

- ok ✓
1. The mean breaking strength of a certain type of fiber is required to be at least 200 psi. Past experience indicates that the standard deviation of breaking strength is 5 psi. If a sample of 8 pieces of fiber yielded breakage at the following pressures:

210, 198, 195, 202, 197.4, 196, 199, 195.5

would you conclude, at the 5 percent level of significance, that the mean breaking strength of the fiber is less than the target? What is the p-value?

- ✓ 2. Refer to the problem above. If the standard deviation is not known from past experience, perform an appropriate test and comment.
- ✓ 3. Your claim is that the mobile phone battery you developed works continuously for more than 75 hours, on an average, without recharging. Let the population SD be known to be 5 and the sample size be 50. Determine the rejection region of the test for 5% level of significance. What is the power if the true mean is 77 hours?

4. A sample of 10 fish were caught at lake A and their PCB concentrations were measured using a certain technique. The resulting data in parts per million were

Lake A: 11.5, 10.8, 11.6, 9.4, 12.4, 11.4, 12.2, 11, 10.6, 10.8

✗ ✓ In addition, a sample of 8 fish were caught at lake B and their levels of PCB were measured by the same technique. The resultant data were

Lake B: 11.8, 12.6, 12.2, 12.5, 11.7, 12.1, 10.4, 12.6

If it is known that the measuring technique has a variance of .09 (same for both lakes), could you reject (at the 5 percent level of significance) a claim that the two lakes are equally contaminated?

- ✓ 5. A professor claims that the average starting salary of industrial engineering graduates is greater than that of civil engineering graduates. To study this claim, samples of 16 industrial engineers and 16 civil engineers, all of whom graduated in 2006, were chosen and sample members were queried about their starting salaries. If the industrial engineers had a sample mean salary of \$59,700 and a sample standard deviation of \$2,400, and the civil engineers had a sample mean salary of \$58,400 and a sample standard deviation of \$2,200, has the professor's claim been verified?

- ✗ ✓ 6. A question of medical importance is whether jogging leads to a reduction in one's pulse rate. To test this hypothesis, 8 nonjogging volunteers agreed to begin a 1-month jogging program. After the month their pulse rates were determined and compared with their earlier values. If the data are as follows, can we conclude that jogging has had an effect on the pulse rates?

Pulse Rate Before: 74, 86, 98, 102, 78, 84, 79, 70

Pulse Rate After: 70, 85, 90, 110, 71, 80, 69, 74

7. A gun-like apparatus has recently been designed to replace needles in administering vaccines. The apparatus can be set to inject different amounts of the serum, but because of random fluctuations the actual amount injected is normally distributed with a mean equal

to the setting and with an unknown variance σ^2 . It has been decided that the apparatus would be too dangerous to use if σ exceeds 0.10. If a random sample of 50 injections resulted in a sample standard deviation of 0.08, should use of the new apparatus be discontinued? Suppose the level of significance is $\alpha = 0.10$. Comment on the appropriate choice of a significance level for this problem, as well as the appropriate choice of the null hypothesis.

8. A standard drug is known to be effective in 72 percent of the cases in which it is used to treat a certain infection. A new drug has been developed and testing has found it to be effective in 42 cases out of 50. Is this strong enough evidence to prove that the new drug is more effective than the old one? Find the relevant p -value.
9. The corrosion of a certain metallic substance has been studied in dry oxygen at 500 degrees centigrade. In this experiment, the gain in weight after various periods of exposure was used as a measure of the amount of oxygen that had reacted with the sample. Here are the data:

Hours Percent Gain

1.0	.02
2.0	.03
2.5	.035
3.0	.042
3.5	.05
4.0	.054

- a. Fit a linear relation.
- b. Predict the percent gain when the metal is exposed for 3.2 hours.
- c. Estimate the error variance.
- d. Test the significance of β .
- e. What percent of variation in percent gain is explained by period of exposure.
- f. Plot the standardized residuals and comment.

10. Refer to the above question. Calculate the sample correlation coefficient.

11. In 1957 the Dutch industrial engineer J. R. DeJong proposed the following model for the time it takes to perform a simple manual task as a function of the number of times the task has been practiced:

$$T \approx t s^{-n}$$

where T is the time, n is the number of times the task has been practiced, and t and s are parameters depending on the task and individual. Estimate t and s for the following data set.

T	22.4	21.3	19.7	15.6	15.2	13.9	13.7
n	0	1	2	3	4	5	6