External Merge Sort + Grouping with Aggregation?

PASS 0

3,4 6,2 9,4 8,7 5,6 3,1 7,4 6,1

PASS 1

2,3 1,1
4,4 3,4
6,7 5,6
8,9 6,7

SELECT number, count(*)
FROM Input
GROUP BY number
Late Grouping with Aggregation: Part 1

Input file

PASS 0

4-page runs

PASS 1

8-page runs

group and aggregate here
Late Grouping with Aggregation: Part 2

Input file

4-page runs

8-page runs

group and aggregate here
Online Grouping with Aggregation (aka Online Merge)

PASS 0

Input file

4-page runs

PASS 1

8-page runs

group and aggregate here
Early Grouping with Aggregation: group and count()

Input file

4-page runs

8-page runs

early grouping & aggregate

~ NCE
Early Aggregation only: just count()

\[
\begin{array}{c}
\text{PASS 0} \\
3,4 \quad 6,2 \quad 9,4 \quad 8,7 \quad 5,6 \quad 3,1 \quad 7,4 \quad 6,1 \\
\end{array}
\]

aggregated here

\[
\begin{array}{c}
\text{PASS 1} \\
(.,8) \quad (.,8) \\
\end{array}
\]

\[
\begin{array}{c}
\text{1-page runs} \\
(.,16) \\
\end{array}
\]

Input file

\[
\begin{array}{c}
\text{1-page runs} \\
\end{array}
\]

```
SELECT Number/10, count(*)
FROM Input
GROUP BY Number;
```