AP Statistics
Extra Chapter 7 Test Review

Name Key
Date________________Hour__________

1) A certain beverage company is suspected of underfilling its cans of soft drink. The company advertises that its cans contain, on average, 12 ounces of soda with standard deviation 0.4 ounce. For the questions that follow, suppose that the company is telling the truth.

Let X = amt of soda in can $\mu_x = 12 oz$ $\sigma_x = 0.4 oz$

(a) Can you calculate the probability that a single randomly selected can contains 11.9 ounces or less? If so, do it. If not, explain why you cannot.

No, we do not know the shape of the distribution, so we can't calculate this probability.

(b) A quality control inspector measures the contents of an SRS of 50 cans of the company's soda and calculates the sample mean $\bar{x}$. What are the mean and standard deviation of the sampling distribution of $\bar{x}$ for samples of size n = 50?

① SRS of n = 50 where $\mu_x = 12 oz$, then $\mu_{\bar{x}} = \mu_x = 12 oz$.

② ✓ 10%

10(50) ≤ population of all can's company's soda

500 ≤ population

reasonable to assume so $\sigma_{\bar{x}} = \frac{0.4}{\sqrt{50}} = .0566$

(c) The inspector in part (b) obtains a sample mean of $\bar{x}$ = 11.9 ounces. Calculate the probability that a random sample of 50 cans produces a sample mean amount of 11.9 ounces or less. Be sure to explain why you can use a Normal calculation.

③ ✓ for Normal Conditions

Since n = 50 and 50 ≥ 30, by CLT, the distribution of sample means is ~N(12, .0566)

$P(\bar{x} \leq 11.9)$ = normcdf(−∞, 11.9, 12, .0566) ≈ .0386

(d) What would you conclude about whether the company is underfilling its cans of soda? Justify your answer.

If the true mean amount of soda in the cans is 12 oz, there is about a 4% chance of getting a sample mean as low or lower than 11.9 oz. This result is unlikely enough to give us some suspicion that the company is underfilling its cans of sodas.

$n = 500$

2) An opinion poll asks a sample of 500 adults (an SRS) whether they favor giving parents of school-age children vouchers that can be exchanged for education at any public or private school of their choice. Each school would be paid by the government on the basis of how many vouchers it collected. Suppose that in fact 45% of the population favor this idea.

(a) What is the mean of the sampling distribution of $\hat{p}$, the proportion of adults in samples of 500 who favor giving parents of school-age children these vouchers?

Since SRS size $n = 500$ and $p = .45$, then $\mu_{\hat{p}} = p = .45$

(b) What is the standard deviation of $\hat{p}$?

$\sigma_{\hat{p}} = \sqrt{\frac{(.45)(.55)}{500}} \approx \underline{\underline{.0222}}$

✓ 10%

$10(500) \leq$ pop of parents school age children

$5000 \leq$ pop

reasonable to assume

(c) Check that you can use the Normal approximation for the distribution of $\hat{p}$.

✓ normal

$np \geq 10$ and $n(1-p) \geq 10$

$500(.45) \geq 10$ and $500(.55)$

$225 \geq 10$ and $275 \geq 10$

(d) What is the probability that more than half of the sample are in favor? Show your work.

$P(\hat{p} > .50)$ = normcdf$(.50, \infty, .45, .0222) \approx .0122$

$\sim N(.45, .0222)$