Homework 6 Solutions
Chapter 9: #15, 25, 37, 44
Chapter 9: #50 (Each of the 6 parts counts as 1 point)
Chapter 10: (NOT TO HAND IN) #5, 22, 42

Assigned Wed, Nov 3

9.15 Research question: How much difference is there between the proportions getting relief from sore throat symptoms in the population if herbal tea is used versus if throat lozenges are used?
Population parameter: $p_1 - p_2$ = difference in proportions reporting relief if everyone in the population were to use herbal tea compared with if everyone in the population were to use throat lozenges.
Sample estimate: $\hat{p}_1 - \hat{p}_2$ = difference in observed proportions reporting relief for the two different methods in the study of 200 volunteers.

9.25 **a.** The population proportion would not change. It is the proportion of all adults in the population that buys organic vegetables.
b. The sample proportion would change for each sample.
c. The standard deviation of $\hat{p}$ would not change. It is based on the population proportion and on the sample size, which is 1000 for each of the samples.
d. The standard error would change because it is an estimate of the standard deviation of the sampling distribution, and it uses the sample data, which changes for each sample.
e. The sampling distribution of $\hat{p}$ remains the same for all samples of the same size (1000 in this case) from the same population.

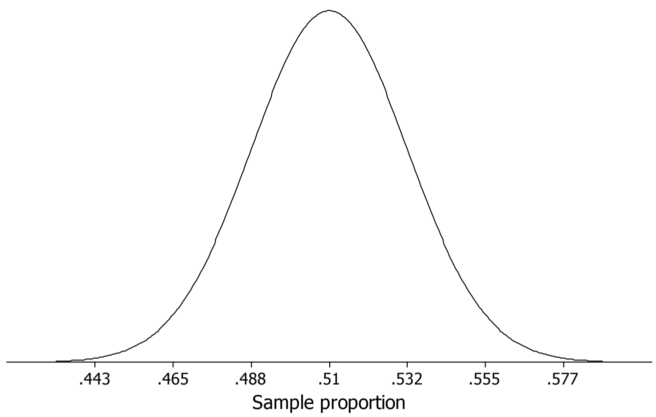
9.37 **a.** Mean = .70; s.d.$(\hat{p})=\sqrt{\frac{.70(1-.70)}{200}}=.0324$.
b. .70 ± (3×.0324), or .6028 to .7972.
c. $\hat{p}=120/200=.60$. This is a statistic.
d. The value .60 is slightly below the interval of possible sample proportions for 99.7% of all random samples of 200 from a population where p = .70. In other words, the sample proportion is unusually low if the true proportion were .70. Maybe the population value is actually less than .70.

9.44 The student is right that once a sample is taken, the observed value of the proportion is known so that particular value doesn't have a distribution. In essence, the sampling distribution describes what the sample proportions *might be* for all the *different samples* of the same size that could be taken from the same population. The sampling distribution gives information about how much the sample proportion might differ if we observed a different sample.

Assigned Fri, Nov 5

9.50 **a.** The sampling distribution is approximately normal with a mean of p_1 = .51 and standard deviation of $\sqrt{\frac{.51(.49)}{500}}$ = .0224.

Figure for Exercise 9.50a

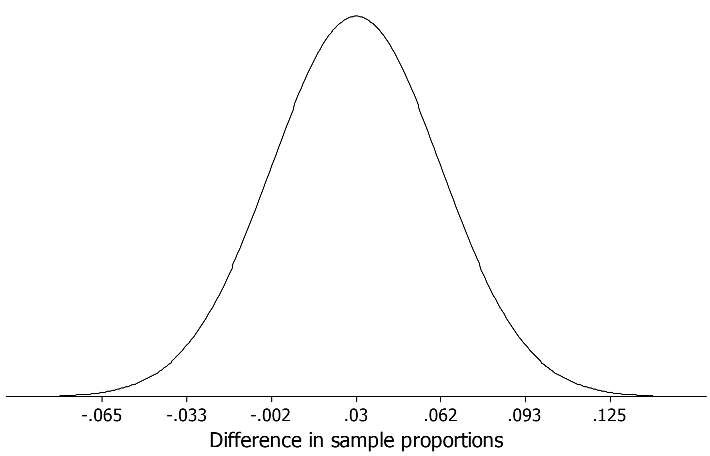


b. $.51 - .48 = 0.03$

c. $\sqrt{\frac{.51(.49)}{500} + \frac{.48(.52)}{500}} = .0316$

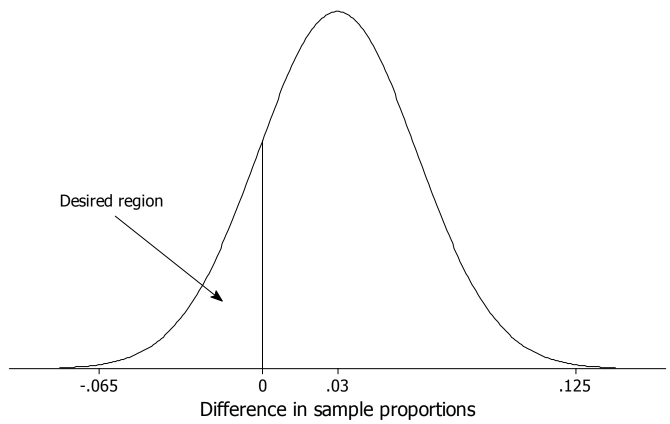
d. The figure is centered on 0.03 and has a standard deviation of .0316.

Figure for Exercise 9.50b



e. The appropriate region is to the left of 0. See picture on next page.

Figure for Exercise 9.50e



f. The probability is the area below 0 for the figure in part d and is found as $P(Z < -0.03/.0316) = P(Z < -0.95) = .1711$. Even though a larger proportion of morning voters than later voters support Candidate A, the probability is .1711 that the exit polls will find a larger sample proportion later in the day than in the morning.

Assigned Mon, Nov 8

10.5 **a.** A confidence interval would be more appropriate. We have information about a sample and want to use it to say something about the population.
b. A sampling distribution would be more appropriate. We have information about a population and want to describe possible samples.

10.22 **a.** The "formula" to use is S*ample estimate ± Multiplier × Standard error*. The sample estimate is $\hat{p} = .56$ and the standard error is $\sqrt{\frac{.56(1-.56)}{753}} = .018$. The multiplier is 1.96, which we will round to 2. The confidence interval is .56 ± .036, or .524 to .596.
b. Yes, it is reasonable to conclude that more than half of all Americans in 1998 thought that abortion is wrong because the confidence interval is completely above .5. Therefore, all plausible values for the true proportion are above .5, or half of the population.

10.42 **a.** In 2000, .312 was opposed. In 1993, .226 was opposed.
b. $\hat{p}_1 - \hat{p}_2 = .312 - .226 = .086$.
c. The interval, read from the output, is 0.058 to 0.114. With 95% confidence, we can say that the difference between the population proportions opposed in the years 2000 and 1993 was between 0.058 and 0.114.
d. $\hat{p}_1 - \hat{p}_2 \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$, which is $.086 \pm 1.96\sqrt{\frac{.312(1-.312)}{2565} + \frac{.226(1-.226)}{1488}}$.