

Quiz 7: External Sorting (10 points), 10 minutes (Afternoon)

Consider external-sorting a table R which contains 120 blocks of data, using 4 pages of memory buffer. That is, $B(R) = 120$ and $M = 4$. Note: use all available memory for sorting and merging.

1. [8 points] For each pass (sorting and merging), state the number of runs and the size of runs generated by the pass.

Pass 0 (use all pages to sort): Generate 30 runs, the size of each run is 4 blocks.

Pass 1 (3-way merge): Generate 10 runs, the size of each run is 12 blocks.

Pass 2 (3-way merge): Generate 4 runs (3 runs having 36 blocks and 1 run having 12 blocks)

Pass 3 (3-way merge): Generate 2 runs (1 run having 108 blocks and 1 run having 12 blocks)

Pass 4 (2-way merge): Generate 1 sorted run of 120 blocks

2. [2 points] What is the total cost (measured by the number of block I/O's) of this external-sorting?

Total cost = (# of passes) \times 2 \times (# of blocks) = $5 \times 2 \times 120 = 1200$

Or Total cost = $(1 + \lceil \log_3 \lceil \frac{120}{4} \rceil \rceil) \times 2 \times 120 = 1200$