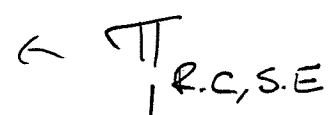


~~PAGES(S(RWS))~~
 $PAGES(\pi(\sigma(RW))) = K$

COST = COST OF SORTING
 K PAGES w/ 20 blocks of memory
 (— K (first read is free) SORT

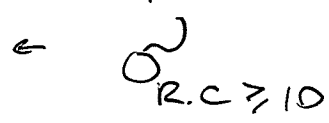
external sort
 M=20

COST=0



on the fly
 M=1

COST=0



on the fly
 M=1

COST= PAGES(R) +

PAGES(S) *

$$\left\lceil \frac{PAGES(R)}{20} \right\rceil$$



R.F=S.B

S

Block nested loop join
 M=21

(2)

SUPPOSE
 $PAGES(R) = 100$

$PAGES(S) = 200$

$$PAGES(\underbrace{\sigma}_{R.C, S.E}(\underbrace{\pi}_{R.C \geq 10}(R \bowtie S))) = 400$$

$R.A = S.B$

JOIN w/ $M=21$ $COST = 100 + 5 * 200 = 1,100$

SORT cost $M=20$ (Sorting the output of ops with 400 pages)

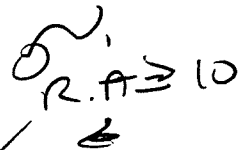
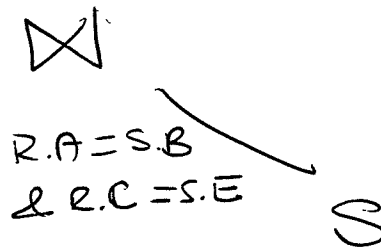
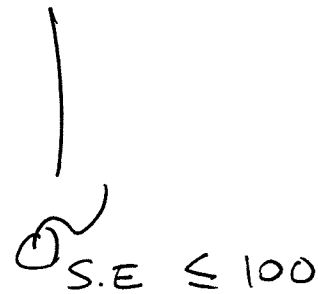
STEP 1: $0 + 400$ (Produce $\frac{400}{20} = 20$ sorted groups)

STEP 2: 400 (Read + merge to output)

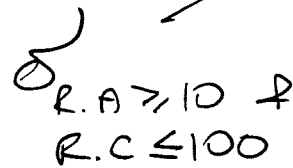
TOTAL COST = 1,100 (Join) + 800 (Sort) = 1,900

⑤

Pushing selections down

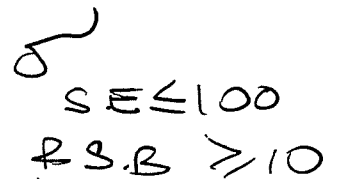


R

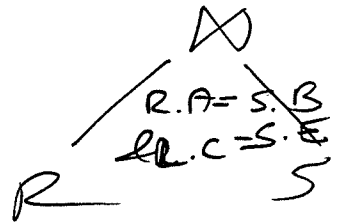
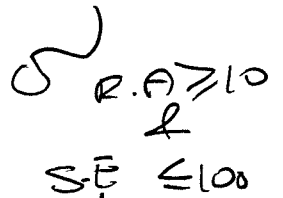


R

S



S

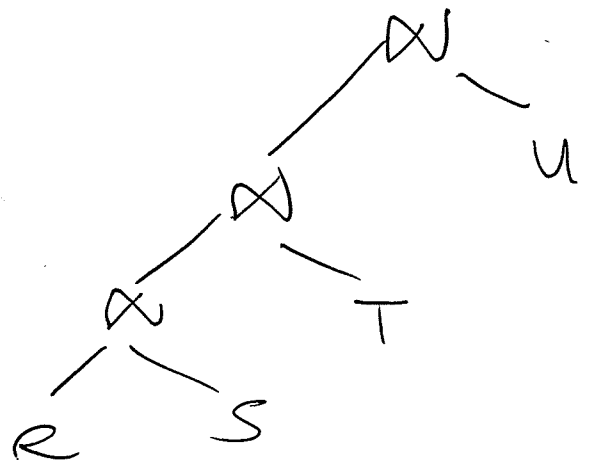


R

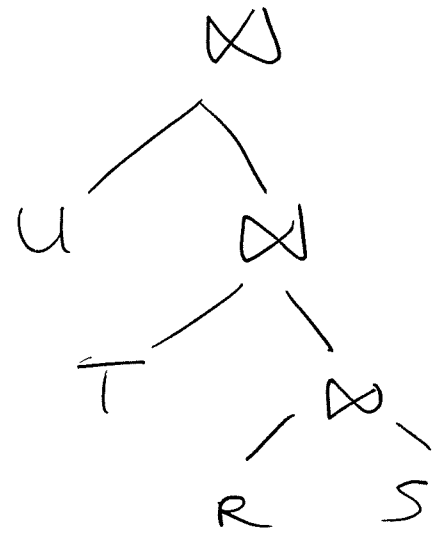
S

⑦

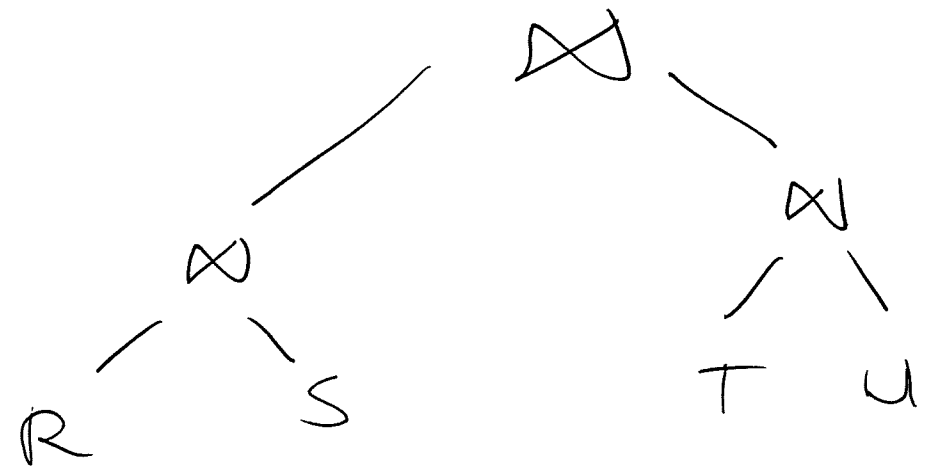
Join orderings



Left deep join

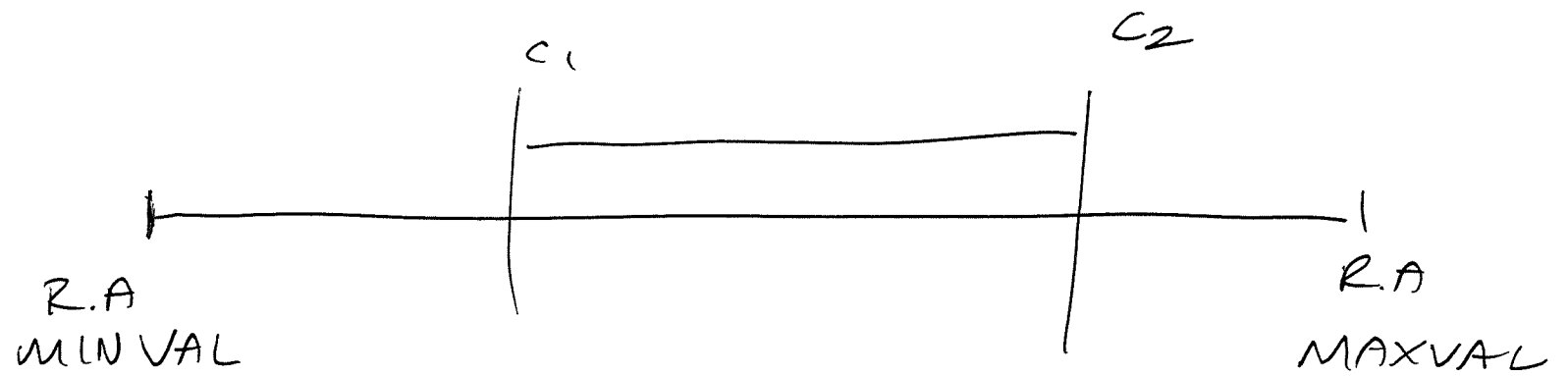


Right deep join



Bushy join

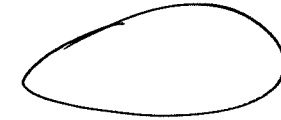
$$c_1 \leq RA \leq c_2$$



Transcript

Student

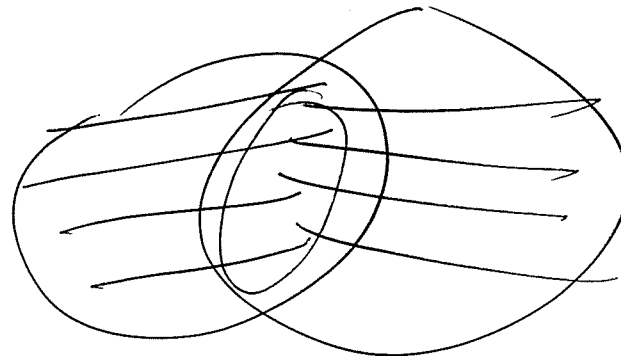
RIN : 1 $\xrightarrow{1 \text{ match}}$



RIN : 2

$$\begin{array}{r} 6,000 \\ \hline 6,000 \end{array}$$

c1 o2 c2



T.RIN =

Age

types
~~value~~

