1. Assume a sample of $n = 25$ is randomly selected from a normal distribution with $\sigma = 5$. Suppose you get a sample mean of $\overline{x} = 45$. What is the 95% confidence interval for μ?

2. A manufacturer claims that its light bulbs have an average life span of $\mu = 1200$ hours, with a standard deviation of $\sigma = 25$. If you randomly test 36 light bulbs and find that their average life span is $\overline{x} = 1150$, does a 95% confidence interval for μ suggest that the claim $\mu = 1200$ is unreasonable? Explain.

3. Recall that a confidence interval μ (with known σ) can be found from the equation

$$\left(\overline{x} - c\frac{\sigma}{\sqrt{n}}, \overline{x} + c\frac{\sigma}{\sqrt{n}}\right)$$

   What values of c would be needed to compute 80%, 92%, and 98% confidence intervals, respectively?

4. Suppose $n = 16$, $\sigma = 2$, and $\mu = 30$. Assume normality and determine
   (a) $p(\overline{x} < 29)$
   (b) $p(\overline{x} > 30.5)$
   (c) $p(29 < \overline{x} < 31)$

5. Someone claims that within a certain neighborhood, the average cost of a house is $\mu = 100,000$ dollars with a standard deviation of $\sigma = 10,000$ dollars. Suppose that based on $n = 16$ homes, you find that the average cost of a house is $\overline{x} = 95,000$ dollars. Assuming normality, what is the probability of getting a sample mean this low (or lower) if the claims about the mean and standard deviation are true?

6. Compute a 95% confidence interval if:
   (a) $n = 10$, $\overline{x} = 26$, $s = 9$
   (b) $n = 18$, $\overline{x} = 132$, $s = 20$
   (c) $n = 25$, $\overline{x} = 52$, $s = 12$

7. Repeat Exercise 6, but compute 99% confidence intervals instead.

8. Rats are subjected to a drug that might affect aggression. Suppose that for a random sample of rats, measures of aggression are found to be

$$5, 12, 23, 24, 18, 9, 18, 11, 36, 15.$$

   Compute a 95% confidence interval for the mean, assuming that the scores are from a normal distribution.

9. Explain the meaning of a 95% confidence interval to someone who has never had a course in statistics.

10. Last week, we discovered that for a normal model, the maximum likelihood estimate for the population mean μ is the sample mean $\overline{x}$. Based on our work this week, explain what happens to the *precision* of our MLE as sample size increases. (Hint: what is precision? How would we compute it?)