Today: External-memory sorting, multi-way merge sorting; §§ 8.5, 21.6.
Next class: Union-find data structures, minimum spanning trees; §§24.*, Reynolds's paper.[1]
Reminders: Read material, incl. code, *before and after* class.

1. Write your group identifier (e.g., C3) and its members' names Underline your name.

2. Consider an external storage device with a *page size* of 16 bytes (artificially low for illustration). Depict an aligned layout of the following array of 32-bit integers in such a device. How many page accesses are needed to access (1) all elements and (2) every fourth element of the array?

   ```
   83 10 80 85 88 7 93 25 63 46 9 14 87 97 49 82
   ```

3. Depict the action of *heap sort* on the array of Question 2. Determine the exact number of page accesses made in the first three iteration of the outer loop. What is the total number of of page accesses?

   ```
   83 10 80 85 88 7 93 25 63 46 9 14 87 97 49 82
   ```

[1] Samuel W. Reynolds, "A Generalized Polyphase Merge Algorithm," *Communications of the ACM* 4/8 (1961).

[additional space for answering the earlier question]

4. Depict the action of 2-way merge sort on the data of Question 3. Determine the exact number of page accesses for the first three merges, as well as the total number of page accesses.

   `83 10 80 85 88 7 93 25 63 46 9 14 87 97 49 82`

5. Repeat Question 4 for 4-way merge sort.

6. $\star$ How many page access are made by a k-way merge sort operating on nm items in external memory of page size m (as a function of k, m, and n)?