CHAPTER 10 SOLUTIONS (PROBLEMS 1-3, 4-11, 13, 15)

1. a. The answer is 0.036. You'll get this with the “conservative” formula \( \frac{1}{\sqrt{753}} \) or with the more complicated formula \( 2 \times \sqrt{\frac{0.56(1-0.56)}{753}} \).

b. estimate ± margin of error is \( 0.56 \pm 0.036 \) which is 0.524 to 0.596.
c. It is reasonable to conclude that more than half of all Americans think abortion is wrong because the confidence interval is completely above 0.5.

2. Sorry – the problem should read “In Case Study 10.1” (we added a chapter and missed switching this reference).
   a. \( \frac{45}{164} = 0.274 \)
   b. \( \sqrt{\frac{0.274(1 - 0.274)}{164}} = 0.035 \)
   c. \( 0.274 \pm 2 \times 0.036 \) which is \( 0.274 \pm 0.072 \) which is 0.202 to 0.346. Note that the answer to part b is the standard error. The margin of error is \( 2 \times \)standard error.
   d. No, the interval does not provide evidence of ESP. If receivers are guessing, the true \( p \) is 0.25. This value is included in the interval so we can’t rule out the possibility that the results reflect mere guessing. Also notice that \( \hat{p} = 0.274 \) is very close to \( \frac{1}{4} \).

3. a. \( \hat{p} = \frac{56}{190} = 0.295 \)
   b. \( \sqrt{\frac{0.295(1 - 0.295)}{190}} = 0.033 \)
   c. \( 0.295 \pm 1.65 \times 0.033 \) which is \( 0.295 \pm 0.054 \), about 0.24 to 0.35.
   d. \( 0.295 \pm 2 \times 0.033 \) which is \( 0.295 \pm 0.066 \), about 0.23 to 0.36.
   e. \( 0.295 \pm 2.33 \times 0.033 \) which is \( 0.295 \pm 0.077 \) about 0.22 to 0.37.
   f. As the confidence level is increased, the width of the interval increases.
   g. If numbers are chosen randomly, the true \( p \) for the number “7” would be 0.1. The intervals don’t include 0.1, so at any of these confidence levels it’s reasonably safe to say that the picks aren’t random.

5. a. Interval width increases when \( n \) gets smaller.
   b. Interval width decreases when \( n \) gets larger.
   c. Interval width increases when confidence level is increased. (see prob. 3)
   d. Interval width decreases when confidence level is decreased.

6. In general, the sample proportion is the proportion of the sample that has a certain characteristic. We’ll be able to calculate this value. The population proportion is what we’re trying to estimate. We won’t know its value. It’s the proportion of the population represented by the sample that has the characteristic of interest.

7. For 95% of all random samples of the same size, the difference between the sample proportion and the population proportion will be less than 4%.

8. Sorry again. The question should read “What is the probability that the difference between the sample percentage and the population percentage will be greater than
3%” The answer is 100-95=5% (assuming the margin of error is, as usual, associated with 95% confidence).

9. 
   a.
   
   ![Bar chart](chart.png)

   b. \( \frac{1}{\sqrt{543}} = 0.43 \) and \( \frac{1}{\sqrt{511}} = 0.044 \). The Gallup Organization usually rounds up so they reported that the margin of error was about 5%.
   
   c. 71% ± 5% or 66% to 76%.
   
   d. We can be 95% confident that somewhere between 66% and 76% of all adult Americans would answer that they are for the death penalty when asked Quest. 1.
   
   e. 56%± 5% which is 51% to 61%.
   
   f. We are 95% confident that between 51% and 61% of all adult Americans would respond “death penalty” when asked Question 2. Note the values in this interval are all lower than the values in the interval of part c. The wording of the question definitely affects the opinion.

10. The margin of error will be smallest in situation B. Sample size affects the margin of error and the sample size is largest for situation B. The population size does not affect margin of error (as long as the sample is a small part of the population.)

11. a. \( \frac{1}{\sqrt{400}} = 0.05 \) or about 5%.
   
   b. From Table 10.2, we learn that \( n = 1000 \) provides a margin of error = about 3%.
      
      You can check this by calculating \( \frac{1}{\sqrt{1000}} \).

13. 100%-95% = 5%.
15. a. 90%
   
   b. 95%
   
   c. 98%
   
   d. 99%