Chapter 7 FRQ Review

Name _____

1. For each of the following situations, identify the population of interest, the parameter, and the statistic.
    a. A medical researcher is interested in exploring the effects of a new medicine on blood pressure. 500 males with high blood pressure are randomly selected and given the new drug. After two weeks, their blood pressure is measured and the average arterial pressure is calculated.

    b. A study is conducted to determine whether or not the dangerous activity of texting while driving is a common practice. 1500 16 – 24 year olds are randomly selected and asked whether or not they text while driving. Of the 1500 drivers, 12% indicate they text while driving.

2. A breakfast cereal includes marshmallow shapes in the following distribution: 10% stars, 10% crescent moons, 20% rockets, 40% astronauts, 20% planets. We are interested in examining the proportion of rockets in a random sample of 2000 marshmallows from the cereal.
    a. Sketch the population distribution of marshmallow shapes.

    b. Suppose you were to collect a random sample of 2000 marshmallow shapes. Sketch the distribution of sample data you would expect to see. How many rockets would you expect to see in your sample?

    c. Now, suppose you collected many samples of the same size. Describe the sampling distribution of the proportion of rockets you think you would see in the samples.

3. Suppose your job at a potato chip factory is to check each shipment of potatoes for quality assurance. Further, suppose that a truckload of potatoes contains 95% that are acceptable for processing. If more than 10% are found to be unacceptable in a random sample, you must reject the shipment. To check, you randomly select and test 250 potatoes. Let $\hat{p}$ be the sample proportion of unacceptable potatoes.
    a. What is the mean of the sampling distribution of $\hat{p}$?

    b. Check the 10% condition and calculate the standard deviation of the sampling distribution of $\hat{p}$.

    c. Check the Normal condition of the sampling distribution of $\hat{p}$. Do you think it would be likely to reject the truckload based on a random sample of 250 potatoes? Why or why not?

4. A phone company is interested in exploring marketing possibilities for a new smartphone for teenagers. They ask an SRS of 1000 high school students whether they own a smartphone. Suppose 65% of all high school students own a smartphone. What is the probability that the random sample selected by the company will result in a $\hat{p}$ -value within 3 percentage points of the true population proportion? Show all your work!

5. The times it takes 5^{th} graders to complete a particular mathematics problem are Normally distributed with mean 2 minutes and standard deviation 0.8 minutes.
    a. Find the probability that a randomly chosen 5^{th} grader will take more than 2.5 minutes to complete the problem. Show your work.

    b. Suppose you give the problem to an SRS of 20 students. Determine the probability that the mean time to complete the problem for the SRS of students is greater than 2.5 minutes. Show your work.

6. The blood cholesterol level of adult men has mean 188 mg/dl and standard deviation 41 mg/dl. A SRS of 150 men is selected and the mean blood cholesterol level in the sample is calculated. What is the probability that the sample mean will be greater than 193? Show your work.

Answers

1. a) The population of interest is males with high blood pressure. The parameter, μ, is the mean arterial pressure of all males with high blood pressure. The statistics, $\bar{x}$, is the mean arterial pressure of the sample of 500 males with high blood pressure.

   b) The population of interest is 16-24 year olds who can drive. The parameter, *p*, is the proportion of 16-24 year olds who can drive and text. The statistics, $\hat{p}$, is the proportion of the sample of 1500, 16-24 year olds who drive and text.
2. b) We would expect 400 rocket marshmallows.

   c) Assuming we are using n = 2000, the mean of the sampling distribution would be 0.2 and the standard deviation of the sampling distribution is 0.0089.
3. a) The mean of the sampling distribution of $\hat{p}$ is 0.05

   b) Assume there are more than 2500 potatoes in the truckload. $\sigma_{\hat{p}}$ = 0.01378

   c) 250(.05) = 12.5, which is greater than 10. 250(.95) = 237.5, which is greater than 10. Since both conditions are met, we can proceed with normal rules to find the probability. I do not think it would be likely to reject the truckload based on the random sample of 250 potatoes because the probability that I find 10% or more that are unacceptable is 0.000143, which is below the 0.05 threshold.
4. The probability that the random sample selected by the company will result in a $\hat{p}$ within 3% points of the true population proportion is 0.9533.
5. a) The probability that a randomly chosen 5^{th} grader will take more than 2.5 minutes to complete the problem is 0.2659.

   b) The probability that the mean time to complete the problem for the SRS of 20 students is greater than 2.5 minutes is 0.002596.
6. The probability that the sample mean of blood cholesterol level of 150 men will be greater than 193 mg/dl is 0.0676.