GE2262 Business Statistics
Topic 5: Confidence Interval Estimation Exercises

Q1

If $\bar{X}=120$, $\sigma=24$ and n=36, construct a 99% confidence interval estimate of the population mean, μ

Q2

A stationery store wants to estimate the mean retail value of greeting cards that it has in its inventory. A random sample of 100 greeting cards indicates a mean value of $2.65 and a standard deviation of $0.44.

Assuming a normal distribution, construct a 95% confidence interval estimate of the mean value of all greeting cards in the store's inventory.

Q3

The U.S. Department of Transportation requires tire manufacturers to provide tire performance information on the sidewall of the tire to better inform prospective customers when making purchasing decisions. One very important measure of tire performance is the tread wear index, which indicates the tire's resistance to tread wear compared with a tire graded with a base of 100. This means that a tire with a grade of 200 should last twice as long, on average, as a tire graded with a base of 100. A consumer organization wants to estimate the actual tread wear index of a brand name of tires that claims "graded 200" on the sidewall of the tire. A random sample of n=18 indicates a sample mean tread wear index of 195.3 and a sample standard deviation of 21.4.

a) Assuming that the <u>population of tread wear indexes is normally distributed,</u> construct a 95% confidence interval estimate of the population mean tread wear index for tires produced by this manufacturer under this brand name.
b) Do you think that the consumer organization should accuse the manufacturer of producing tires that <u>do not meet the performance information</u> provided on the sidewall of the tire? Explain.
c) Explain why an observed tread wear index of 210 for a particular tire is not unusual, even though it is outside the confidence interval developed in (a).

Q4

An advertising agency that serves a major radio station wants to estimate the mean amount of time that the station's audience spends listening to the radio on a daily basis. From past studies, the standard deviation is estimated as 45 minutes. Assume the population has the normal distribution.

a) What sample size is needed if the agency wants to be 90% confident of being correct to within $\pm$ 10 minutes?
b) If 99% confidence is desired, how many listeners need to be selected?

Q5

The personal director of a large corporation wants to study absenteeism among clerical workers at the corporation's central office during the year. A random sample of 25 clerical workers reveals the following:

$$\text{Absenteeism: } \overline{X}=9.7 \text{ days, s=4.0 days}$$

a) Set up a 95% confidence interval estimate of the average number of absences for clerical workers. Give a practical interpretation of the interval obtained.

b) What assumption must hold in order to perform the estimation in (a)?

c) If the personnel director also wants to take a survey in a branch office, what sample size is needed if the director wants to be 95% confident of being correct to within ± 1.5 days and the population standard deviation is assumed to be 4.5 days?

Q6

A food inspector, examining 10 bottles of a certain brand of honey, obtained the following percentages of impurities:

23.5   19.8   21.3   22.6   19.4   18.2   24.7   21.9   20.0   21.1

a) What are the mean and standard deviation of this sample?

b) With 95% confidence, what is the sampling error if the inspector used the sample mean to estimate the mean percentage of impurities in this brand of honey?

Q7

A sample of 12 observations is obtained from an infinite population with normal distribution. Based on the sample data, the 95% confidence interval for the population mean is calculated to be [20, 30]. Form this 95% confidence interval, determine the mean and standard deviation of the sample.

Q8

From past experience, the numbers of vitamin supplements sold per day in a health food store well fit a normal distribution with variance 9. The number of vitamin supplements sold per day in a sample of 11 days is obtained:

19   19   20   20   20   22   23   25   26   27   30

a) Construct a 95% confidence interval for population average number of vitamin supplements sold per day in the store.

b) Someone suggests constructing the confidence interval by t-distribution. Do you agree? Explain your opinion.

c) The data analyst found that there is a data-entry mistake. The last observation should be smaller than 30. How will this affect the confidence interval?

d) If the company would like to limit the sampling error within ± 0.5, what is the least sample size needed for a 90% confidence interval?