AP Statistics Ch 9 HW Assignment:

1. What is a sampling distribution? Define it.

2. Define what each of these notations represent and explain how they are different from each other:

   μ, σ, $\bar{x}$, $\mu_{\bar{x}}$, $\sigma_{\bar{x}}$, p, $\hat{p}$, $\mu_{\hat{p}}$, $\sigma_{\hat{p}}$

3. What is standard error? How is it different from standard deviation?

4. Define inference? What is it used for?

5. What is the difference between a parameter and a statistic? How do you tell the difference between the two?

6. Indicate which values are parameters and which ones are statistics: The National Center for Health Statistics reports that the mean systolic blood pressure for males 35 to 44 years of age is 128 and the standard deviation is 15. The medical director of a large company looks at the medical records of 72 executives in this age group and finds that the mean systolic blood pressure for these executives is 126.07.

7. What is the Central Limit Theorem? What does it say and how is it used?

8. What conditions must be met in before you can use the Central Limit Theorem? List out these conditions and indicate why they are important:

9. What is the equation for standard error? What conditions must be met to use this formula? Does the population need to be normally distributed? Explain:

10. According to government data, 22% of American children under the age of 6 live in households with incomes less than the official poverty level. A study of learning in early childhood chooses an SRS of 300 children.
    i) What is the probability that more than 20% of the sample are from poverty households? (Remember to check that you can use the Normal approximation.)

11. Why is it important to check for the conditions of normality before we perform any inference procedure? Explain:

12. What is the difference between a "mean" and a "proportion"?

13. The weights of newborn children in the United States vary according to the Normal distribution with mean 7.5 pounds and standard deviation 1.25 pounds. The government classifies a newborn as having low birth weight if the weight is less than 5.5 pounds.
    i) What is the probability that a baby chosen at random weighs less than 5.5 pounds at birth?

    ii) You choose three babies at random and compute their mean weight, $\bar{x}$.

    iii) What are the mean and standard deviation of the sampling distribution of the mean weight $\bar{x}$ of the three babies?

    iv) What is the probability that their average birth weight is less than 5.5 pounds?

    v) Would your answers to 1, 2, or 3 be affected if the distribution of birth weights in the population were distinctly non-Normal?

14. Derive the equation for standard error on the distribution of sample means and sample proportions. Show all your work and steps:

15. Big Town Fisheries recently stocked a new lake in a city park with 2,000 fish of various sizes. The distribution of the lengths of these fish is approximately normal.

(a) Big Town Fisheries claims that the mean length of the fish is 8 inches. If the claim is true, which of the following would be more likely?
- A random sample of 15 fish having a mean length that is greater than 10 inches or
- A random sample of 50 fish having a mean length that is greater than 10 inches

Justify your answer.

(b) Suppose the standard deviation of the sampling distribution of the sample mean for random samples of size 50 is 0.3 inch. If the mean length of the fish is 8 inches, use the normal distribution to compute the probability that a random sample of 50 fish will have a mean length less than 7.5 inches.

16. A local radio station plays 40 rock-and-roll songs during each 4-hour show. The program director at the station needs to know the total amount of airtime for the 40 songs so that time can also be programmed during the show for news and advertisements. The distribution of the lengths of rock-and-roll songs, in minutes, is roughly symmetric with a mean length of 3.9 minutes and a standard deviation of 1.1 minutes.

(a) Describe the sampling distribution of the sample mean song lengths for random samples of 40 rock-and-roll songs.

(b) If the program manager schedules 80 minutes of news and advertisements for the 4-hour (240-minute) show, only 160 minutes are available for music. Approximately what is the probability that the total amount of time needed to play 40 randomly selected rock-and-roll songs exceeds the available airtime?

Q17.

A tire manufacturer designed a new tread pattern for its all-weather tires. Repeated tests were conducted on cars of approximately the same weight traveling at 60 miles per hour. The tests showed that the new tread pattern enables the cars to stop completely in an average distance of 125 feet with a standard deviation of 6.5 feet and that the stopping distances are approximately normally distributed.

(a) What is the 70th percentile of the distribution of stopping distances?

(b) What is the probability that at least 2 cars out of 5 randomly selected cars in the study will stop in a distance that is greater than the distance calculated in part (a) ?

(c) What is the probability that a randomly selected sample of 5 cars in the study will have a mean stopping distance of at least 130 feet?