

Homework 7

Due 3/27/25 by end of the day

Directions: Reading the supplemental reading posted as Lecture 14 reading and the last part of Chapter 4 will help you answer these questions. In lectures 14, 15 and 16 you will have seen relevant background and examples. Do problem 1-2 by hand using Excel (unless otherwise noted). For the rest of the homework, use Minitab. Try to be aware of the significant figures when reporting model coefficients.

- 1) Do problem 4.26 (4.43 in 7th edition) in your book, and answer parts a and b by hand (using Excel to aid in the calculations) but use Minitab to check parts a and b and calculate the CI in part c. Keep 3 significant figures and use $\alpha=0.05$. Also, do extra part (not in book):

d) calculate the R^2 by hand and explain what this tells you
- 2) Do problem 4.28 (4.45 in 7th edition) by plotting: (1) residuals on a normal probability plot, (2) residuals versus predicted value, (3) residuals vs. x . To complete these, calculate the residuals in Excel and paste them as part of your answer. You can produce the plots using Excel or Minitab. Remember to comment on if you think the assumptions are valid.
- 3) Do problem 4.27 (4.44 in the 7th edition) in your book – you can use Minitab for the entire problem (no need to calculate by hand). For part a) also generate a scatter plot of the data and convince yourself a linear model is appropriate and be sure to highlight or report your regression equation. For part b) be sure to state the null and alternative hypothesis and your conclusion. For part c) report the CI and describe what it means. Keep 3 significant figures and use $\alpha=0.05$. Also add these parts to this problem (not in your book):

d) use Minitab to generate a plot of the linear regression lines with 95% confidence intervals and explain what the intervals mean
- 4) An electric utility is interested in developing a model relating peak-hour demand (y in kilowatts) to total monthly energy usage during the month (x , kilowatt hours). Data for 50 residential customers are shown in the table below (last page). You can use Minitab to solve this entire problem.
 - a. Plot the scatter diagram of y vs x .
 - b. Fit the simple linear regression model (report the equation)
 - c. Test for significance of the simple linear regression using $\alpha=0.05$. State the null and alternative hypothesis.
 - d. Plot the residuals versus predicted, and comment on the underlying assumptions, specifically, is the equality of variance assumption valid?
 - e. Find a simple linear regression model using \sqrt{y} as the response. Does the transformation stabilize the inequality found in part d

- 5) Do problem 4.30 – 4.33 (4.49-4.52 in the 7th ed) using Minitab, alpha = 0.05. Create a contour plot using Minitab and explain why adding age to the model might be helpful. Using the contour plot, report the range of satisfaction for a 40 year old with a disease severity of 30 and the range for a 40 year old with severity of 60 according to your model.

Data for Problem 4 (cut and paste into Minitab):

	x	y
1	679	0.79
2	292	0.44
3	1012	0.56
4	493	0.79
5	582	2.7
6	1156	3.64
7	997	4.73
8	2189	9.5
9	1097	5.34
10	2078	6.85
11	1818	5.84
12	1700	5.21
13	747	3.25
14	2030	4.43
15	1643	3.16
16	414	0.5
17	354	0.17
18	1276	1.88
19	745	0.77
20	795	3.7
21	540	0.56
22	874	1.56
23	1534	5.28
24	1029	0.64
25	710	4
26	1434	0.31
27	837	4.2
28	1748	4.88
29	1381	3.48
30	1428	7.58
31	1255	2.63
32	1777	4.99
33	370	0.59
34	2316	8.19
35	1130	4.79
36	436	0.51
37	770	1.74
38	724	4.1
39	808	3.94
40	790	0.96
41	783	3.29
42	406	0.44
43	1242	3.24
44	658	2.14
45	1746	5.71
46	895	4.12
47	1114	1.9
48	413	0.51
49	1787	8.33
50	3560	14.94