

## In-Class Activity 1 (Jan 7)

1. The blood pressure of one tribe of people has a mean of 125 mmHg and standard deviation of 50 mmHg. Is there reason to believe the distribution cannot be Normal?
2. The weight of a specific product follows a normal distribution with a mean of 30 g and a standard deviation of 4 g.
  - a. Calculate the probability that a randomly chosen product weights less than 27.6g.
  - b. What is the probability that a randomly chosen product has a weight that exceeds 26.6 g?
  - c. What is the probability that a randomly chosen product is between 26.9 and 29.6 g?
- 3a. What is the maximum weight of the lightest 10% of products?
- 3b. What is the minimum weight of the heaviest 5% of products?
- 4a. calculates the z-score for the 10th percentile, which corresponds to the maximum weight of the lightest 10% of products.
- 4b. calculates the z-score for the 95th percentile, which corresponds to the minimum weight of the heaviest 5% of products.
5. We are interested to calculate the marginal error when we are 95% Confident that our interval contains the true mean of our population. What should be the z-score?

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6. The weight of a specific product follows a normal distribution with a mean of 30 g and a standard deviation of 4 g.

6a. If we select a simple random sample of 49 products, what is the probability that the average weight of our sample is less than 30.6 g?

6b. If we select a simple random sample of 49 products, what is the probability that the average weight of our sample is at least 30.6 g?

6c. If we select a simple random sample of 49 products, what is the probability that the average weight of our sample is between 28.9 and 29.6 g?

6d. Ninety percent of the average weight of 49 randomly selected products are less than how many grams?

6e. Ninety percent of the average weight of 49 randomly selected product are greater than how many grams?

7. Psychologists have found that twins, in their early years, tend to have lower intelligence quotients and pick up language more slowly than nontwins. The slower intellectual growth of twins may be caused by benign parental neglect.

Suppose we want to investigate this phenomenon. A random sample of  $n = 50$  sets of 2.5 -year-old twin boys is selected, and the total parental attention time given to each pair during 1 week is recorded.

Estimate  $\mu$ , the mean attention time given to all 2.5 year-old twin boys by their parents, using a 99% confidence interval. Interpret the interval in terms of the problem. (Use ATTENTIMES -> chapter1 -> D2L.)

8. The Geothermal Loop Experimental Facility, located in the Salton Sea in southern California, is a U.S. Department of Energy operation for studying the feasibility of generating electricity from the hot, highly saline water of the Salton Sea. Operating experience has shown that these brines leave silica scale deposits on metallic plant piping, causing excessive plant outages. Researchers found that scaling can be reduced somewhat by adding chemical solutions to the brine. In one screening experiment, each of five antiscalants was added to an aliquot of brine, and the solutions were filtered. A silica determination (parts per million of silicon dioxide) was made on each filtered sample after a holding time of 24 hours, with the results stored in SILICA data set (D2L). Estimate the mean amount of silicon dioxide present in the five antiscalant solutions. Use a 95% confidence interval.

9. After installing a drive-thru ATM on the outside of a local bank, the bank manager wanted to see if customers' waiting time inside the bank was shortened during lunch hour (12noon-1pm). In the past (before the installation of the drive-thru ATM), the average customers' waiting time (inside the bank) during lunch hour has been 15 minutes. From a random sample of 20 bank customers during lunch hour (12noon-1pm), the average wait time was found to be 12.3 minutes. It is known that the wait time has a Normal distribution and a standard deviation of 9 minutes. Can we show that the current wait time has been shortened?

- Identify the parameter of interest.
- Set up the null hypothesis and the alternative hypothesis.
- Draw an appropriate conclusion. Use  $\alpha = 0.05$ .
- What if you wanted to check that waiting time  $\neq 15$ ?

10. Humerus bones from the same species of animal tend to have approximately the same length-to-width ratios. When fossils of humerus bones are discovered, archeologists can often determine the species of animal by examining the length-to-width ratios of the bones. It is known that species A has a mean ratio of 8.5. Suppose 41 fossils of humerus bones were unearthed at an archeological site in East Africa, where species A is believed to have flourished. (Assume that the unearthed bones were all from the same unknown species.) The length-to-width ratios of the bones were measured and are recorded in BONES data set.

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- a. Do these data present sufficient evidence to indicate that the mean ratio of all bones of this species differs from 8.5? Use  $\alpha = .05$ .
- b. The mean ratio of all bones of this species is greater than 8.5? Use  $\alpha = .05$ .
- c. The mean ratio of all bones of this species is less than 8.5? Use  $\alpha = .05$ .

11. A dietitian has developed a diet that is low in fats, carbohydrates, and cholesterol. Although the diet was initially intended to be used by people with heart disease, the dietitian wishes to examine the effect this diet has on the weights of obese people. Two random samples of 100 obese people each are selected, and one group of 100 is placed on the low-fat diet. The other 100 are placed on a diet that contains approximately the same quantity of food but is not as low in fats, carbohydrates, and cholesterol. For each person, the amount of weight lost (or gained) in a 3-week period is recorded. The data, saved in DIETS data set (D2L).

- a. Form a 95% confidence interval for the difference between the population mean weight losses for the two diets. Interpret the result.
- b. What is the alternative hypothesis in a?
- c. What if you want to test that the differences is greater than or smaller than zero?

12. Suppose you wish to compare a new method of teaching reading to "slow learners" to the current standard method. You decide to base this comparison on the results of a reading test given at the end of a learning period of 6 months. Of a random sample of 22 slow learners, 10 are taught by the new method and 12 are taught by the standard method. All 22 children are taught by qualified instructors under similar conditions for a 6-month period. The results of the reading test at the end of this period are recorded in READING data set.

- a. Use the data to test whether the true mean test scores differ for the new method and the standard method. Use  $\alpha = .05$ .
- b. What assumptions must be made in order that the estimate be valid?

13. Data set: PAIRED shows the data on reading test scores for eight pairs of slow learners with similar reading IQs of which one member is randomly assigned to the standard teaching method while the other is assigned to the new method. Do the data support the hypothesis that the population mean reading test score for slow learners taught by the new method is greater than the mean reading test score for those taught by the standard method.