

1. Find the appropriate value for constructing a confidence interval in each of the following settings:
 - a. Estimating a population proportion p at a 94% confidence level based on an SRS of size 125.

 - b. Estimating a population mean μ at a 99% confidence level based on an SRS of size 58.

2. A company that produces AA batteries tests the lifetime of random sample of 30 batteries using a special device designed to imitate real-world use. Based on the testing, the company makes the following statement: "Our AA batteries last an average of 430 to 470 minutes, and our confidence in that interval is 95%."
 - a. Determine the point estimate, margin of error, standard error, and sample standard deviation.

 - b. Give a statistically correct interpretation of the confidence level that could be published in a newspaper report.

3. A recent Gallup Poll conducted telephone interviews with a random sample of adults aged 18 and older. Data were obtained for 1000 people. Of these, 37% said that football is their favorite sport to watch on television. Knowing that the confidence interval is set at 95%, find the interval that would capture the population parameter.
4. A school counselor wants to know how smart the students in her school are. She gets funding from the principal to give an IQ test to an SRS of 60 of the over 1000 students in the school. The mean IQ score was 114.98 and the standard deviation was 14.80. Construct a 90% confidence interval for the mean IQ score of students at the school.

5. The Gallup Poll plans to ask a random sample of adults whether they attended a religious service in the last 7 days. How large a sample would be required to obtain a margin of error of at most 0.01 in a 99% confidence interval for the population proportion who would say that they attended a religious service? Show and explain your work.

6. A random digit dialing telephone survey of 880 drivers asked, "Recalling the last ten traffic lights you drove through, how many of them were red when you entered the intersections?" Of the 880 respondents, 171 admitted that at least one light had been red.
 - a. Construct a 95% confidence interval for the population proportion.

 - b. Nonresponse is a practical problem for this survey: only 21.6% of calls that reached a live person were completed. Another practical problem is that people may not give truthful answers. What is the likely direction of the bias: Do you think more or fewer than 171 of the 880 respondents really ran a red light? Why? Are these sources of biased included in the margin of error?

7. Here are measurements (in mm) of a critical dimension on an SRS of 16 of the more than 200 auto engine crankshafts produced in one day:

224.120	224.050	224.017	223.982
223.989	223.961	223.960	224.089
223.987	223.976	223.902	223.980
224.018	224.057	223.913	223.999

- a. Construct and interpret a 95% confidence interval for the process mean at the time of these crankshafts were produced.
- b. The process mean is supposed to be $\mu = 224$ mm but can drift away from this target during production. Does your interval from part (a) suggest that the process mean has drifted? Explain.

8. A lab supply company sells pieces of Douglas fir 4 inches long and 1.5 inches square for force experiments in science classes. From experience, the strength of these pieces of wood follows a Normal distribution with standard deviation 3000 pounds. You want to estimate the mean load needed to pull apart these pieces of wood within 1000 pounds with 95% confidence. How large a sample is needed? Show your work.
9. Explain how each of the following would affect the margin of error of a confidence interval, if all other things remained the same...
- a. Increasing the confidence interval.
 - b. Quadrupling the sample size.
10. When constructing confidence intervals for a population mean, we almost always use critical values from a t distribution rather than the standard Normal distribution.
- a. When it is necessary to use a t critical value rather than a z critical value when constructing a confidence interval for a population mean?
 - b. Describe two ways that the t distributions are different from the standard Normal distribution
 - c. Explain what happens to the t distributions as the degrees of freedom increase.