name*** _____

The following graphs and tables explore the relationship between the outside temperature expressed in the Fahrenheit scale and the amount of electricity used in an apartment expressed in kilowatt per hour, month by month around the year.



Month	Avg. temp	Elec (kWh)	Month	Avg. temp	Elec (kWh)
Jan	39	1922	July	69	503
Feb	35	2123	Aug	70	377
Mar	41	2111	Sept	66	670
Apr	48	1728	Oct	57	679
May	55	878	Nov	51	1212
June	61	765	Dec	41	1589





Dependent variable is: kWh
No Selector
R squared = 91.3% R squared (adjusted) = 90.4%
s = 201.3 with 12 - 2 = 10 degrees of freedom

Source	Sum of Squares	df	Mean Square	F-ratio
Regression	4234482	1	4234482	104
Residual	405235	10	40523.5	

Variable	Coefficient	s.e. of Coeff	t-ratio	prob
Constant	3898.20	269.0	14.5	≤ 0.0001
avtemp	-50.9027	4.980	-10.2	≤ 0.0001

1.Is the Straight Enough Condition satisfied?
A. Yes, because the scatterplot of residuals and predicted values shows random scatter
B.Yes, the scatterplot of residuals and predicted values shows fairly uniform spread
C. Yes, because the histogram of residuals is unimodal and symmetric
D. Yes, because the points on the scatterplot of temperature and kwh looks roughly clustered around a line

2.Is the independence assumption satisfied?
A. Yes, because the scatterplot of residuals and predicted values shows random scatter
B.Yes, the scatterplot of residuals and predicted values shows fairly uniform spread
C. Yes, because the histogram of residuals is unimodal and symmetric

D. Yes, because the points on the scatterplot of temperature and kwh looks roughly clustered around a line

3.Is the "Does the plot thicken?" condition satisfied?
A. Yes, because the scatterplot of residuals and predicted values shows random scatter
B.Yes, the scatterplot of residuals and predicted values shows fairly uniform spread
C. Yes, because the histogram of residuals is unimodal and symmetric
D. Yes, because the points on the scatterplot of temperature and kwh looks roughly clustered around a line

4.Is the "Nearly normal condition" satisfied?
A. Yes, because the scatterplot of residuals and predicted values shows random scatter
B.Yes, the scatterplot of residuals and predicted values shows fairly uniform spread
C. Yes, because the histogram of residuals is unimodal and symmetric
D. Yes, because the points on the scatterplot of temperature and kwh looks roughly clustered around a line

5.Given that the condition and assumptions are satisfied, how can I model the regression slope?
A. With a chi-square model with 10 degrees of freedom
B. With a Student's t model with 12 degrees of freedom
C. With a Student's t model with 10 degrees of freedom
D. With a z distribution

6.What is my null hypothesis?
A. There is no linear association between monthly temperature and electrical usage
B. There is linear association between monthly temperature and electrical usage
C. There is no linear association between the electrical usage in each of the 12 months of the year and the following month
D. There is linear association between electrical usage in each of the 12 months of the year and the following

7.What is my alternative hypothesis?
A. There is no linear association between monthly temperature and electrical usage
B. There is linear association between monthly temperature and electrical usage
C. There is no linear association between the electrical usage in each of the 12 months of the year and the following month
D. There is linear association between electrical usage in each of the 12 months of the year and the following

8.What is my null hypothesis in mathematical terms?
A. $\beta_1 < 0$
B. $\beta_1 > 0$
C. $\beta_1 \neq 0$
D. $\beta_1 = 0$

9.What is my alternative hypothesis in mathematical terms?
A. $\beta_1 < 0$
B. $\beta_1 > 0$
C. $\beta_1 \neq 0$
D. $\beta_1 = 0$

10.What's the t ratio corresponding to the slope?
A. 14.5 B. 269 C. 4.98 D. -10.2

11.What are my conclusions?
A. there is weak evidence that as temperature increases, the average electrical usage decreases
B. there is strong evidence that as temperature decreases, the average electrical usage decreases
C. there is strong evidence that as temperature increases, the average electrical usage decreases
D. there is weak evidence that as temperature decreases, the average electrical usage increases

12.Find a 95% CI for the slope. What's the critical value t* from the t-table?
A. 1.960 B. 0.001 C. 0.3981 D. 2.228

13.What's the value of $SE(b_1)$ from the regression table?
A. 14.5 B. -10.5 C. 4.98 D. 269

14.What's the value of b_1 from the regression table?
A. 4.98 B. 3898.20 C. 269 D. -50.9027

15.What's the confidence interval?
A. (-61.00, -86.34)
B. (-61.00, -39.81)
C. (-23.56, -39.81)
D. (-39.81, -23.56)

16.What's the meaning of the confidence interval? (X and Y are the values for the interval we just calculated).

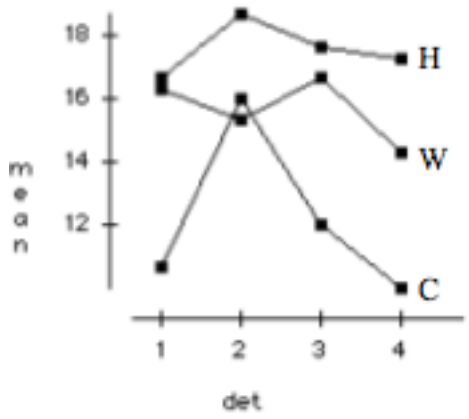
A.I am 95% confident that each additional degree-day in average temperature is associated with an average decrease of between X and Y kilowatt hours in electricity usage.
B.I am 95% confident that each additional degree-day in average temperature is associated with an average increase of between X and Y kilowatt hours in electricity usage.
C.I am 90% confident that each additional degree-day in average temperature is associated with an average decrease of between X and Y kilowatt hours in electricity usage.
D.I am 95% confident that each additional kilowatt hours in electricity usage is associated with an average decrease of between X and Y in average temperature

17.What's the correlation coefficient?
A. 0.091 B. 0.095 C. 0.91 D. 0.95

Chapter 26-27

Some researchers tested four different types of dish soap (1,2,3,4) in hot water, warm water or cold water (H, W, C). After washing a pile of dishes in the dishwasher in each condition, they rated how clean the dishes were from 0 (no change) to 20 (completely free of grease). See below the two-factor ANOVA table and an interaction plot. Remember that with a multi-factorial ANOVA we test one hypothesis for each factor.

Source	df	Sums of Squares	Mean Square	F-ratio	P-value
Detergent	3	38.972	12.9907	3.966	0.0171
Temp	2	181.056	90.5278	27.634	< 0.0001
Error	30	98.278	3.2759		
Total	35	318.306			



18.What are the factors?
A. Level of cleanliness and Temperature
B. Level of cleanliness and Detergent
C. Detergent and Temperature
D. Detergent, Temperature and Level of cleanliness

19.From the table, what's the MSE?
A. 3.2759 B. 98.278 C. 318.306 D. 30

20.What's the null hypothesis being tested by the F-ratio relative to Detergent?
A. Each detergent as an equal effect on how clean the dishes are
B. Each detergent as a different effect on how clean the dishes are
C. At least one detergent has a different effect than the others
D. Each detergent has no effect on how clean the dishes are

21.What's the alternative hypothesis being tested by the F-ratio relative to Detergent?
A. Each detergent as an equal effect on how clean the dishes are
B. Each detergent as a different effect on how clean the dishes are
C. At least one detergent has a different effect than the others
D. Each detergent has no effect on how clean the dishes are

22.What's the null hypothesis being tested by the F-ratio relative to Temperature?
A. Each temperature as an equal effect on how clean the dishes are.
B. Each temperature as a different effect on how clean the dishes are.
C. At least one temperature has a different effect than the others
D. Each temperature has no effect on how clean the dishes are.

23.What's the alternative hypothesis being tested by the F-ratio relative to Temperature?
A. Each temperature as an equal effect on how clean the dishes are.
B. Each temperature as a different effect on how clean the dishes are.
C. At least one temperature has a different effect than the others
D. Each temperature has no effect on how clean the dishes are.

24.What are my conclusions relative to the efficacy of detergent?
A. There is strong evidence that the detergents do not clean equally well
B. There is very weak evidence that the detergents do not clean equally well
C. There is absolute evidence that the detergents do not clean equally well
D. There is strong evidence that the detergents clean equally well

25.What are my conclusions relative to the efficacy of temperature?
A. There is strong evidence that the temperature levels do not clean equally well
B. There is very weak evidence that the temperature levels do not clean equally well
C. There is absolute evidence that the temperature levels do not clean equally well
D. There is strong evidence that the temperature levels clean equally well

26.Looking at the interaction plot, should I include an interaction?
A. Yes, between Cold Water and Warm Water
B. Yes, because the lines for Cold Water and Warm Water cross
C. Yes, because detergent 2 seems to clean much better in cold water
D.Yes, because the lines for Hot Water and Warm Water almost touch