EXERCISES 12

1. A company packs sacks of flour. The standard deviation of the filling process is $\sigma = 10$g. A sample of 50 bags is taken and weighed and the resulting sample mean is 750g. Compute a 95% and 99% confidence interval for the mean weight of a bag of flour.
2. A company manufactures bolts with a process variance of 50. A sample of 100 bolts is taken and measured and their average length is calculated as 98mm. What is the 95% confidence interval for the mean length of bolts? If the bolts are designed to be 100mm long, is the process satisfactory?
3. AG Automotive claims that its latest hatchback will achieve a fuel efficiency figure of 70 miles per gallon (mpg) on average. A random sample of 8 vehicles was taken, and, after each vehicle was run for a month, the following sample of efficiency figures were obtained

   59.1, 65.8, 76.1, 72.3, 69.3, 71.5, 67.9, 70.5

   Assuming that the population standard deviation is known to be 4mpg, calculate a 95% confidence interval for the mean fuel efficiency figure of the AG Automotive hatchback. Do you think that the manufacturer's claim of 70mpg is justified?
4. A class of students has sat an exam. A sample of 40 students is taken and their marks produced first. This sample has a mean of 55% and a sample variance of 100. Calculate the 95% confidence interval for the mean mark of the class as a whole.
5. A sample of 12 students is taken and their mean IQ calculated as 110 (with a sample variance of 220). What is the 95% and 99% confidence intervals for the population value based on this sample? What do you notice about the calculated interval as the confidence level increases? Do either of these two confidence intervals contain the known population mean IQ of 100?
6. The following are the number of cars caught speeding each day on one speed camera over a two week period.

10	12	15	9	8	12	11
6	15	17	12	10	9	7

   What is the 95% confidence interval for this sample?

7. Past experience shows that the standard deviation of the distances traveled by consumers to patronize a “big-box” retail store is 4 km. Adopting an error probability of 0.05, how large a sample is needed to estimate the population mean distance traveled to within 0.5 km? 1 km? 5 km?

8. A geographer is asked to determine the sample size necessary to estimate the proportion of residents of a city who are in favor of declaring the city a nuclear-free zone. The estimate must not differ from the true proportion by more than 0.05 with a 95% confidence level. How large a sample should be taken? at 99%?

Answers

1. (747.228, 752.772) and (746.357, 753.643).
2. (96.614, 99.386), no
3. (66.291, 71.835), yes
4. (51.9%, 58.1%)
5. (100.58, 119.42), (96.70, 123.30), only 99%
6. (9.096, 12.760)
7. 983, 246, 10
8. 385, 664