

Chapter 8 Worksheet 1
Confidence Intervals

- 1) The Arizona Department of Transportation (ADOT) is studying traffic patterns on Loop 101 and needs to estimate the mean number of vehicles per day that use the southbound Chaparral Road off-ramp. A recent random sample of 64 days gives a mean of 14,205 vehicles per day. In previous studies of this same ramp, the standard deviation has been 1,010 vehicles per day.
 - a) Develop a 90% confidence interval estimate for the ramp's true mean daily activity. Interpret your interval.
 - b) Develop a 98% confidence interval estimate for the ramp's true mean daily activity. Interpret your interval.
 - c) Contrast the *margin of error* provided by the two intervals.
 - d) Which interval should ADOT prefer to use?
- 2) OKAYDATA, makers of a particular brand of computer printer, is interested in estimating the mean cost of repair during the first two years of ownership. A random sample of 8 registered owners reported the following costs of repair: \$52.00, 17.50, 0.00, 87.00, 8.75, 32.00, 6.50, 41.00.
 - a) Using an alpha level of 5%, construct a confidence interval for estimating the true mean cost of repair during the first two years of ownership.
 - b) What is the *precision* of your interval?
 - c) What assumption was necessary for your interval in part a)?
 - d) What would the z interval multiplier be if you were entitled to use z? What happens to interval *precision* when you use t instead of z?
- 3) After calculating the confidence interval in problem #1 above, an ADOT director feels the margin of error must be improved to 150. Retaining the same 90% confidence level, what sample size is required?
- 4) To qualify for matching federal highway funds, states are must ensure that at least 70% of their motorists obey the speed limit. A team of federal inspectors has gone to a southern state and checked the speed of 180 randomly-selected vehicles and found that 117 motorists obeyed the speed limit. Based on this evidence, and using a 96% confidence level, can the inspectors make a case for denying the state its funding?
- 5) Refer problem 4 above. Upon reviewing the report submitted by the inspectors, the district manager objects strongly. She claims that the sample size was much too small to draw meaningful conclusions. She wants to limit the precision to no more than .04. Retaining the same 96% confidence level, what sample size is required?
- 6) A few years ago, The Arizona Republic ran a story describing the results of a telephone survey in which 28% of those polled indicated they considered themselves "very religious." The article also described the poll's methodology:

ABOUT THE ARIZONA POLL

The data in the Arizona Poll were based on 1,000 telephone interviews with adults living in Maricopa County. Interviews were conducted Feb. 7-12. The size of the sample gives the overall results of the survey a margin of error of plus or minus 3.1 percentage points. In theory, this means that in 19 cases out of 20, the results based on such samples will differ by no more than 3.1 percentage points in either direction from the results of interviews with all adults living in telephone households in Maricopa County. The margin of error for subsamples of the overall population will be somewhat larger.

Use the appropriate formula to confirm that the sample size should be 1,000 for a desired m.o.e. of 3.1 percentage points. Assume that no previous polls were available to estimate the true proportion in the population.