

GE2262 Business Statistics
Topic 6: Hypothesis Testing Exercises

Q1

Do students at your school study more, less, or about the same as at other business schools? Business Week reported that at the top 50 business schools, students studied an average of 14.6 hours. Set up a hypothesis test to try to prove that the mean number of hours studied at your school is different from the 14.6 hour benchmark reported by Business Week.

- a) State the null and alternative hypotheses.
- b) What is a Type I error for your test?
- c) What is a Type II error for your test?

Q2

ATMs must be stocked with enough cash to satisfy customers making withdrawals over an entire weekend. But if too much cash is unnecessarily kept in the ATMs, the bank is forgoing the opportunity of investing the money and earning interest. Suppose that at a particular branch the population mean amount of money withdrawn from ATMs per customer transaction over the weekend is \$160 with a population standard deviation of \$30.

- a) If a random sample of 36 customer transactions is examined and the sample mean withdrawal is \$148, is there evidence to believe that the population average withdrawal is less than \$160? (Use a 0.05 level of significance.)
- b) Compute the p-value and interpret its meaning.

Q3

A manufacturer of chocolate candies uses machines to package candies as they move along a filling line. Although the packages are labeled as 8 ounces, the company wants the packages to contain a mean of 8.17 ounces so that virtually none of the packages contain less than 8 ounces. A sample of 50 packages is selected periodically, and the packaging process is stopped if there is evidence that the mean amount packaged is different from 8.17 ounces. Suppose that in a particular sample of 50 packages, the mean amount dispensed is 8.159 ounces, with a sample standard deviation of 0.051 ounce.

- a) Is there evidence that the population mean amount is different from 8.17 ounces? (Use a 0.05 level of significance.)
- b) Compute the p-value and interpret its meaning.

Q4

The Glen Valley Steel Company manufactures steel bars. If the production process is working properly, it turns out that steel bars are normally distributed with mean length of at least 2.8 feet. Longer steel bars can be used or altered, but shorter bars must be scrapped. You select a sample of 25 bars, and the mean length is 2.73 feet and the sample standard deviation is 0.20 feet. Do you need to adjust the production equipment?

- a) If you test the null hypothesis at the 0.05 level of significance, what decision do you make using the critical value approach to hypothesis testing?
- b) If you test the null hypothesis at the 0.05 level of significance, what decision do you make using the p-value approach to hypothesis testing?
- c) Interpret the meaning of the p-value in this problem.
- d) Compare your conclusions in (a) and (b).

Q5

A bank branch located in a commercial district of a city has developed an improved process for serving customers during the 12:00 to 1 p.m. peak lunch period. The waiting time in minutes (operationally defined as the time the customer enters the line to the time he or she is served) of all customers during this hour is recorded over a period of a week. A random sample of 15 customers is selected, and the results are as follows:

4.21	5.55	3.02	5.13	4.77	2.34	3.54	3.20
4.50	6.10	0.38	5.12	6.46	6.19	3.79	

At the 0.05 level of significance, is there evidence that the average waiting time at a bank branch in a commercial district of the city is less than five minutes during the lunch period?

Q6

A television documentary on over-eating claimed that Americans are about 10 pounds overweight on average. To test this claim, 18 randomly selected individuals were examined, and their average excess weight was found to be 12.4 pounds, with a sample standard deviation of 2.7 pounds.

- a) What assumption(s) is(are) required for performing the hypothesis testing in (b) below?
- b) At a significance level of 0.01, is there any reason to doubt the validity of the claimed 10-pound value?
- c) Define the probability of type I error α and that of type II error β according to the context of this part.

Q7

A management consultant has introduced new procedures to a reception office. He claims that the receptionist should not do more than 10 minutes of paperwork in each hour. A check is made on 40 random hours of operation. The sample mean and sample standard deviation of the time spent on paperwork are found. Based on these figures, the null hypothesis that the new procedures meet specifications is rejected at a 1% level of significance.

- a) After the consultant has asked the data entry clerk to show him the original data, he finds that the sample size should be 41, instead of 40. Should the null hypothesis that the new procedures meet specifications be rejected? Why or why not?
- b) Peter, the manager of the reception office, asks the consultant to test the same hypothesis with a new level of significance of 5%. Should the null hypothesis that the new procedures meet specifications be rejected? Why or why not?