This assignment is to setup RStudio and LaTeX, collect performance data, make one data analysis run, and hand in your results in a LaTeX document, representing the first rough draft of your paper. The final paper will be due with Assignment 19.

1. Skim the specification for the complete paper just to get an idea of what will be required for the final version. See the following document on the course web site for the specification of the paper.

   - Sort paper

2. Setup LaTeX, which is a mandatory requirement for this paper. See the following documents on the course web page for how to setup LaTeX.

   - Setup for LaTeX
   - The Not So Short Introduction to LaTeX2e

   The first document describes how to set up the LaTeX typesetting system in the cloud with Overleaf. The second document is a popular introductory reference to the LaTeX system that you may find useful.

   To write your paper in LaTeX, you should simply modify the `paper-template.tex` file. For this assignment, insert your proposed title and your name on the front page. The document can have any extraneous material from the original template, so long as it has the two raw data tables filled out with your data, one plot of the assignment statement raw data, and the results of the one analysis run described below.

3. Setup RStudio, which you will use to analyze your data. See the following RStudio documentation on the course web site.

   - Setup for RStudio
   - Data management in RStudio
   - Plotting raw data in RStudio
   - Curve fitting in RStudio

4. Take performance data from the `SortCompAsgnMain` project and fill out the following tables. Include both tables in the LaTeX `.pdf` document.

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Number of data points	Algorithm				
	Insert	Select	Heap	Merge	Quick
500					
1000					
1500					
2000					
2500					
3000					
3500					
4000					
4500					
5000					
5500					
6000					

Figure 1. Number of array element comparisons.

Number of data points	Algorithm				
	Insert	Select	Heap	Merge	Quick
500					
1000					
1500					
2000					
2500					
3000					
3500					
4000					
4500					
5000					
5500					
6000					

Figure 2. Number of array element assignments.

5. In R, create a plot of your raw data of the number of assignment statements executed as a function of the number of data values sorted. Your plot should have five lines, one for each sort. Include this plot in your LaTeX document.

6. In R, do a curve fit of the number of assignments in the merge sort for n^2 and for $n \lg n$. The program gives you the residual standard error (RSE) for each fit, and a plot of the raw data and best curve fit for each model. Write a paragraph that states the RSE for each model, whether the data shows that merge sort execution time increases as n^2 or as $n \lg n$, and why. State the theoretical execution time increase and whether the data confirms the theory. Include the paragraph and the plot in your LaTeX document.

   It is permissible for this preliminary document to have extraneous material from the original paper template document.

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7. Typeset your document in LaTeX and hand in the PDF output in a file named

   `a09written.pdf`

   electronically with the file name prefixed with your two-digit course ID number.

   Do *not* hand in the the `.tex` file.