

Statistical Methods Test 4 Practice

Chapters 7 and 8. When needed, round answers to 3 decimal places.

1. The table shows the duration (in minutes) of Old Faithful's eruptions and the times (in minutes) until the next eruption.

Duration, x	Time, y	Duration, x	Time, y
1.8	56	3.78	79
1.82	58	3.83	85
1.88	60	3.87	81
1.9	62	3.88	80
1.92	60	4.1	89
1.93	56	4.27	90
1.98	57	4.3	84
2.03	60	4.3	89
2.05	57	4.43	84
2.13	60	4.43	89
2.3	57	4.47	86
2.35	57	4.47	80
2.37	61	4.53	89
2.82	73	4.55	86
3.13	76	4.6	88
3.27	77	4.6	92
3.65	77	4.63	91
3.7	82		

- Find the equation of the regression line for predicting the time until the next eruption.
 - Explain in this context what the slope of this line means.
 - Predict the time until the next eruption when the duration is 4.61 minutes.
2. Highway planners investigated the relationship between traffic density (# of automobiles per mile) and the average speed of the traffic on a moderately large city thoroughfare. The data were collected at the same location at 10 different times over a span of 3 months. They found a mean traffic density of 68.6 cars per mile (cpm) with standard deviation of 27.07 cpm. Overall the cars' average speed was 26.38 mph with a standard deviation of 9.68 mph. These researchers found the regression line for these data to be $\widehat{speed} = 50.55 - 0.352cars$.
- Predict the average speed of traffic on the thoroughfare when the traffic density is 50 cpm.
 - What is the value of the residual for a traffic density of 56 cpm with an observed speed of 32.5 mph?

Statistical Methods Test 4 Practice

3. A Statistics instructor created a linear regression equation to predict students' final exam scores from their midterm exam scores. The regression equation was

$$\widehat{fin} = 10 + 0.9mid.$$

- If Susan scored a 70 on the midterm, what did the instructor predict for her score on the final?
- Susan scored an 80 on the final. Using the predicted score from part a, find the residual.
- How many points would someone need to score on the midterm to have a predicted final score of 82?

4. Marine biologists warn that the growing number of powerboats registered in Florida threatens the existence of manatees. The following data was reported in 2002:

Year	Manatees Killed	Powerboat Registrations (in 1000s)
1982	13	447.0
1983	21	459.6
1984	24	481.0
1985	16	497.9
1986	24	512.6
1987	20	512.3
1988	15	526.5
1989	34	558.6
1990	33	585.3
1992	33	613.5
1993	39	645.5
1994	43	675
1995	50	711
1996	47	719
1997	53	716
1998	38	716
1999	35	716
2000	49	735
2001	81	860

- In this context, which do you think is the explanatory variable?
- Make a scatterplot of these data and describe the association you see.
- Find the correlation between boat registrations and manatee deaths.
- Find the equation of the regression line.
- Interpret the slope of your model.
- How accurately did your model predict the high number of manatee deaths in 2001?

Statistical Methods Test 4 Practice

- g) Which is better for manatees, positive residuals or negative residuals?
5. One Thursday, researchers gave students enrolled in a section of basic Spanish a set of 50 new vocabulary words to memorize. On Friday the students took a vocabulary test. When they returned to class the following Monday, they were retested – without advance warning. Both sets of test scores for the 25 students are shown.

Friday	Monday
42	36
44	44
45	46
48	38
44	40
43	38
41	37
35	31
43	32
48	37
43	41
45	32
47	44
50	47
34	34
38	31
43	40
39	41
46	32
37	36
40	31
41	32
48	39
37	31
36	41

- a) What is the correlation between Friday and Monday scores?
- b) What does a scatterplot show about the association between the scores?
- c) Write the equation of the regression line.
- d) Predict the Monday score of a student who earned a 40 on Friday.

Statistical Methods Test 4 Practice

6. The Minnesota Department of Transportation hoped that they could measure the weights of big trucks without actually stopping the vehicles by using a newly developed "weigh-in-motion" scale. After installation of the scale, a study was conducted to find out whether the scale's readings correspond to the true weights of the trucks being monitored. The regression equation is $\widehat{Wt} = 10.85 + 0.64scale$, where both the scale reading and the predicted weight of the truck are measured in thousands of pounds.

- Estimate the weight of a truck if this scale read 31,200 pounds.
- If that truck actually weighed 32,120 pounds, what was the residual?
- If the scale reads 35,590 pounds, and the truck has a residual of -2440 pounds, how much does it actually weigh?

ANSWERS:

- $\hat{y} = 35.301 + 11.824x$
 - For each additional minute the eruption lasts the time until the next eruption is increased by 11.824 minutes.
 - 89.810
- 32.95 mph
 - 1.662
- 73
 - 7
 - 80
- Powerboat registrations
 - Shows a fairly strong, linear, and positive association.
 - 0.924
 - $\hat{y} = -45.893 + 0.132x$
 - For each additional 1000 registered powerboats there is an increase in 0.132 manatee deaths.
 - 67.627 which is under by 13.373
 - Negative residuals because the actual number of deaths is less than the predicted number.
- 0.473
 - Shows a weak, non-linear, positive association.
 - $\hat{y} = 14.592 + 0.536x$
 - 36.032
- 30,818
 - The model underestimated the weight by 1302 pounds.
 - 31,187.6