The Stat 20 instructors take a simple random sample of 100 students in the course and ask them the following question: *"How many hours of sleep do you get each night?"* They construct a 95 percent confidence interval for the mean hours slept as [4.5, 5.7].

1. True or False: The probability that the population parameter falls in the interval is 95%.

2. True or False: If the Stat 20 instructors created 200 intervals of this type, they would expect that 190 of them would capture the population parameter.

3. True or False: 95 percent of students sampled reported getting between 4.5 and 5.7 hours of sleep each night.

A social scientist takes a simple random sample of 100 American adults over age 60 and asks them how many children they have. The average number of children was 2.4, with a standard deviation of 1.5.

4. Provide a *point estimate* for the average number of children that all American adults over age 60 have.

5. The point estimate in **Question 4** may change from sample to sample. To account for this variability, calculate a *standard error* for the distribution of the sample average.

6. Using your point estimate and standard error from **Questions 4-5**, construct a 95 percent confidence interval for the average number of children that all American adults over age 60 have.

7. In a sentence, interpret this interval in the context of the problem.

8. How could the social scientist change her sample size to make a new confidence interval which is $\frac{1}{4}th$ as long as the interval from **Question 6**?

Basketball player and Golden State Warriors legend Stephen Curry is practicing his free throw. He takes 100 free throws and shoots the basketball into the net 92 times. You may assume that each of his free throws are independent of the next one and/or the one that came before it.

9. Follow similar steps to **Questions 4-5**, and then construct a 95 percent confidence interval for the probability that Curry makes a free throw on any given attempt.

10. In a sentence, interpret this interval in the context of the problem.

In the next set of questions, we will be revisiting the `penguins` data frame within the `stat20data` package in R. Treat the data as a random sample of all penguins in Antarctica.

11. Use `dplyr` code (write it below) to create a four-column data structure called `q11`:

- The first column should display the names of the different penguin species.
- The second column should display the mean bill length for each species.
- The third column should display the standard deviation of bill length for each species.
- The fourth column should display the number of penguins belonging to each species.

12. Write `dplyr` code to add on columns to `q11` which contain the lower and upper bounds of a confidence interval for the mean bill length of all penguins in Antarctica (for each species). Write the code you used below.