

# Sampling Distributions and Confidence Intervals Worksheet

- 1. The number of eggs a female house fly lays during her lifetime is normally distributed with a mean of 800 eggs and a standard deviation of 100 eggs.**
  - Random samples of size 16 are drawn from this population and the mean of each sample is determined. Find the mean and standard error of the sampling distribution.
  - Random samples of size 36 are drawn from this population and the mean of each sample is determined. Find the mean and standard error of the sampling distribution.
  - Random samples of size 100 are drawn from this population and the mean of each sample is determined. Find the mean and standard error of the sampling distribution.
  - Sketch the distributions from parts a, b, and c.
- 2. The mean life span of a brand name tire is 50,000 miles. Assume that the life spans of the tires are normally distributed, and the population standard deviation is 800 miles.**
  - If you select one tire, what is the probability that its life span is less than 48,500 miles?
  - If you select 100 tires, what is the probability that their mean life span is more than 50,200 miles?
- 3. The mean annual salary for registered nurses in the U.S. is \$38,000. Assume that  $\sigma = \$1700$ .**
  - A sample of 15 nurses selected. What is the probability that their mean annual salary is less than \$34,500?
  - A sample of 65 nurses selected. What is the probability that their mean annual salary is more than \$38,600?
- 4. You work for a consumer advocate agency and want to find the mean repair cost of a washing machine. As part of your study, you randomly select 40 repair costs and find the mean to be \$100.00. From past studies, you assume that the  $\sigma$  is \$17.50.**
  - Construct a 90% confidence interval. (Include all three steps: check conditions, calculate the CI, and interpret it).
  - Construct a 95% confidence interval. (You don't need to check the conditions again, but calculate the CI and interpret it).
  - Construct a 99% confidence interval. (You don't need to check the conditions again, but calculate the CI and interpret it).
  - Draw the intervals from the previous parts on a number line. Draw all three on the same number line with the point estimate in the middle.
  - Determine the minimum required sample size if you want to be 95% confident that the sample mean is within \$10 of the population mean.

5. A publisher wants to estimate the mean length of time (in minutes) all adults spend reading newspapers. To determine this estimate, the publisher takes a random sample of 15 people and obtains the following results:

11, 9, 8, 10, 10, 9, 7, 11, 11, 7, 6, 9, 10, 8, 10

Assume that the population of times is normally distributed.

- Find the point estimate of the population mean.
  - Construct the 95% confidence interval for the mean population length reading time and interpret it.
  - What is the margin of error?
  - How can we reduce the margin of error?
6. Given the population of the eight planets in our solar system and their period of revolution around the Sun (in Earth days).

Planet	Period
Mercury	88
Venus	225
Earth	365
Mars	687
Jupiter	4,332
Saturn	10,760
Uranus	30,684
Neptune	60,188

We want to know the mean period of revolution around the Sun (in earth days) for the eight planets. Does it make sense to calculate a 95% confidence interval? Explain your answer.

7. Based on a sample of 100 employees a 95% confidence interval is calculated for the mean age of all employees at a large firm. The interval is (34.5 years, 47.2 years).
- What was the sample mean?
  - Find the margin of error.
8. A soccer ball manufacturer wants to estimate the mean circumference of soccer balls within 0.1 inch. Determine the minimum sample size needed to construct a 99% confidence interval for the population mean. Assume the population standard deviation is 0.25 inch.

- 9. The proportion of students at a college who have GPA higher than 3.5 is 19%.**
- You take repeated random samples of size 25 from that college and find the proportion of student who have GPA higher than 3.5 for each sample. What is the mean and the standard error of the sampling distribution of the sample proportions?
  - You take repeated random samples of size 50 from that college and find the proportion of student who have GPA higher than 3.5 for each sample. What is the mean and the standard error of the sampling distribution of the sample proportions?
  - Compare the results of parts a and b, and sketch the sampling distributions.
- 10. In 2001, a Gallup poll surveyed 1016 households in the U.S about their pets. Of those surveyed, 599 said they had at least one dog or cat as a pet.**
- Find and interpret the 90% CI for the population proportion. What is the margin of error?
  - Find and interpret the 99% CI for the population proportion. What is the margin of error?
- 11. You wish to estimate, with 95% confidence, the proportion of computers that need repairs or have problems by the time the product is three years old. Your estimate must be accurate within 3% of the true proportion.**
- If no preliminary estimate is available, find the minimum sample size required.
  - Find the minimum sample size needed, using a prior study that found that 19% of computers needed repairs or had problems by the time the product was three years old.