Homework #8 Problems

Do Chapter 8: **8.1**: 2, 3, 4, 8, 9, 12; **8.2**: 1, 4, 9 whose modified statements are given below with modifications.

8.1.2) Consider the one-sided confidence interval expressions for a mean of a normal population.

(a) What value of z_α would result on 98% Confidence Interval (CI)?
(b) What value of z_α would result on 95% CI?
(c) What value of z_α would result on 90% CI?

8.1.3) Following are two confidence interval estimates of the mean μ of the cycles of failure of an automotive door latch mechanism (the test was conducted at an elevated stress level to accelerate failure).

$3148.5 \leq \mu \leq 3250.25$ $3182.40 \leq \mu \leq 3216.35$

(a) What is the value of the sample mean cycles to failure?
(b) The confidence level for one of theses CIs is 95% and for the other is 99%. Both CIs are calculated from the same sample data. Whis is the 95% CI? Explain.

8.1.4) A confidence interval estimate is desired for the gain in a circuit on a semiconductor device. Assume that gain is normally distributed with standard deviation $\sigma = 20$.

(a) Find a 95% confidence interval on μ when n = 12 and $\bar{x} = 1200$
(b) Find a 99% confidence interval on μ when n = 12 and $\bar{x} = 1200$
(c) Find a 95% confidence interval on μ when n = 36 and $\bar{x} = 1200$
(d) Find a 99% confidence interval on μ when n = 36 and $\bar{x} = 1200$
(e) How does the length of the CIs computed change with the change in sample size?
(f) How does the length of the CIs computed change with the change in Confidence level?

8.1.8) The life in hours of a 75-watt light bulb is known to be normally distributed with $\sigma = 20$ hours. A random sample of 18 bulbs has a mean life of $\bar{x} = 1020$ hours.

(a) Construct a 95% two-sided confidence interval on the mean life.
(b) Construct a 95% lower-confidence bound on the mean life.
(c) Compare the lower bound on this confidence interval with the one in part (a).

8.1.9) Suppose that in Exercise 8.1.8 we wanted error in estimating the mean life from the two-sided confidence interval to be 6 hours at 99% confidence. What sample size should be used?

8.1.12) Dairy cows at large commercial farms often receive injections of bST (Bovine Somatotropin), a hormone used to spur milk production. Twelve cows given bST produced an average of 25.0 kg/d of milk. Assume that the standard deviation of milk production is 2.10 kg/d.

(a) Find a 95% confidence interval for the true mean milk production.
(b) If the farms want the confidence interval to be no wider than ± 1.30 kg/d, what level of confidence would they need to use?
(c) What sample size is necessary to estimate the true mean milk production within 1.5 kg/d with a 95% confidence?

8.2.1) A random sample has been taken from a normal distribution. Output from a software package follows:

Variable	n	Sample Mean ($\bar{X}$)	Estimate of Std, Error (SE) of Mean	Sample Std. Dev (S)	Sample Variance (S^2)	Sum ($\sum_{i=1}^{n} x_i$)
X			15.27525	37.41657		900

(a) Fill in the missing quantities.
(b) Find a 95% CI on the population mean.

8.2.4) Determine the t-percentile that is required to construct each of the following two-sided confidence intervals:

(a) Confidence level = 95%, degrees of freedom = 20
(b) Confidence level = 99%, degrees of freedom = 20
(c) Compare the two t-percentile values obtained above.

Determine the lower t-percentile value for the following one-sided lower confidence intervals:

(a) Confidence level = 95%, degrees of freedom = 20
(b) Confidence level = 99%, degrees of freedom = 20
(c) Compare the two t-percentile values obtained above.

8.2.9) A machine produces metal rods used in an automobile suspension system. A random sample of 15 rods is selected, and the diameter is measured. The resulting data (in millimeters) are as follows:

8.20 8.25 8.18 8.25 8.22 8.20 8.28 8.28 8.18 8.24 8.25 8.25 8.17 8.26 8.22

(a) Check the assumption of normality for rod diameter.
(b) Calculate a 99% two-sided confidence interval on mean rod diameter.
(c) Calculate a 99% upper confidence bound on the mean.
(d) Compare this bound with upper bound of the two-sided confidence interval and discuss why they are different.