Practice Problem for Midterm 1  
CompSci 161—Fall, 2022—Dillencourt

1. This problem considers the polyphase merge algorithm for external sorting as presented in the lectures and in the lecture notes. Suppose we run this algorithm on the following input:

[58, 76, 97, 18, 34, 25, 89, 82, 77, 64, 16, 15, 87, 56, 46, 67, 91, 17, 62, 48, 30]

Assume that the number of items that we can hold in memory at one time is 4. (This parameter was called $m$ in the lecture and the class notes.) Also assume that the number of input files that can be open at once is 3. (This parameter was called $f$ in the lecture and the class notes.)

(a) How many runs are created in Phase 1 if we run the simple version that does not use replacement selection? List the contents of each run.

(b) Describe the processing in the subsequent phases if we run the simple version that does not use replacement selection. For each run that is produced in the subsequent phases:

- State which runs are merged to create the run
- List the contents of the run

(c) How many runs are created in Phase 1 if we use replacement selection? List the contents of each run.

(d) Describe the processing in the subsequent phases if we use use replacement selection. For each run that is produced in the subsequent phases:

- State which runs are merged to create the run
- List the contents of the run
