Implementation of data structures and algorithms
Long Project 1: RMQ

Version 1.0: Initial description (Jan 26).
Due: 11:59 PM, Feb 19th, 2023.

Max excellence credits: 1.0

- Submission procedure is same as the same as that of SP1.
- For each group, only its last submission will be graded, and earlier submissions are discarded.
- Your code must be of good quality, well commented, and pass all test cases to earn excellence credits.

Team tasks:

a. Implement spare table RMQ structure.
b. Implement hybrid approach one.

   Implement hybrid approach one efficiently. The performance of your implementation will be compared with other teams' implementation and **excellence credits will be awarded based on the relative performance.** The rubric for awarding EC is as follows:

   - ✓ Top 5 performing teams will get 1 EC
   - ✓ Top 6 to 10 performing teams will receive 0.75 EC
   - ✓ Top 11 to 15 performing teams will receive 0.5 EC
   - ✓ Top 15 to 20 performing teams will receive 0.25 EC

c. Implement Fischer-Heun algorithm.
d. Compare the performances of the hybrid 1 and Fischer-Heun approaches. Generate input arrays of various sizes (n=10M, 100M, 200M, and 400M) and measure preprocessing time for each n. Measure the query processing time over various ranges (0.01n, 0.1n, 0.2n, 0.4n, 0.8n) for each n. Run several trials and take the average for each measurement. Write a good report (with graphs) about your observations. You may want to run your experiments on cs3/csgrads1 servers as they may have larger memory than your laptop.

Starter code and driver code are provided.