Lesson 7.2.4

7-62. a. She must confirm the poll was randomly drawn from the full population of American families. The number of successes and failures are $n\hat{p} = 348$ and $n(1 - \hat{p}) = 646$, clearly both larger than 10, satisfying large counts condition, and the population of American families is significantly larger than $10 \cdot 994$, so independence is satisfied as well.

b. 35% ± 3%, approximately, so with 95% confidence the percentage of American families who own a dog is between 32 and 38%.

c. The 95% confidence interval does not contain 40%, therefore students can be 95% confident that the true proportion is NOT 40%.

d. Either the book is right or it is not, so the probability of it being right is either 0% or 100%. Rather, say, "we are 95% confident that the true proportion is between 32% and 38%, and 40% is not in that interval so we have reasonable evidence it is not the true proportion."

7-63. a. $p = 0.37$ b. $\mu = 1.2$ hours

c. $p < 0.5$ d. $p \geq 0.15$

e. $\mu \leq 45$ seconds f. $\sigma = 18$ seconds

7-64. a. 0.3514 ± 0.0308 or (0.321, 0.382). With 95% confidence the proportion of Americans who think 13 is an unlucky number is between 0.321 and 0.382.

b. *i.* Even though 0.37 is included in the interval, this is an incorrect interpretation; there are many possible values it could be that still fall within this interval, and 0.37 is not any more likely to be the true value than any other.

ii. 0.37 is included in the interval, so students cannot reject it. This would be the correct interpretation if 0.37 were NOT in the interval.

iii. This is the correct interpretation; you have not provided evidence that the claim is true, you simply have not decided that it is false.

c. You can reject the claim: The 95% confidence interval for $\frac{305}{925}$ is 0.33 ± 0.03, so it does not include 0.37. Therefore you can be 95% confident that 0.37 is not the true proportion.

d. You can reject the claim: The confidence interval is 0.43 ± 0.03, so it does not include 0.37. Therefore you can be 95% confident that 0.37 is not the true proportion.

7-65. a. Besides the numbers, the main difference is the “at least” part—this has a greater than sign in it.

b. Reject the claim. The 95% confidence interval for this p is 0.09 ± 0.04, so 0.15 is not in the interval and you can be 95% confident that the population proportion is not at least 15%.

c. Fail to reject the claim—the confidence interval contains some numbers above 0.15 and some below 0.15, so you cannot draw a conclusion.

d. Accept the claim! All of the values in the confidence interval are at least 0.15, so you can be quite confident that the true value is above 15%, as claimed.

e. In inequality claims, it is possible to accept the claim if the confidence interval is solidly in the range of the claim, but equality claims can never be accepted since there will always be values in the confidence interval that do not match the claim.

7-66. At 90% confidence they can reject the claim ($0.5091 < p < 0.6709$) and shut down Mr. C. However, they are unable to reject the claim at 95% confidence ($0.4936 < p < 0.6864$).

7-67. a. The 95% confidence level means that if one were to repeatedly take random samples of the same size from the population and construct a 95% confidence interval from each sample, then in the long run 95% of those intervals would succeed in capturing the actual value of the population proportion of adults who struggle to afford food.

b. No, the confidence interval captures 15%.

c. About 376 people using the ME reported, a critical value of $z^* = 1.960$, and solving for n.

7-68. a. No. There are numbers above 0.50 in the confidence interval, so it could be more than 50%.

b. Again, no. There are numbers below 50% in the confidence interval as well.

c. 0.45 ± 0.04. Quadrupling n decreases margin of error by a factor of 2.

d. Yes! The new interval provides convincing statistical evidence that less than 50% of all shoppers shop on the weekends, since there are no values above 50% in the confidence interval.

7-69. Observational study: An optometrist's office could ask all of its patients how often they eat carrots and divide them into two groups: those who eat at least two carrots a week and those who do not. The optometrist could then look at the medical records of the subjects in each group and identify those with eye problems or conditions. Finally, the proportion of subjects with eye problems or conditions within each group can be compared.
Experiment: Subjects should have their eye health evaluated before the treatment phase of the experiment. A matched pairs experiment would work well, pairing subjects with nearly identical eye health. Subjects within each pair should be randomly assigned to one of two groups. One subject will be instructed to eat two carrots a week for a year, while the other subject will be told to eat less than two carrots a week for a year. After a year has passed, eye health will be examined again and compared within each block.

7-70. a.

Minor Diameter	0.56	–0.40	0.80	–1.28	–0.88	0.88	–1.04	–0.24	1.60
Mass	0.3125	–0.6750	–0.0125	–1.1000	–0.4625	1.3000	–1.1625	0.0750	1.7250
Product	0.175	0.270	–0.010	1.408	0.407	1.144	1.209	–0.018	2.760

b. See table above.

c. 0.918125

d. This is called the correlation coefficient. For these grapes, it tells students that there is a strong, positive association between the mass of a grape and its minor diameter. Larger diameters seem to be correlated with larger masses.

e. The explanatory variable is the minor diameter. The response variable is the mass.

f. You would obtain the same lists of standardized values, and the products would all be the same, even if you switched the order of the lists. Multiplication is commutative. Therefore, the correlation coefficient would not change if you switch the explanatory and response variables.

