

## From Probability to Inference

### Project 9 THE AGE OF A PENNY

Have you ever wondered how long coins stay in circulation? Are you a collector? You each have a tube of pennies. Your first task is to form a distribution of their ages.

1. Organize the data by using a stemplot of the ages. Split the stems to give sufficient stems to the data.



2. What is the shape of the distribution? Why do you think it is this shape?
3. Did you find any outliers?
4. Do you think the distribution of all pennies in circulation is similar to your sample?
5. List the characteristic assumptions for the Central Limit Theorem, and decide if they are satisfied by your distribution.

6. Find the mean and standard deviation of the ages of the pennies in your sample.

Mean = \_\_\_\_\_ S.D. = \_\_\_\_\_ n = \_\_\_\_\_

7. Compute a 95% confidence interval for the mean ages of pennies.

\_\_\_\_\_ <  $\mu$  < \_\_\_\_\_

8. What is the margin of error for your estimate?

M.E. = \_\_\_\_\_

9. The president of "COINS UNLIMITED" has just hired you as his chief statistician for his research on the age of pennies. You are charged with the task of estimating the average age of pennies in circulation within one year of age with 99% confidence. How large of a sample would you need to obtain? Use the standard deviation from your sample as your best estimate of the population standard deviation.

10. Consider your roll of pennies as a population and place a scale of the ages on the number line below. Choose 20 pennies at random from your pile of pennies. Find the mean and standard deviation of the sample and compute a 95% confidence interval for the population mean,  $\mu$ . Draw a line segment for this interval below the number line that you have scaled. Mix up the pennies and repeat the process five times. Do the intervals of your sample capture the value of  $\mu$ ? Why or why not?

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  $\mu$  \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

11. On the basis of your research with this project, how would you define the age of a "rare" coin? Give a statistical definition for your choice.

12. What would be the age of the pennies that you would begin to save before they become hard to find? Give a statistical reason for your choice. Consider "rare" as 2% or less of the population.