

A.P. Statistics
Assignment 6-6

Remember to show your thinking through your work.

1. What are the conditions for using the standard deviation formula $\sqrt{\frac{p(1-p)}{n}}$ when working with a sampling distribution of proportions?

2. What are the conditions for using the normal approximation for a sampling distribution of proportions?

3. Your mail-order company advertises that it ships 95% of its orders within three working days. You select an SRS of 100 of the 5000 orders received in the past week for an audit. The audit reveals that only 91 of these orders were shipped on time.

- a. What is the sample proportion of orders shipped on time?

- b. If the company really ships 95% of its orders on time, what is the probability that the proportion in an SRS of 100 orders is as small as the proportion in your sample or smaller? (Use a normal approximation – but be sure to JUSTIFY the standard deviation and approximation first!.)

- c. A critic says, "Aha! You claim 95%, but in your sample the on-time percentage is lower than that. So the 95% claim is wrong." Does your probability calculation in (b) support or refute the 95% claim. Explain.

4. You are the new owner of a restaurant. You read that a sample survey by the National Restaurant Association shows that 40% of adults are committed to eating nutritious food when eating away from home. To help plan your menu, you decide to conduct a sample survey in your own area. You will use random digit dialing to contact an SRS of 200 households by telephone.

- a. If the national result holds in your area, is it reasonable to use a normal approximation for the sampling distribution? Be sure to justify your response.

- b. What is the mean number of nutrition-conscious people in your sample if $p = 0.4$ is true?

- c. What is the probability that X lies between 75 and 85?

- d. You found that 100 of your 200 respondents are concerned about nutrition. Is this reason to believe that the percent in your area is higher than the national 40%?

5. A student organization is planning to ask a sample of 50 students if they have noticed alcohol abuse brochures on campus. The sample percentage who say "Yes" will be reported. The organization's statistical advisor says that the standard deviation of this percentage will be about 7%.

- a. What would the standard deviation be if the sample contained 100 students rather than 50?

- b. How large a sample is required to reduce the standard deviation of the percentage who say "Yes" from 7% to 3.5%? Explain to someone who knows no statistics the advantage of taking a larger sample in a survey of opinion.

6. A national opinion poll found that 44% of all American adults agree that parents should be given vouchers good for education at any public or private school of their choice. Suppose that in fact the population proportion who feel this way is also 44%.

- a. Many opinion polls have a "margin of error" of about 3% (meaning plus or minus 3%). What is the probability that an SRS of size 300 has a

sample proportion that is within 3% of the population proportion $p = 0.44$?
(Be sure to first, as always, justify the use of the normal approximation.)

- b. Answer the same question for SRSs of sizes 600 and 1200. What is the effect of increasing the size of the sample?