Estimation - Assignment

Estimation Exercises

3.1 The percentage of copper in a certain chemical element is measured 6 times. The standard deviation of repeated measurements in such an analysis is known to be 2.5%. The sample mean is 14.1%. Construct a 95% C.I. for the true percentage of copper, assuming that the observations are approximately normally distributed.

3.2 25 measurements are made on the speed of light. Those averaged to 300007 with an SD of 10, the units being in Kilometers per second. Report your estimate of the speed of light as a 95% C.I. (1 Km = (5/8) mile).

3.3 A laboratory has a method for measuring lengths, using modern laser technology. The operator's job is to calibrate a yardstick. Measurements were taken 25 times, resulting in an average of 0.910835 meters, with a standard deviation of 45 microns (a micron is one millionth of a meter). Find an approximate 95% C.I. for the exact length of this stick. (Using this modern laser technology, the length can be measured to within one wave length of visible light which is about half a micron.)

Estimation Exercises

3.4 An investigator made 10 measurements of a metric standard and obtained an average of 1.0002 meters, with a standard deviation of 0.0001 meters. Construct a 90% C.I. for the exact length.

3.5 The weight of v7 similar containers of sulfuric acid is: 9.8, 10.2, 10.4, 9.8, 10.0, 10.2, and 9.6 ounces. Find an 85% C.I. for the mean of all such containers assuming an approximate normal distribution.

3.6 An efficiency expert wishes to determine the average time it takes to drill three holes in a certain clamp. How large a sample will he need to be 95% confident that his sample mean will be within 15 seconds of the true mean? Assume that it is known from previous studies that sigma is 40 seconds.

3.7 A random sample of 8 cigarettes of a certain brand has an average nicotine content of 1806 milligram and a standard deviation of 2.4 milligram. Construct a 99% C.I. for the true average of nicotine content of this particular brand of cigarettes.

Estimation Exercises

3.8 A random sample of 100 families from a large city is chosen to estimate the current average annual demand for milk in that city. The mean family demand from the sample is 150 gallons with a standard deviation of 40 gallons.

a) Construct a 95% C.I. for the mean annual demand of milk by all families in the city.
b) If the rage you obtained in a) is larger than you are willing to accept, in what way can you narrow it?

3.9 In a part of a large city in which houses were rented, an economist wishes to estimate the average monthly rent correct to within US$50, a part from a 1-in-20 chance. If he guesses from past experience that sigma is about US$40, how many houses must he include in his sample?

3.10 The yield of alfalfa fro 9 plots were 0.8, 1.3, 1.5, 1.7, 1.7, 1.8, 2.0, 2.0, and 2.2 tons per acre. Set a 95% C.I. for the true average yield.

3.11 A manufacturer of batteries guarantees them to last for a specified period of time and wants to know how much variability there is in the lifetime of the batteries. A sample of 20 batteries was tested for longevity and S2 was found to be 53 hours. Suppose that the lifetimes are normally distributed, estimate the true variability in the life time as a 99% C.I.

Estimation Exercises

3.14 An electrical engineer wishes to estimate the variation in the amount of heat generated by a certain type of electronic component in order to design an appropriate heat dissipater for it. He took a sample of 16 components and observed the following units of heat generated: Find a 95% confidence interval for the true variation in heat generation.

4.260, 3.882, 4.741, 3.897, 4.925, 4.021, 4.822, 4.113, 4.628, 4.013, 4.728, 4.224, 4.171, 4.585, 4.509, 4.419

3.15 The following are the weights, below, in ounces, of 10 packages of grass seeds distributed by a certain company: Find a 95% confidence interval for the variation in all such packages distributed by this company.

16.9, 15.2, 16.0, 16.4, 16.1, 15.8, 17.0, 16.1, 15.9, 15.8

3.16 The vitamin C concentration (in mg per 100 gm) in a sample of size 17 of canned orange juice is: 16, 22, 21, 20, 23, 21, 19, 15, 13, 23, 17, 20, 29, 18, 22, 16, and 25. Find a 90% C.I. for the true variation in Vitamin C concentrations.

Estimation Exercises

3.17 In a sample of 31 patients, the amount of an anesthetic required to produce anesthesia suitable for surgery was found to have a standard deviation (from patient to patient) of 10.2 mg. Compute a 98% confidence interval on the population standard deviation.

3.18 Five out of 50 randomly selected time sharing terminals give incorrect character response. A firm has 800 of these terminals.

a) Estimate the proportion of terminals that give incorrect response.
b) eport your estimate as a 95% confidence interval on the true population proportion.

3.19 A manufacturer of flashcubes wants to estimate the probability that a flashcube will work. Since, destructive testing is involved; he wants to keep the sample size as small as possible. Find the number of observations that must be taken to estimate the probability within 0.04 and with 95% confidence of that if

a) He has no idea of the percent defective.
b) He believes that the percent defective is no more than 6%.

3.20 A public Library wants to estimate the percentage of books in its collection that have publication dates of 1970 or earlier. How large a random sample must be taken to be 90% sure of coming within 5% of the actual proportion?