

Homework 6

Problem 1 (Calculating sample sizes)

Find the sample sizes required to construct 90%, 95%, and 99% confidence intervals that estimate a population proportion p to within 0.05. Since nothing is known about p , you may assume $p = 0.5$ when estimating the standard error of \hat{p} .

Problem 2 (Calculating sample sizes)

A store is interested in estimating the average amount of organic apples sold daily. Apple sales from 40 randomly selected days show a sample average of 83 pounds of apples with a sample standard deviation of 9.2 pounds. Find the sample sizes required to construct 90%, 95%, and 99% confidence intervals that estimate the average amount of apples sold daily to within 10 pounds.

Problem 3 (Hypothesis tests)

I want to figure out if a coin is fair, so I flip it 100 times, and the coin comes up heads 38 times. (If the coin is fair, then $p = P(\text{heads}) = 0.5$).

- (a) What hypotheses (H_0 and H_A) should be used to test if the coin is fair or not?
- (b) Conduct the hypothesis test at the $\alpha = 0.05$ significance level. State the value of the test statistic, the p-value, and your conclusion.
- (c) What is the probability of Type I error?

Problem 4 (Hypothesis tests)

The National Center for Health Statistics reports that the mean systolic blood pressure for males 35 to 45 years of age is 128 and the standard deviation in this population is 15. The medical director of a large company looks at the medical records of 72 male executives in this age group and finds that the mean systolic blood pressure in this sample is $\bar{x} = 126.07$. Is this evidence that the 72 executives have lower blood pressure than the general population? Conduct a hypothesis test at significance level $\alpha = 0.1$. Report the hypotheses, the test statistic, the p-value, and your conclusion.

Problem 5 (Hypothesis tests and confidence intervals)

Referring to the coin in Problem 3, construct a 95% confidence interval for p (the true probability that the coin comes up heads). Does this interval support your findings in Problem 3?

Problem 6

Refer back to problem 3. State Type I and Type II errors in terms of the problem. What is the probability of a Type I error?

Problem 7 (Hypothesis tests and confidence intervals)

An average lawn has a mean of 21 blades of grass per square inch. A garden store sells an expensive fertilizer designed to transform an average lawn into a lush, thick carpet within three weeks. To test the claim, a random sample of 22 lawn plots was obtained. Each was treated with the fertilizer according to the instructions on the package. Three weeks later the density of each plot was measured by counting the blades of grass per square inch. The summary statistics were $\bar{x} = 22.4$ and $s = 2.7$. Conduct a hypothesis test to determine if the fertilizer improves the thickness of a lawn. Report the hypotheses, the test statistic, the p-value, and your conclusion.

Problem 8

Suppose a random sample of size 55 yields a sample mean $\bar{x} = 16$ and $\sum_i^n x_i^2 = 14,134$. Is this consistent with the hypothesis that the population mean is 15? (Is there evidence to reject $H_0 : \mu = 15$?). Conduct a hypothesis test to answer this question. Report the hypotheses, the test statistic, the p-value, and your conclusion.

Problem 9

Refer back to problem 7. State Type I and Type II errors in terms of the problem.

Textbook Problems

Lecture 15: 5.76, 5.77a	(computing sample sizes)
Lecture 16: 6.1, 6.2, 6.3, 6.20, 6.22, 6.38, 6.40, 6.41, 6.42	(hypothesis tests - conceptual)
Lecture 17: 6.24, 6.26, 6.62, 6.64, 6.68, 6.80, 6.82	(hypothesis tests - extra practice)