CSE 444: Database Internals

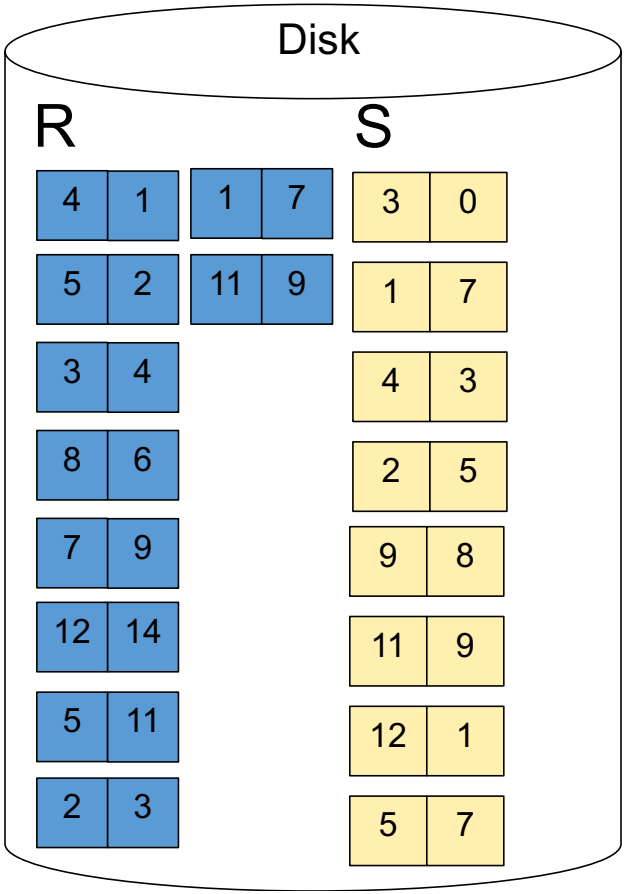
Lecture 8

Operator Algorithms (part 2)

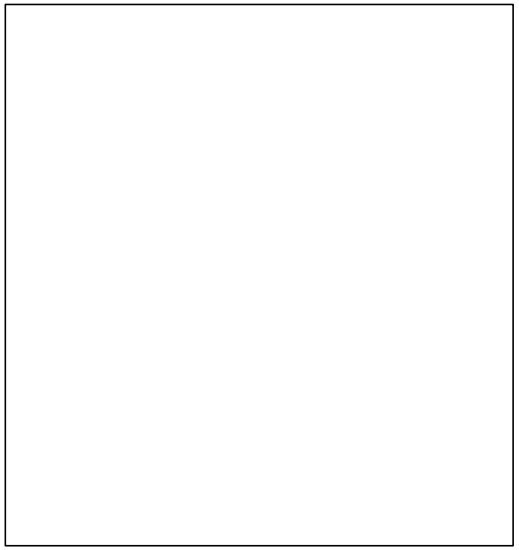
WHITE BOARD EXAMPLE

Relation R: 10 pages
Relation S: 8 pages
Memory: 5 pages

Each page holds 2 tuples
We only show value of join attribute for each tuple

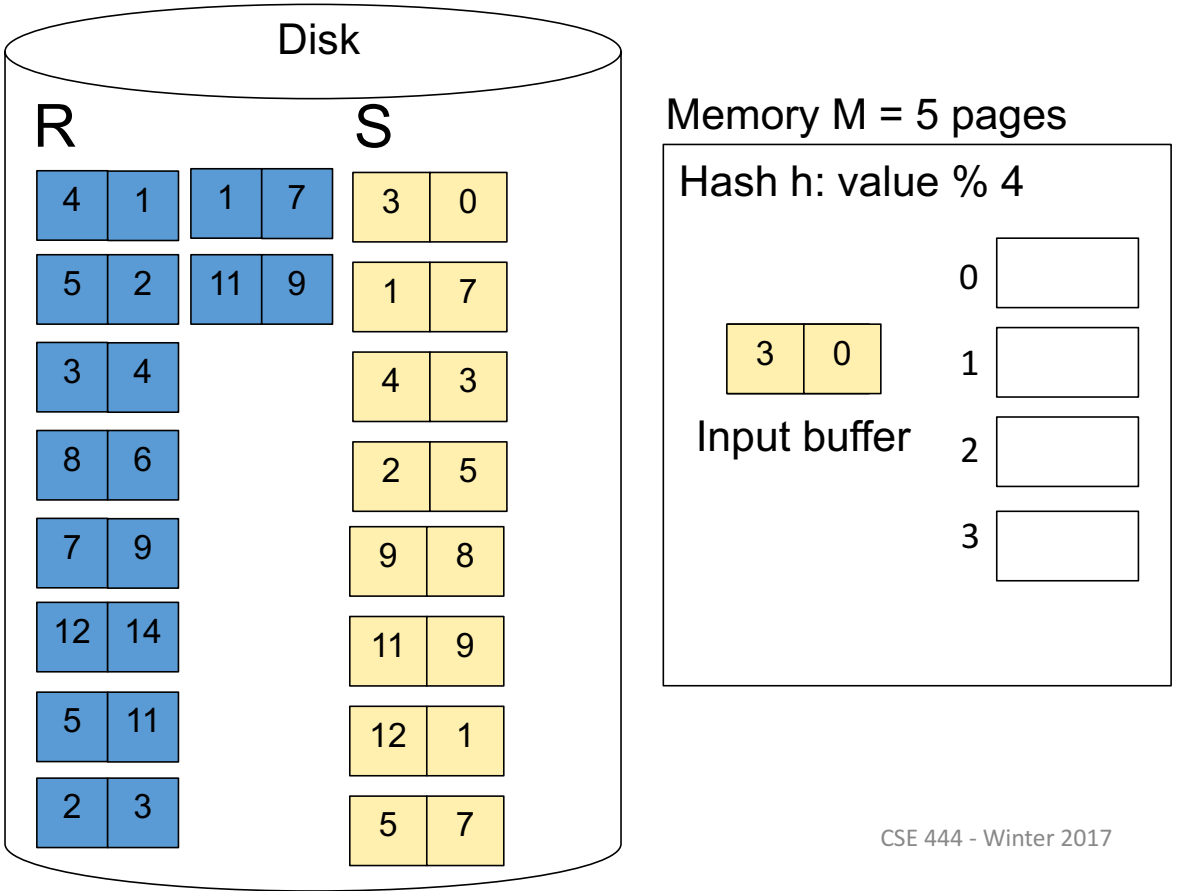


Memory M = 5 pages

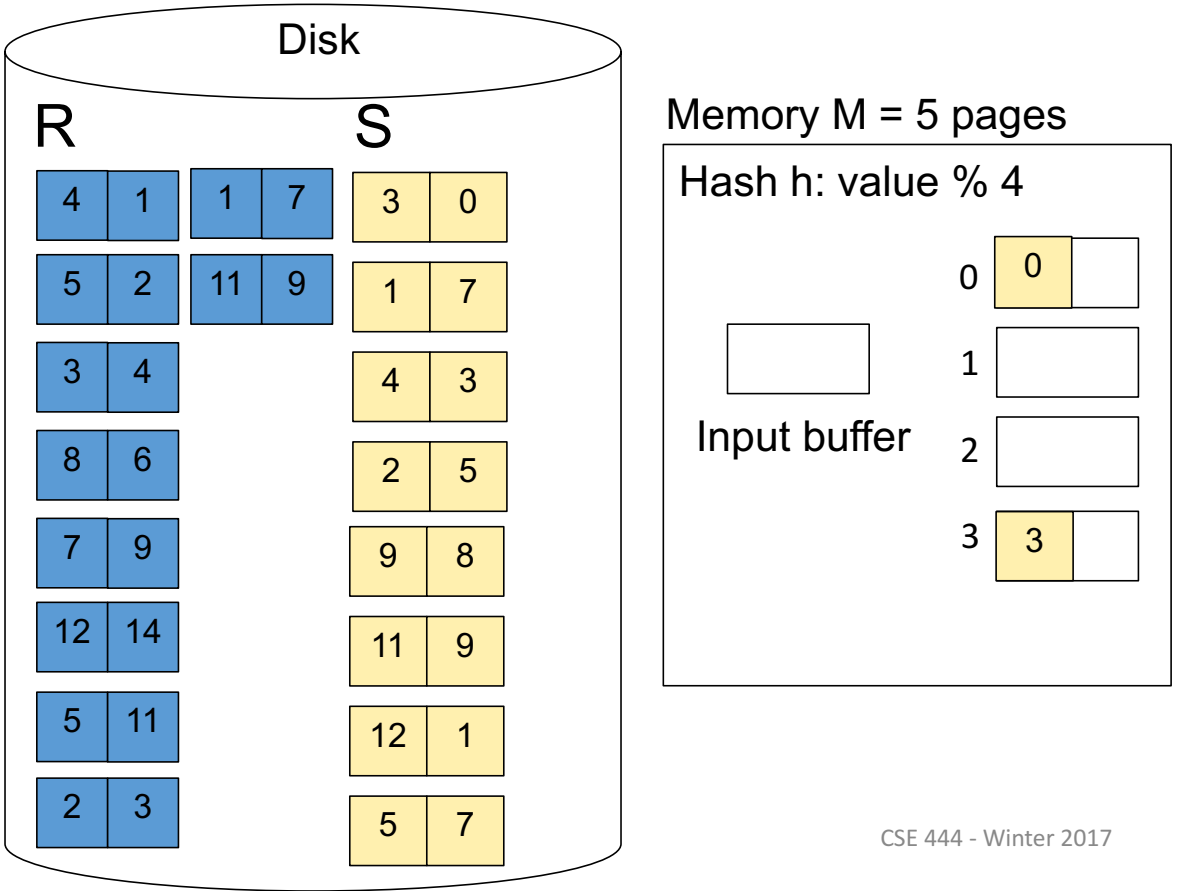


Grace Join
Also called
Partitioned Hash-Join Example

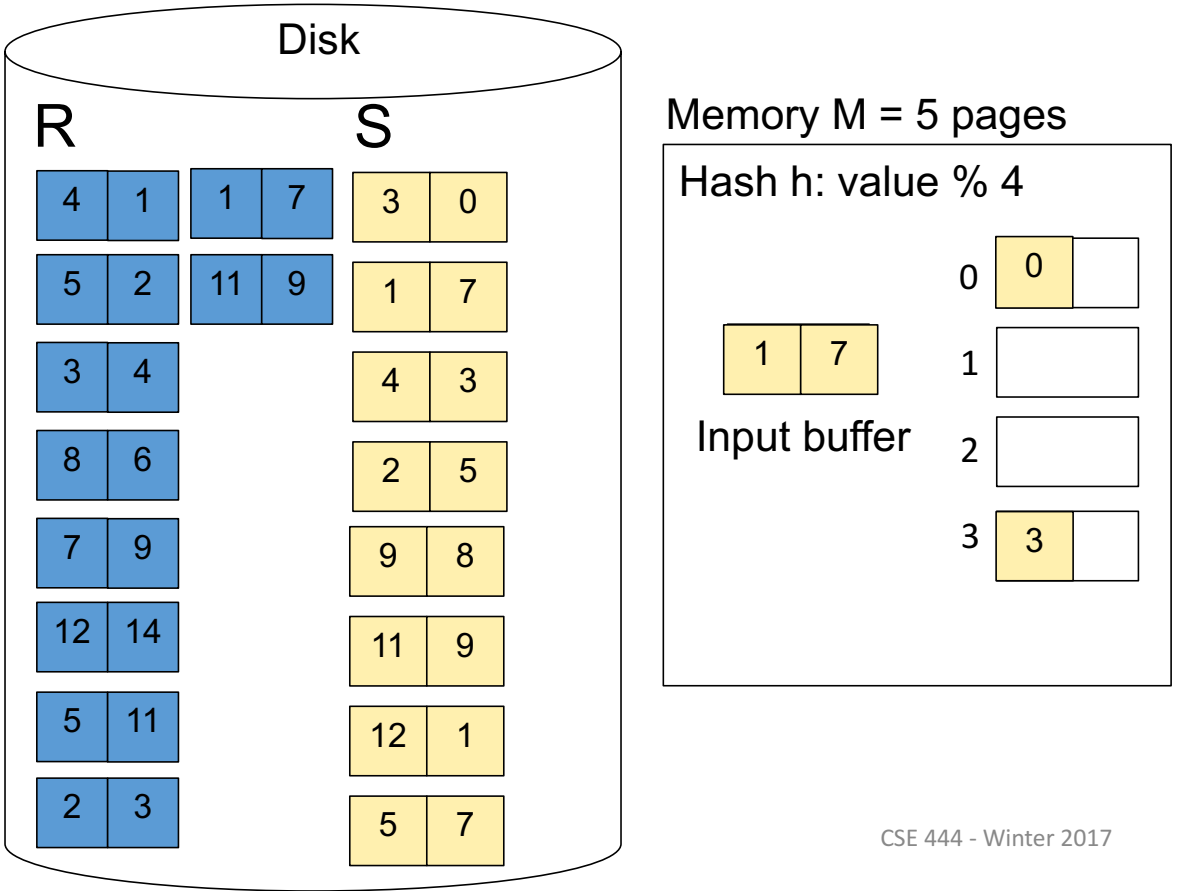
Step 1: Read relation S one page at a time and hash into M-1 (=4 buckets)



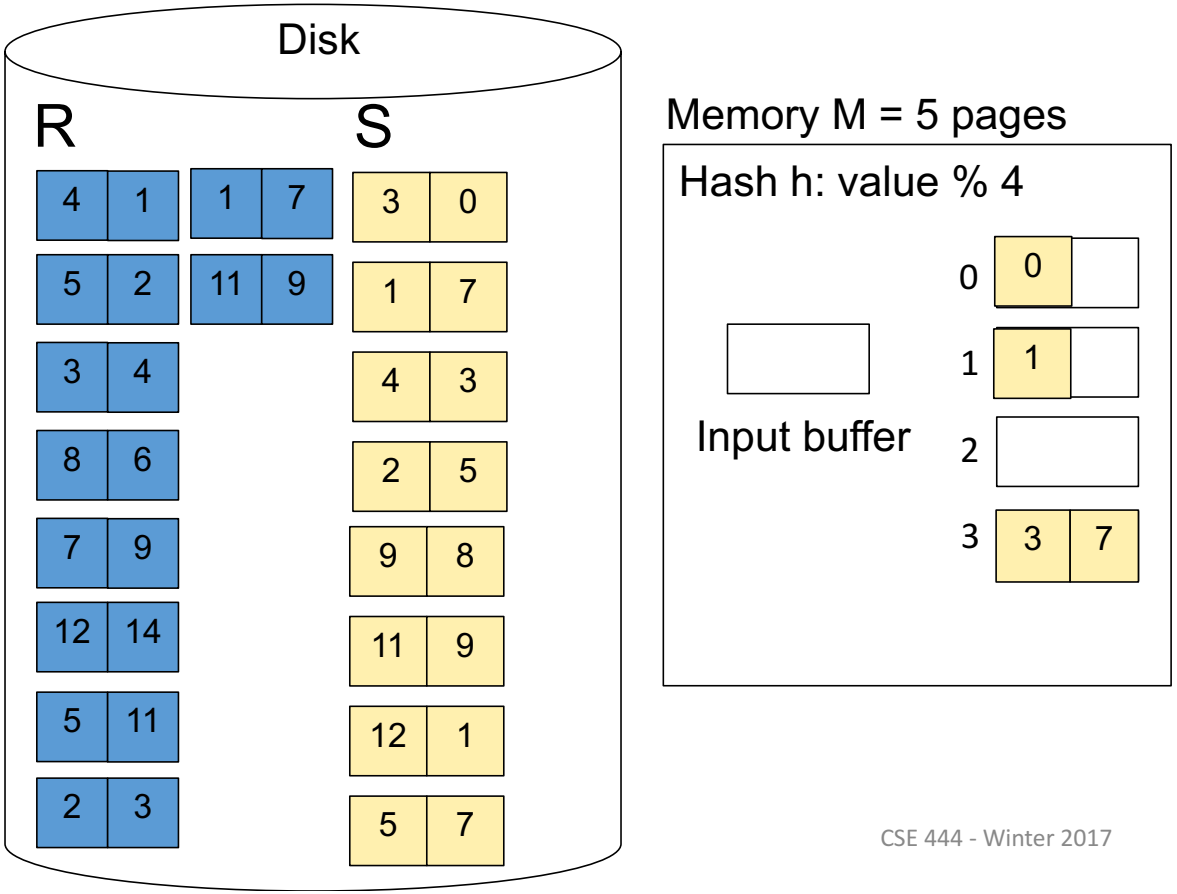
Step 1: Read relation S one page at a time and hash into the 4 buckets



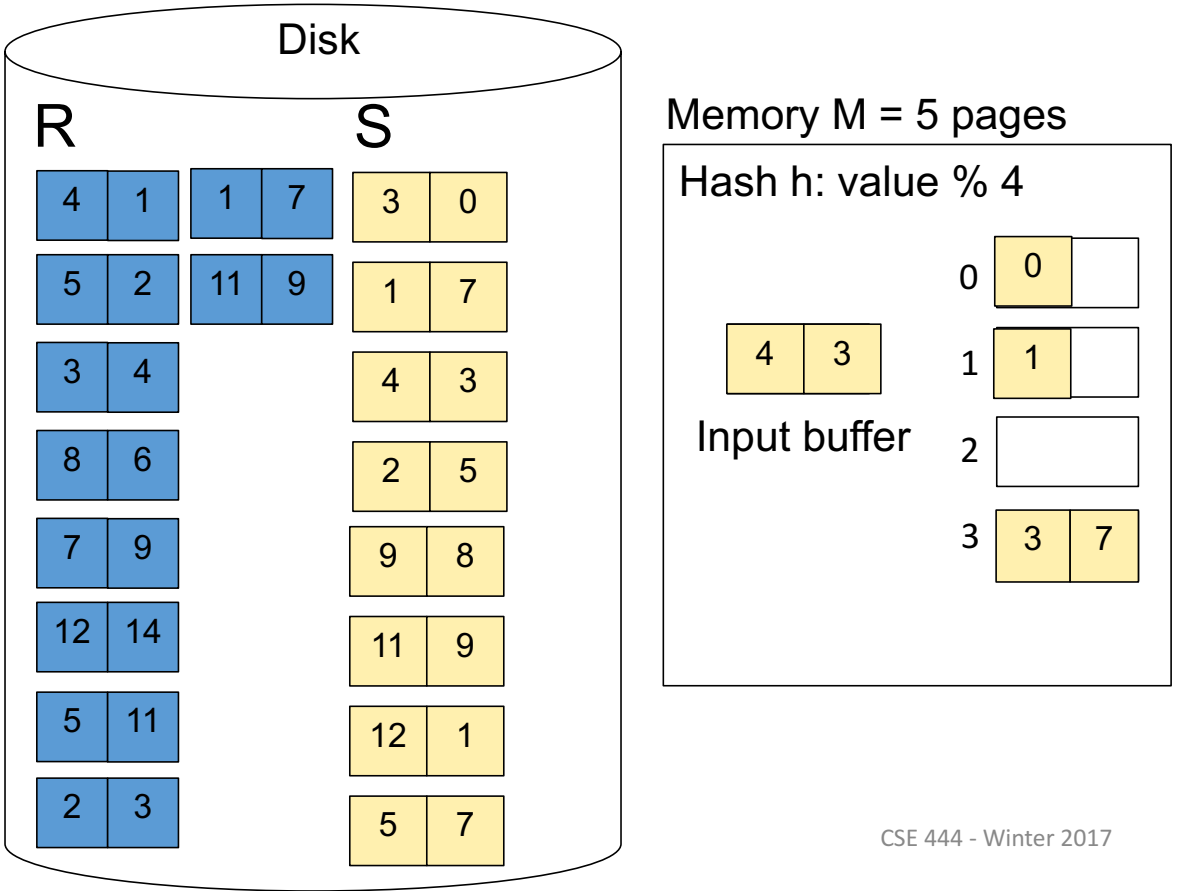
Step 1: Read relation S one page at a time and hash into the 4 buckets



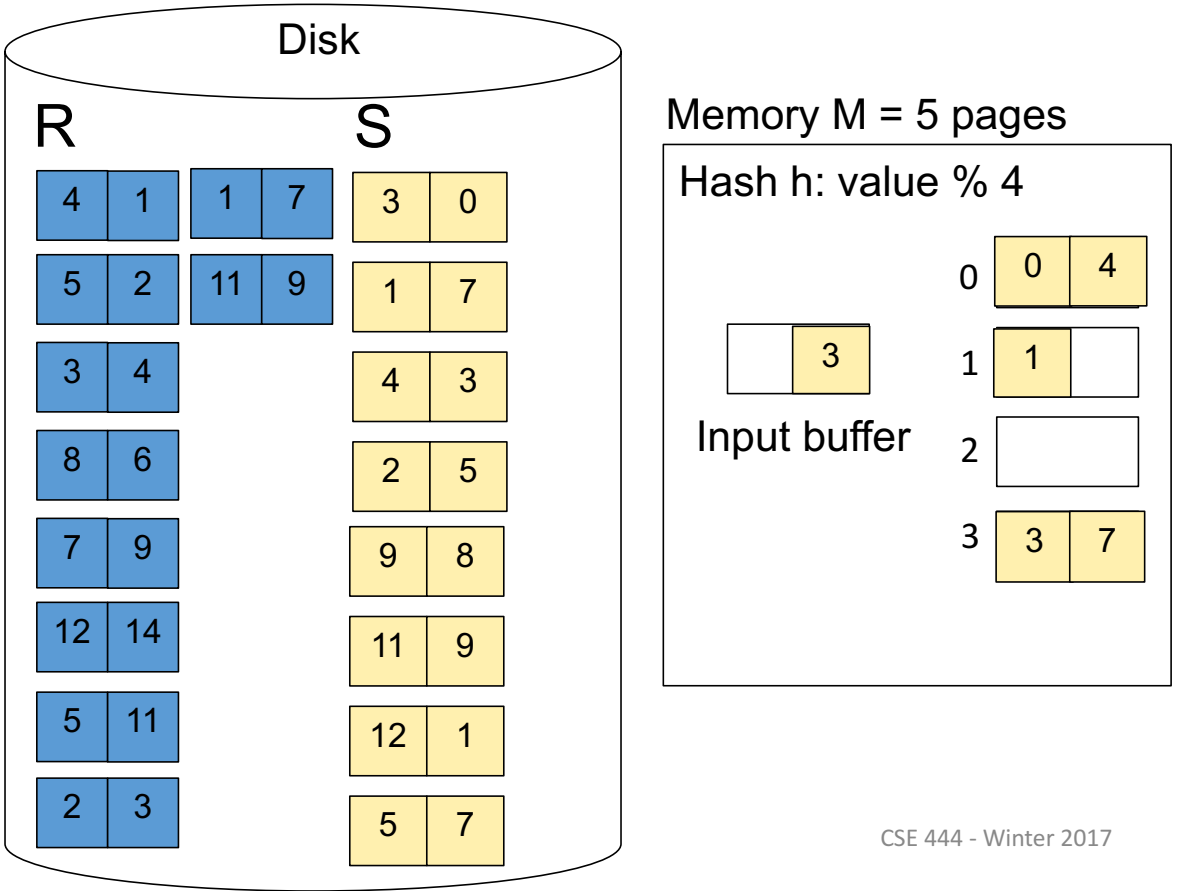
Step 1: Read relation S one page at a time and hash into the 4 buckets



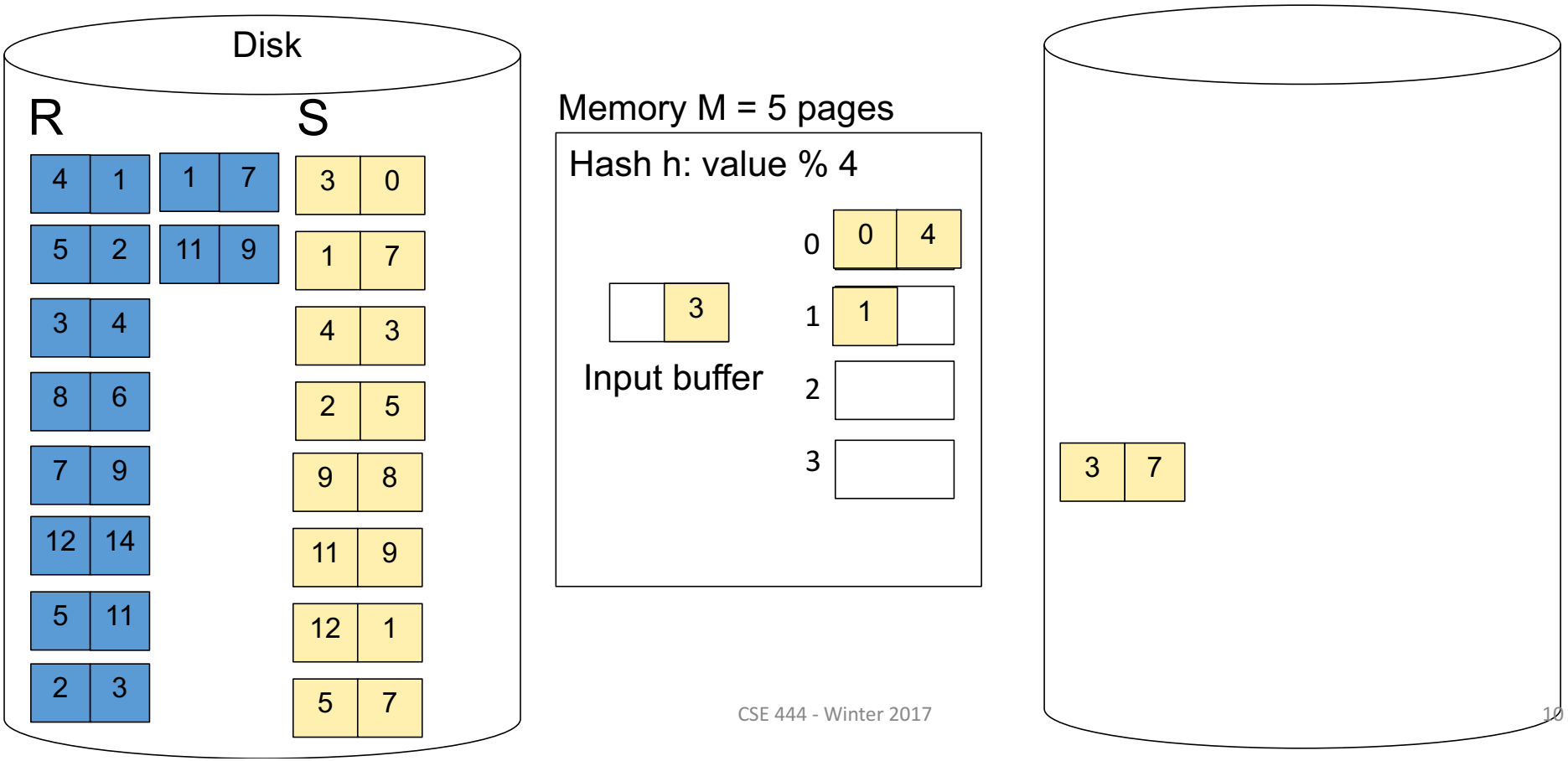
Step 1: Read relation S one page at a time and hash into the 4 buckets



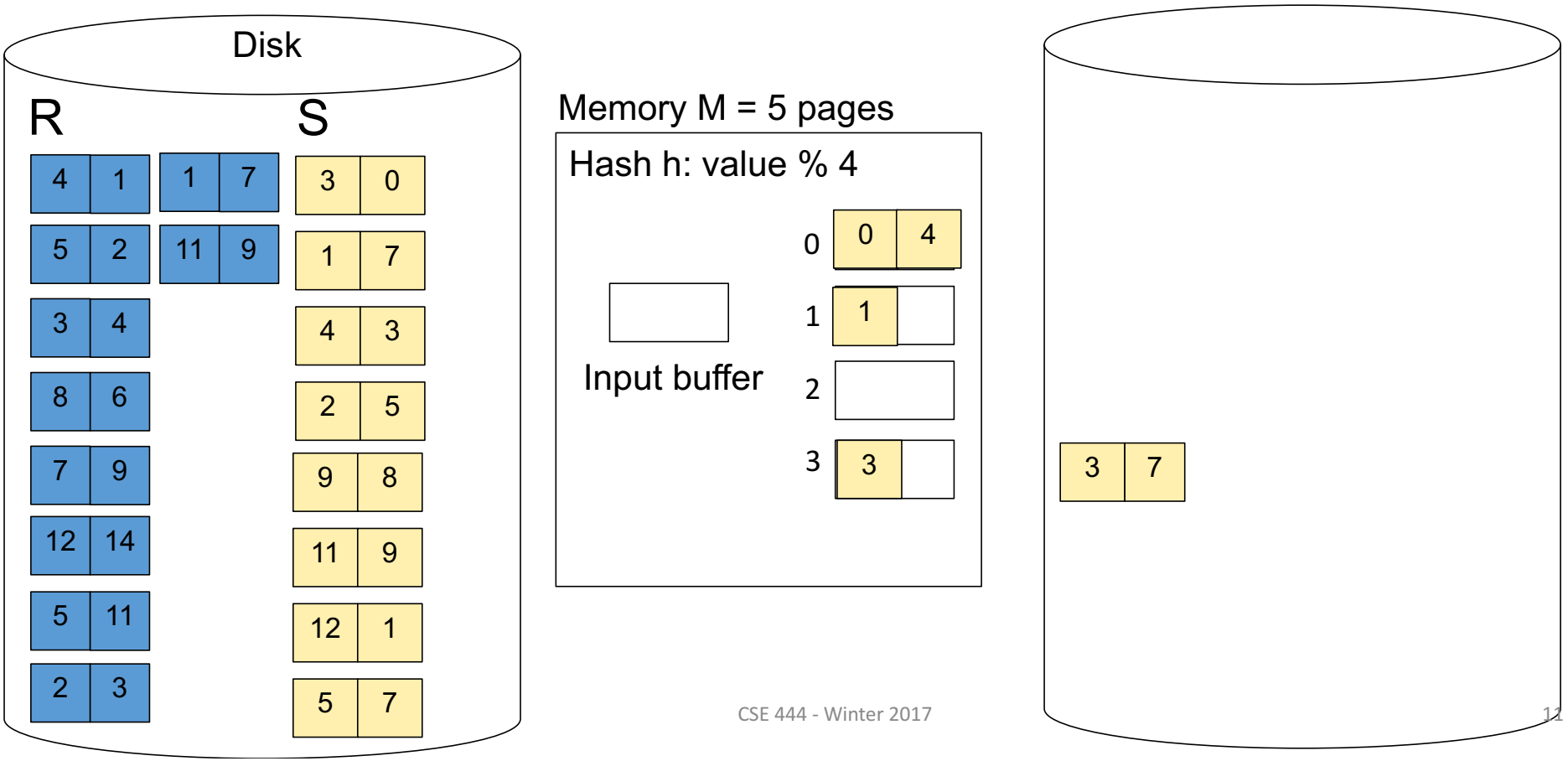
Step 1: Read relation S one page at a time and hash into the 4 buckets
When a bucket fills up, flush it to disk



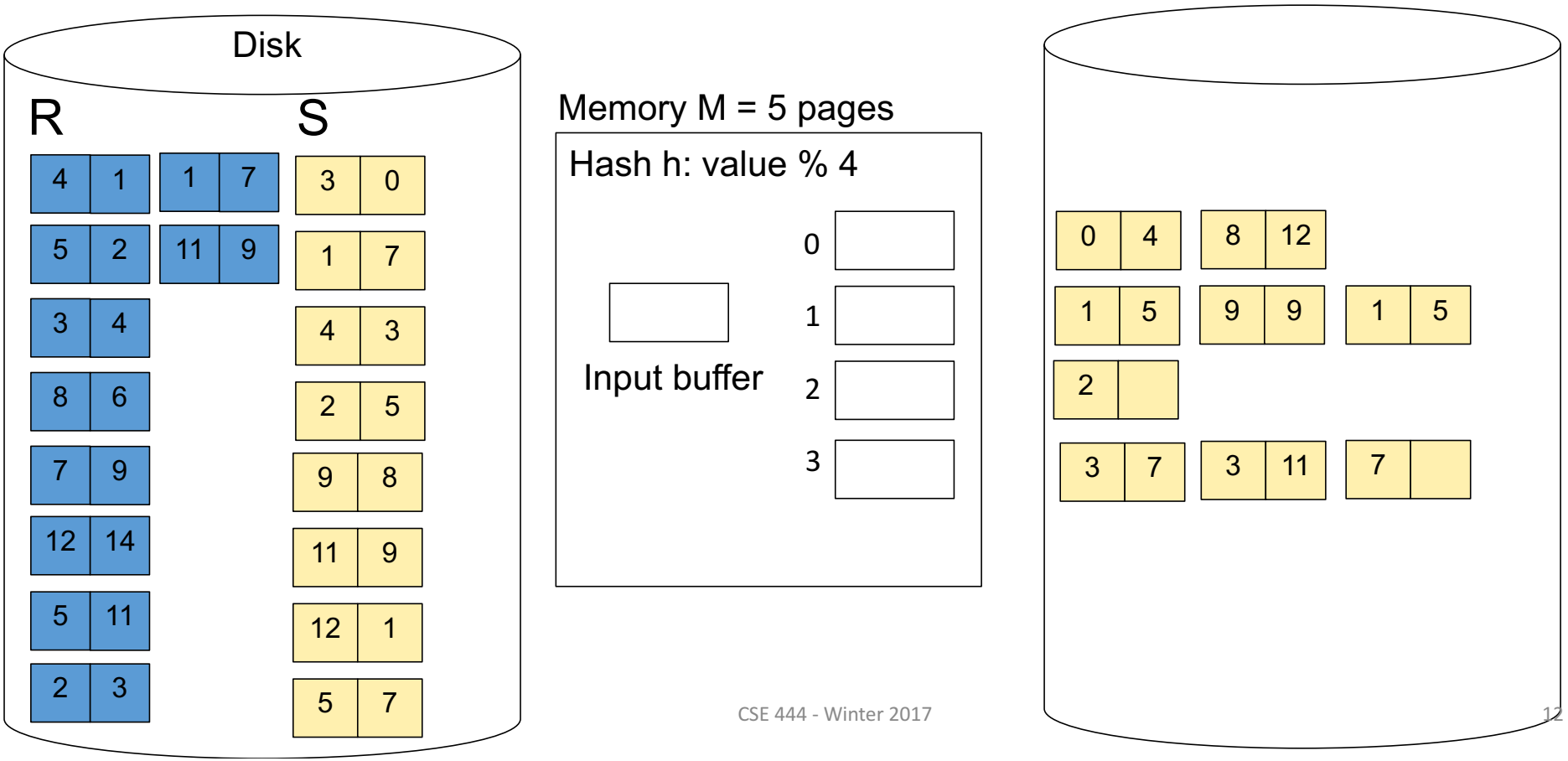
Step 1: Read relation S one page at a time and hash into the 4 buckets
When a bucket fills up, flush it to disk



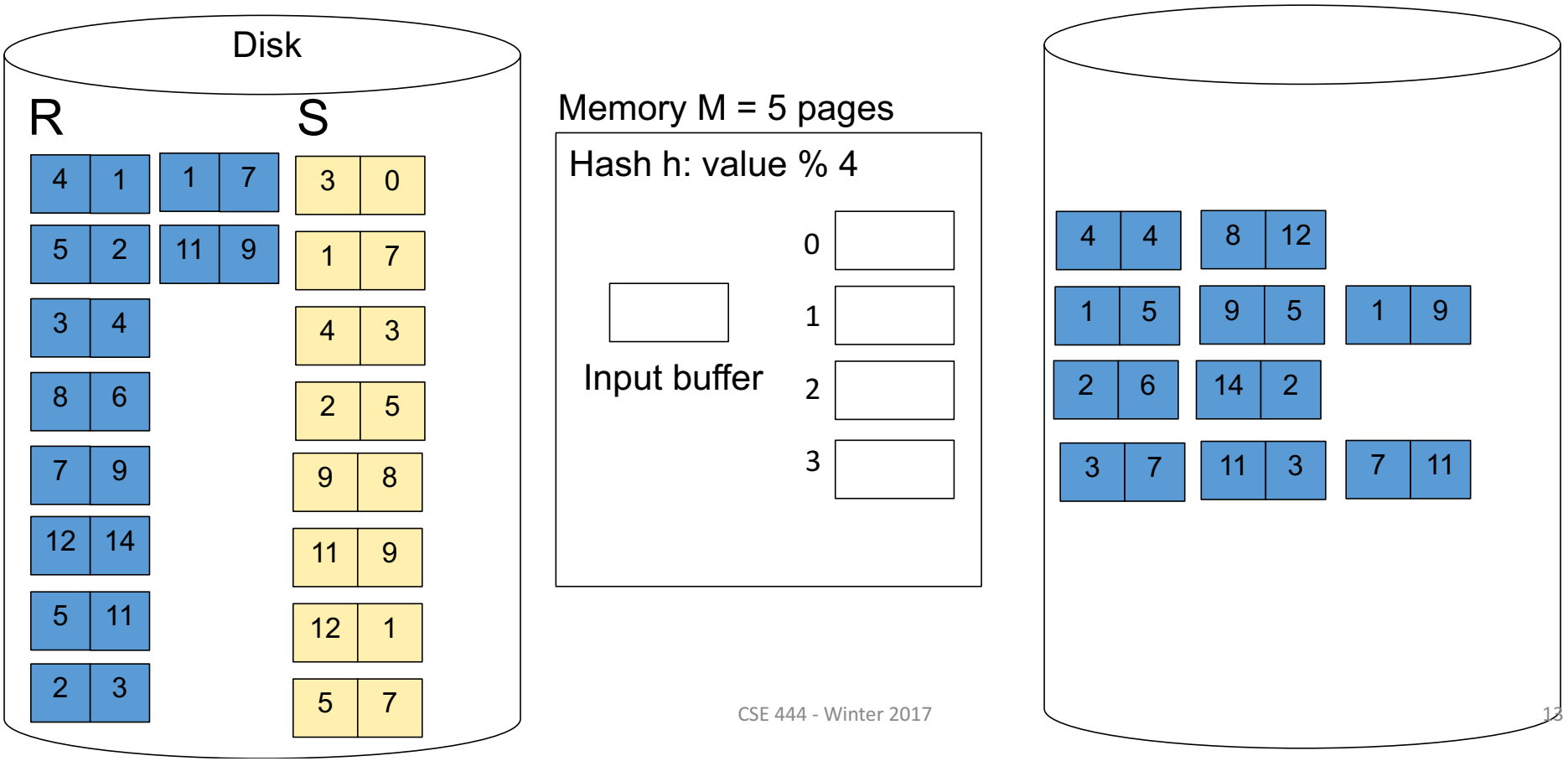
Step 1: Read relation S one page at a time and hash into the 4 buckets
When a bucket fills up, flush it to disk



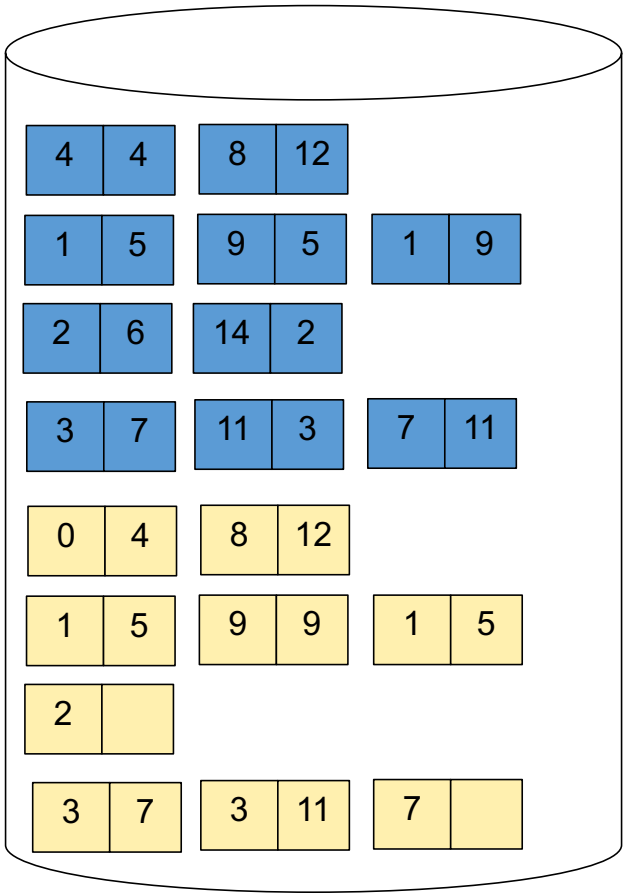
Step 1: Read relation S one page at a time and hash into the 4 buckets
At the end, we get relation S back on disk split into 4 buckets

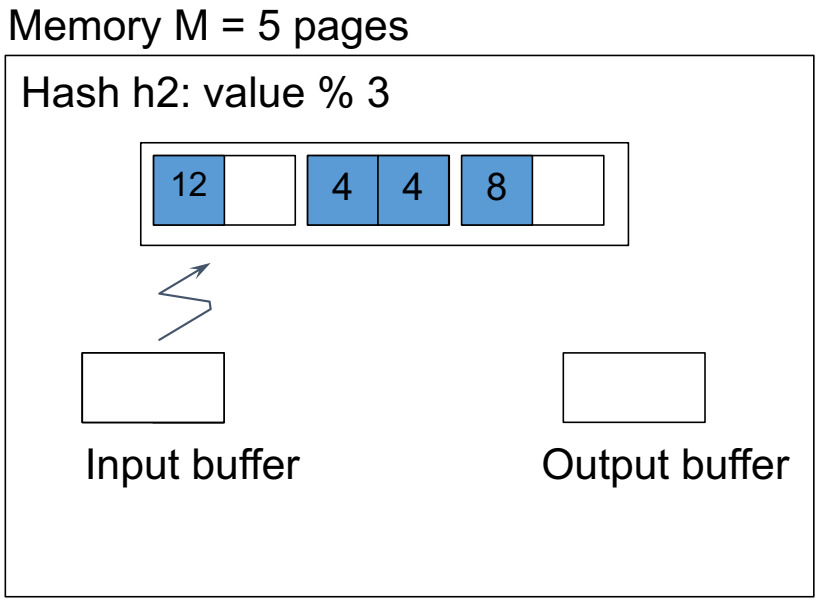


Step 2: Read relation R one page at a time and hash into same 4 buckets

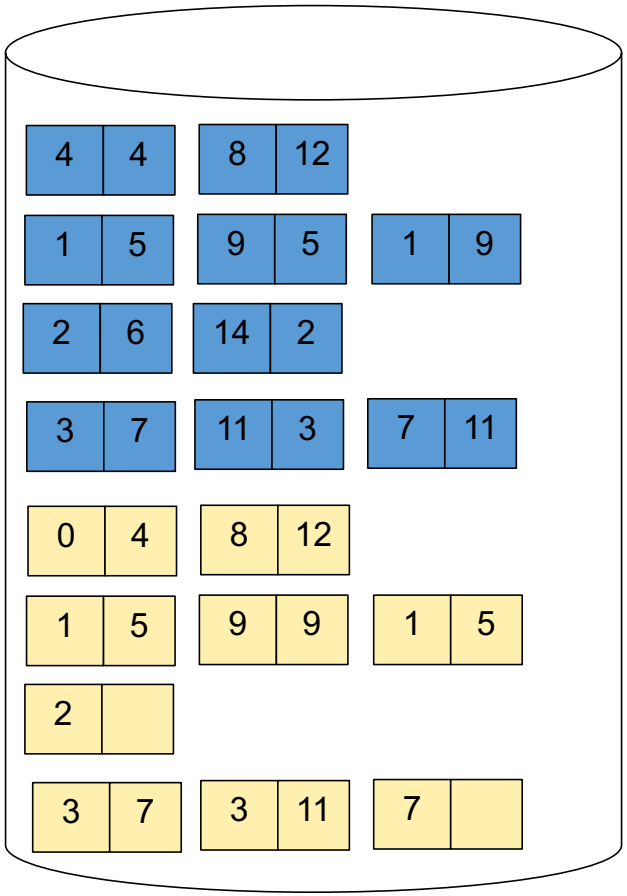


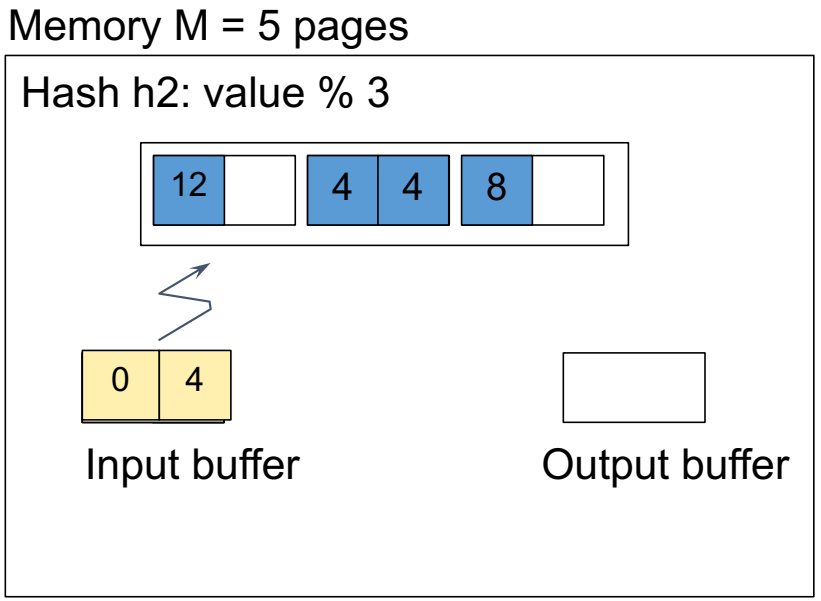
Step 3: Read one partition of R and create hash table in memory using a different hash function





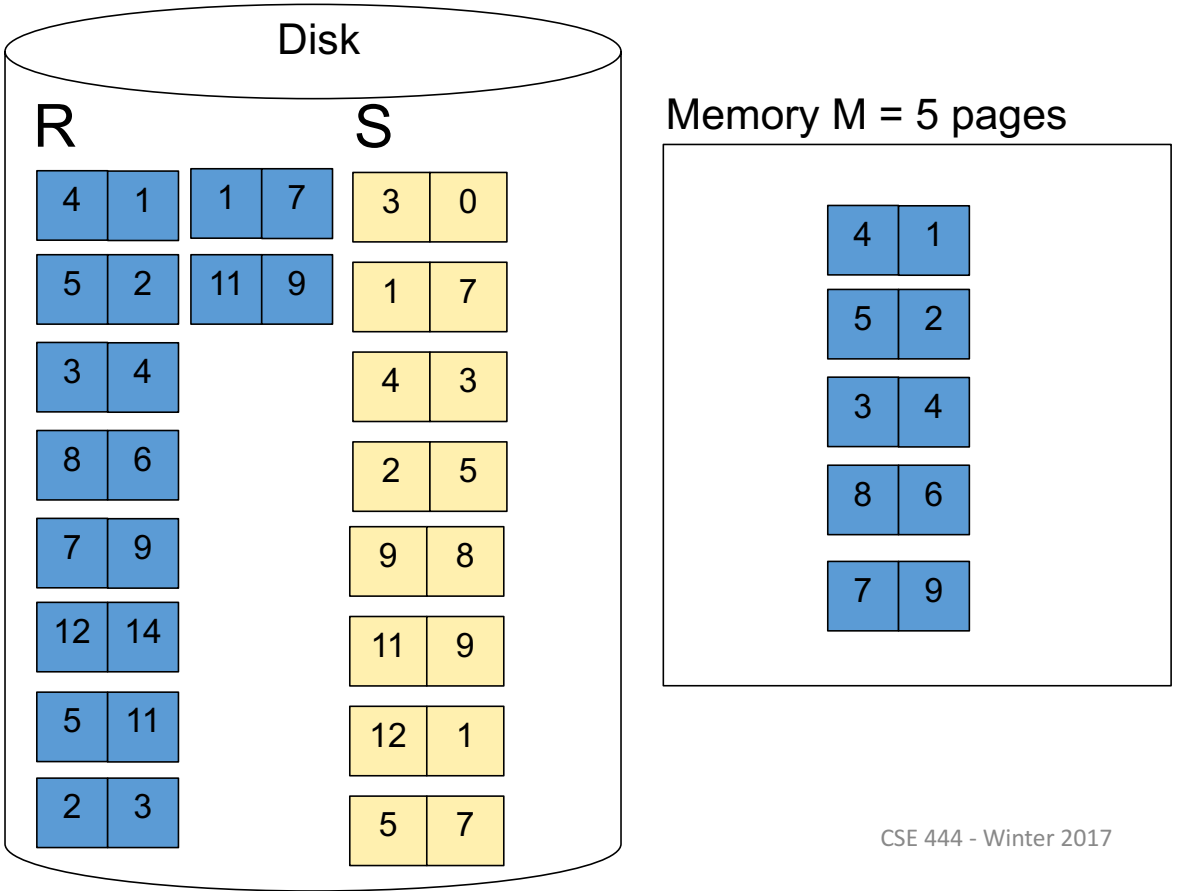
Step 4: Scan matching partition of S and probe the hash table
Step 5: Repeat for all the buckets
Total cost: 3B(R) + 3B(S)



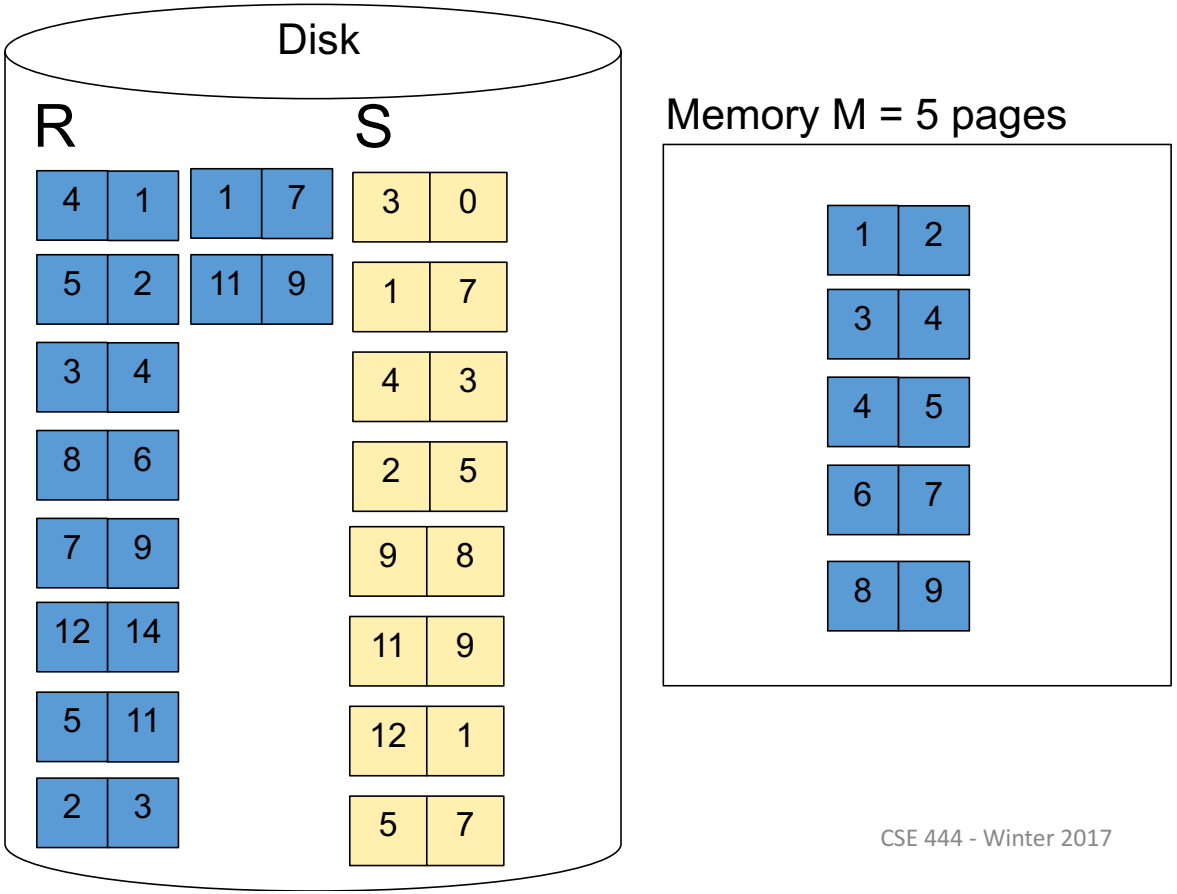


External Merge Join

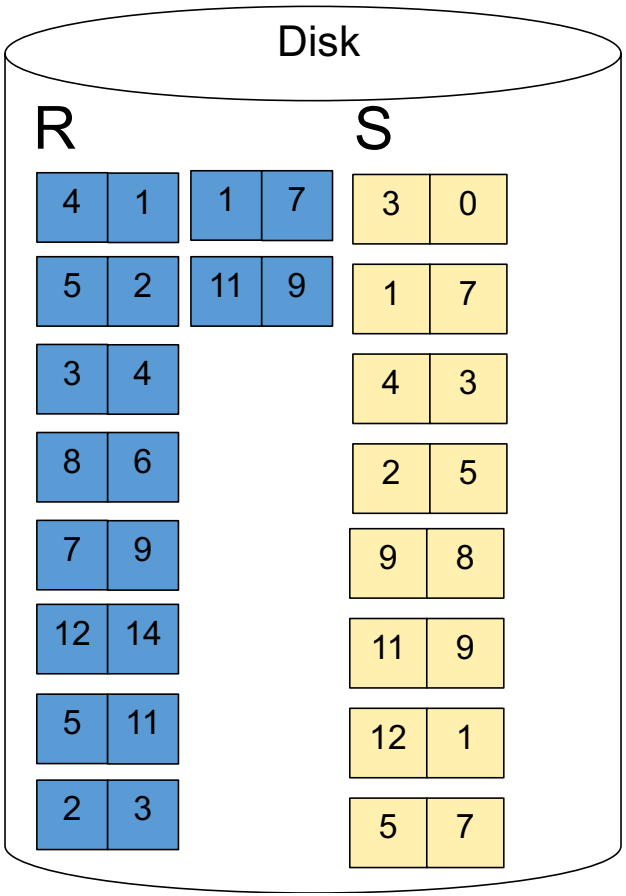
Step 1: Read M pages of R and sort in memory

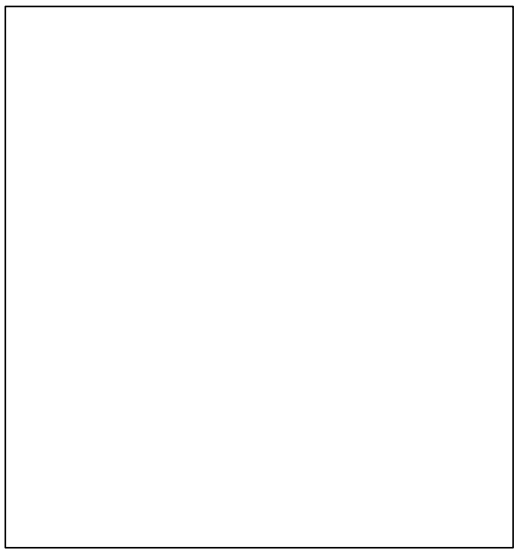


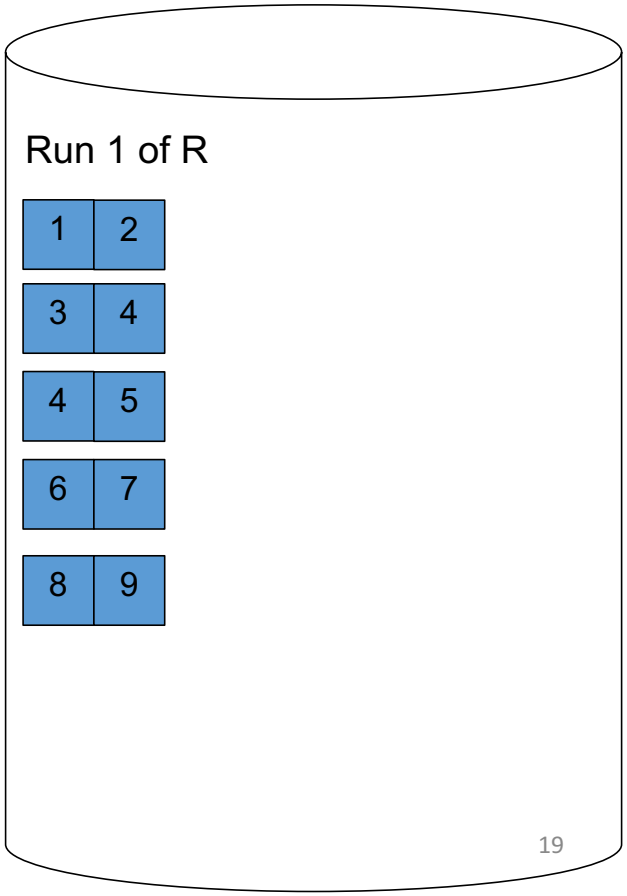
Step 1: Read M pages of R and sort in memory



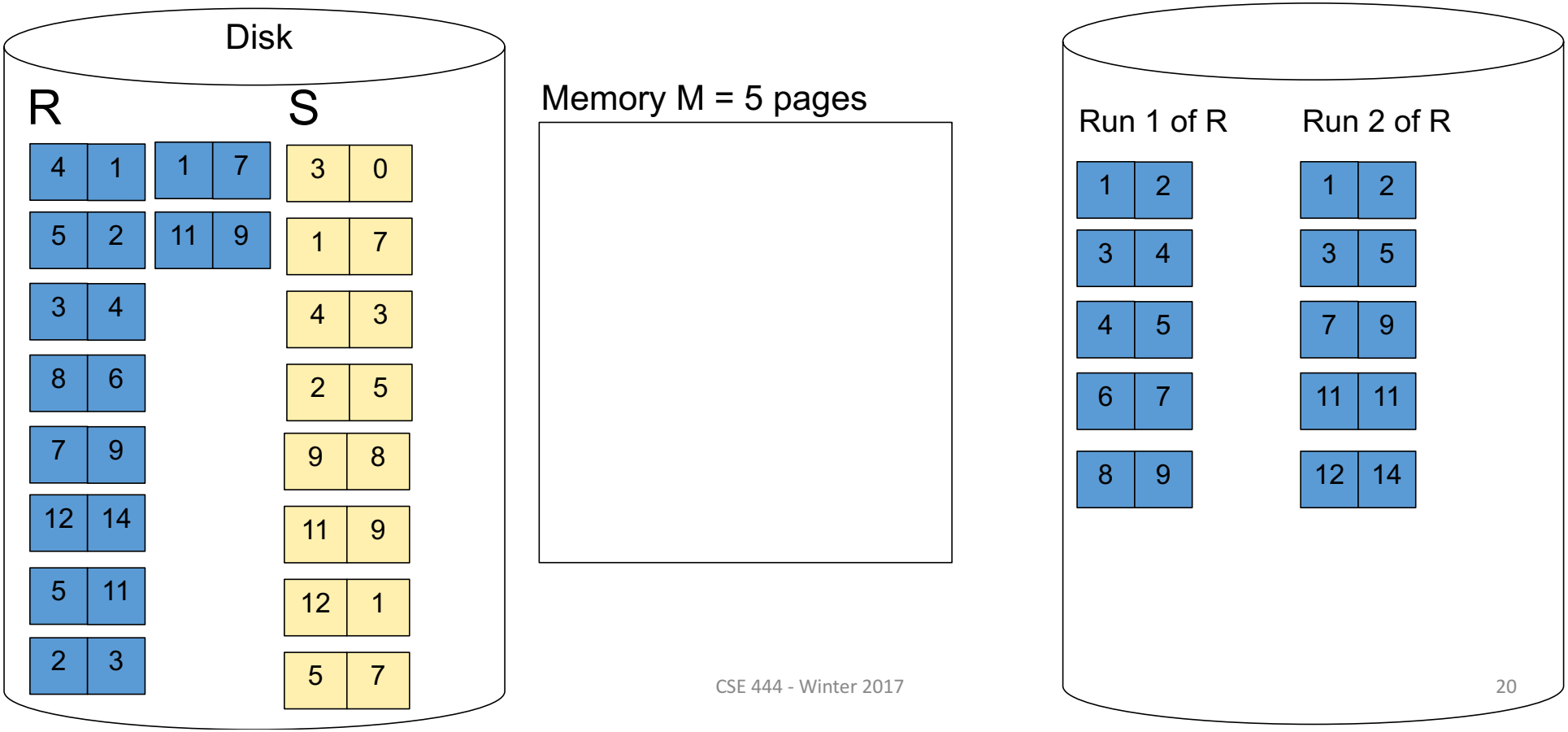
Step 1: Read M pages of R and sort in memory, then write to disk



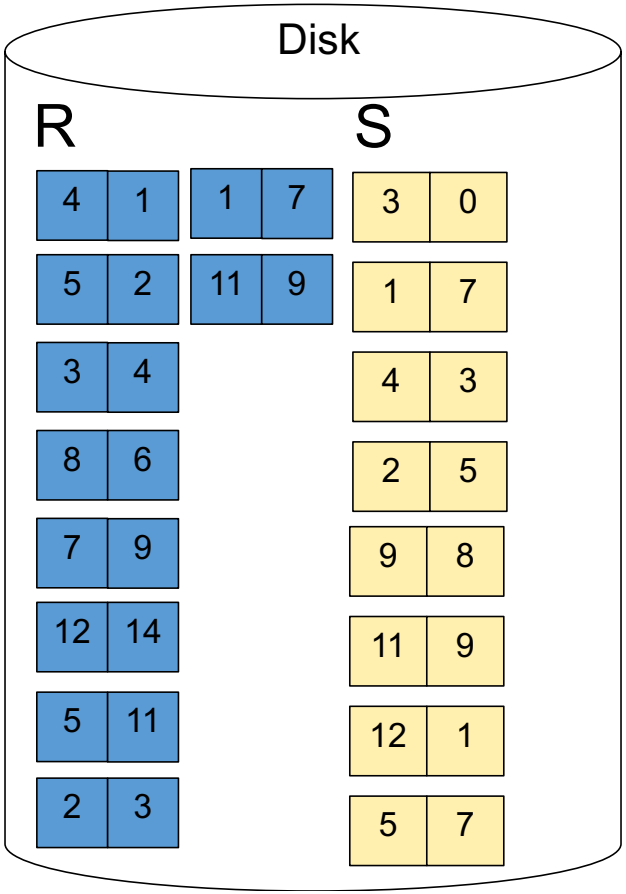


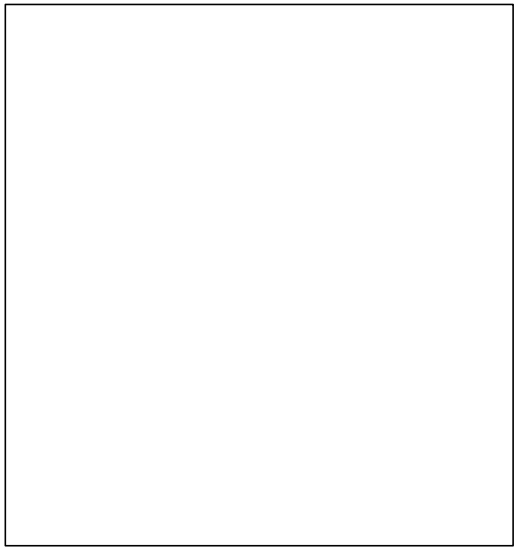


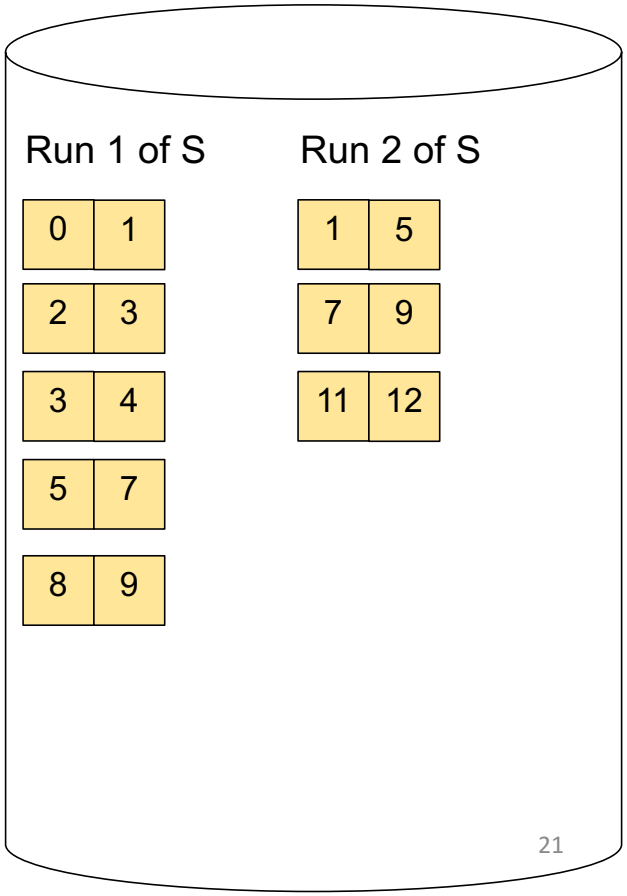
Step 2: Repeat for next M pages until all R is processed



Step 3: Do the same with S







Step 4: Join while merging sorted runs

Total cost: 3B(R) + 3B(S)