

1.
 - a. We are 90% confident that the interval from 0.57 to 0.63 captures the true proportion of all restaurants that fail in their first year of operation.
 - b. If we take many, many samples and calculate a confidence interval for each, about 90% of them would capture the true proportion of all restaurants that fail in their first year of operation.

2.
 - a. The sample proportion is 0.20 because it is the point estimate, or middle value, of the confidence interval. $\frac{0.025 + 0.375}{2} = 0.20$
 - b. The margin of error is 0.175. This is calculated as half of the width of the interval: $\frac{0.375 - 0.025}{2} = 0.175$
 - c. The margin of error is unusually large because Jamie's sample size is small ($n = 20$). Distributions of the sample proportion from small samples have greater variability, which leads to wider confidence intervals and larger margins of error.
 - d. Jamie could increase the sample size by randomly selecting more cereals from the store. A larger sample size would reduce the margin of error because sample proportions from larger samples have less variability, resulting in a more precise estimate of the true proportion.

3.
 - a. If we take many, many samples of this size and calculate a confidence interval for each, about 95% of them would capture the true proportion of customers who would consider returning to the dealership for future car services.
 - b. The interval would be wider. Increasing the confidence level increases the margin of error which widens the confidence interval.
 - c. The interval would be narrower. Increasing the sample size decreases the margin of error which narrows the confidence interval.
 - d. No, the margin of error only accounts for variability from random sampling. Nonresponse bias is a systematic error that occurs when people who respond differ from those who don't respond, and this potential bias is not reflected in the margin of error calculation.

4. The margins of error can be matched with confidence levels by recognizing that higher confidence levels produce larger margins of error: 0.087 corresponds to the 80% confidence level, 0.112 corresponds to the 90% confidence level, and 0.133 corresponds to the 95% confidence level. This ordering makes sense because as we increase the confidence level, we need wider intervals to be more confident of capturing the true proportion, which results in larger margins of error.

5.
 - a. No, the value of 0.20 is contained in only two of the 10 confidence intervals and we would expect 90% of the intervals to include the true proportion.
 - b. Yes, the value of 0.35 is contained in all but one of the ten confidence intervals (90%, or 9/10), which is what we would expect when constructing ten 90% confidence intervals.

6. A

7. C