This problem set covers material from Week 6, dates 3/24 – 3/27.

Instructions: Write or type complete solutions to the following problems and submit answers to the corresponding Canvas assignment. Your solutions should be neatly-written, show all work and computations, include figures or graphs where appropriate, and include some written explanation of your method or process (enough that I can understand your reasoning without having to guess or make assumptions). A general rubric for homework problems appears on the final page of this assignment.

Monday 3/24

1. Suppose I take a sample from some population, and my sample results in the following values: $\boldsymbol{x} = (4, 1, 2, 0, 2, 5)$.

   (a) Determine if each of the following is a valid bootstrap re-sample. If not, justify why not.

   i. $(4, 2, 1, 5, 8, 1)$
   ii. $(1, 1, 1, 1, 1, 1)$
   iii. $(1, 5, 2, 0, 4)$

   (b) Suppose the parameter of interest is the maximum value in the distribution. Would the bootstrap distribution of the sample maximum would yield a good approximation to the sampling distribution? Why or why not?

2. Look to the live code associated with today's content. Explain what each of lines 2-9 are doing.

3. Suppose rather than measuring a single variable for each case, I observe pairs of observations (x_i, y_i) from every case, for $i = 1, \ldots, n$. For example, x_i could be the time it takes for person i to run a mile before participating in a training program, and y_i the time it takes for person i to run a mile after the program.

   Either in words or "pseudo-code" (i.e. a mix of code and words), describe how I could obtain a bootstrap distribution of the average change in mile time. If I want to demonstrate that the program is effective, how do I hope the bootstrap distribution looks like?

Wednesday 3/26

4. Work on problems in associated `.qmd` document. Problems 2 and 3 will be graded as one problem, as will 4 and 5.

Thursday 3/27

TBD

General rubric

Points	Criteria
5	The solution is correct *and* well-written. The author leaves no doubt as to why the solution is valid.
4.5	The solution is well-written, and is correct except for some minor arithmetic or calculation mistake.
4	The solution is technically correct, but author has omitted some key justification for why the solution is valid. Alternatively, the solution is well-written, but is missing a small, but essential component.
3	The solution is well-written, but either overlooks a significant component of the problem or makes a significant mistake. Alternatively, in a multi-part problem, a majority of the solutions are correct and well-written, but one part is missing or is significantly incorrect.
2	The solution is either correct but not adequately written, or it is adequately written but overlooks a significant component of the problem or makes a significant mistake.
1	The solution is rudimentary, but contains some relevant ideas. Alternatively, the solution briefly indicates the correct answer, but provides no further justification.
0	Either the solution is missing entirely, or the author makes no non-trivial progress toward a solution (i.e. just writes the statement of the problem and/or restates given information).
Notes:	For problems with multiple parts, the score represents a holistic review of the entire problem. Additionally, half-points may be used if the solution falls between two point values above.
Notes:	For problems with code, well-written means only having lines of code that are necessary to solving the problem, as well as presenting the solution for the reader to easily see. It might also be worth adding comments to your code.