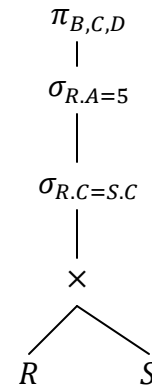
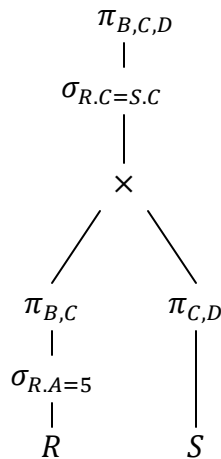
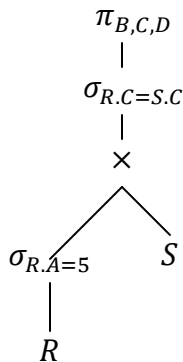
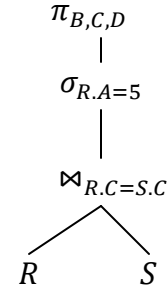
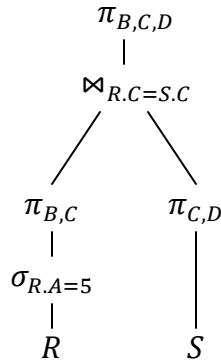
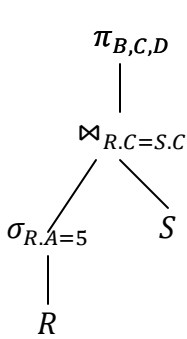


## SOLUTIONS to Practice Problems on Query Processing

### Logical Query Plans

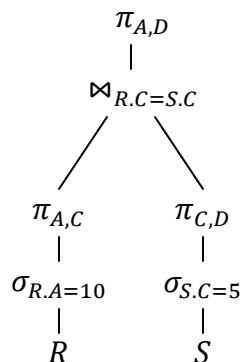
SELECT B, C, D  
FROM R, S  
WHERE R.C=S.C AND R.A=5



### Logical Query Plan Transformation

$$\pi_{A,D} \sigma_{S.C=5 \wedge R.A=10 \wedge R.C=S.C} (R \times S)$$

We could push down selection of  $S.C = 5$  and selection of  $R.A = 10$  first. Then do the projections that include the join condition:  $\pi_{A,C}$  on R and  $\pi_{D,C}$  on S. Lastly do the join and projection of  $\pi_{A,D}$



$$\pi_{A,D} \left( (\pi_{A,C} \sigma_{R.A=10} R) \bowtie (\pi_{D,C} \sigma_{S.C=5} S) \right)$$

### Size Estimation

1.  $\sigma_{A=35} W$

$$size = \frac{T(W)}{V(W,A)} = \frac{100}{80}$$

2.  $\sigma_{A=35 \wedge B=5} W$

$$size = \frac{T(W)}{V(W,A)V(W,B)} = \frac{100}{80 * 10}$$

3.  $W \bowtie X$

$$size = \frac{T(W)T(X)}{\max\{V(W,B), V(X,B)\}} = \frac{100 * 400}{200} = 200$$

4.  $X \bowtie Y$

$$size = \frac{T(X)T(Y)}{\max\{V(X,C), V(Y,C)\}} = \frac{400 * 200}{200} = 400$$

5.  $W \bowtie X \bowtie Y \bowtie Z$

Consider  $((W \bowtie X) \bowtie Y) \bowtie Z$

Let R be  $W \bowtie X$ , then

$$size(R) = 200, V(R,C) = 1 \text{ (value preservation)}$$

Let S be  $R \bowtie Y$ , then

$$size(S) = \frac{T(R)T(Y)}{\max\{V(R,C), V(Y,C)\}} = \frac{200 * 200}{200} = 200$$

$$V(S,D) = 120 \text{ (value preservation)}$$

$$size(S \bowtie Z) = \frac{T(S)T(Z)}{\max\{V(S,D), V(Z,D)\}} = \frac{200 * 300}{200} = 300$$