

Practice Problems on Query Processing

Logical Query Plans

Consider the two relations $R(A, B, C)$ and $S(C, D, E)$. Give 6 valid logical query plans for the following SQL query.

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

Logical Query Plan Transformation

Consider the two relations $R(A, B, C)$ and $S(C, D, E)$. Consider the following relational algebra expression:

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

Transform this expression into an equivalent expression that

1. Has no Cartesian product
2. Performs projections as early as possible
3. Performs selections as early as possible (give selections “priority” over projections)

Physical Plan Generation

Suppose relations **R** and **S** are not sorted in any particular order. Suppose furthermore that two indexes exist on relation **R**, one on column **A** and one on column **C**. No other indices are present. Give 5 (or more!) physical plans for the following logical plan:

$$(\sigma_{A=5}R) \bowtie_{R.C=S.C} S$$

Size Estimation

Here are the statistics for four relations *W, X, Y, Z*.

W(A,B)	X(B,C)	Y(C,D)	Z(D,E)
T(W) = 100	T(X) = 400	T(Y) = 200	T(Z) = 300
V(W,A) = 80	V(X,B) = 200	V(Y,C) = 200	V(Z,D) = 200
V(W,B) = 10	V(X,C) = 1	V(Y,D) = 120	V(Z,E) = 80

Estimate the tuple numbers of the following expressions:

1.

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

2.

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

3.

$$W \bowtie X$$

4.

$$X \bowtie Y$$

5.

$$W \bowtie X \bowtie Y \bowtie Z$$