## Main exercises

(1) Composition of relational algebra operators helps us use the intermediate results of one algebra operations
every operator in relational algebra accepts one or more relation instances as arguments and the result is always an relation instance. So, the argument of one operator can be the result of another operator. This makes it easy to write complex queries by simply composing the relational algebra operators.

(2) $R_1$ relation : $N_1$ tuples
$R_2$ relation : $N_2$ tuples

a) $R_1 \cup R_2$ contains Max $(N_1, N_2)$ tuples at minimum ⟶ when one Relation is a subset of other relation
At Max, we have $N_1 + N_2$ tuples where Both relations are disjoint

(b) $R_1 \cap R_2$ : At max we have Min $(N_1, N_2)$ when one relation is totally a subset

of the other relation

At Min, we have 0 tuples → when both relations are disjoint

(c) Max($N_1$, $N_2$) – other relation when both are same, we have 0 tuples at minimum

At Max, we have ($N_1$, $N_2$) tuples when we do ($R_1 - R_2$ and $R_1 > R_2$ or $R_2 - R_1$ and $R_2 > R_1$) and both are disjoint Relations

(d) cross product

when both are disjoint or both are same → in any case we have $N_1 \times N_2$ tuples

(e) selection operator

when $R_1$ has no tuples with $a = 5$ then at minimum, we get 0 tuples when all tuples of $R_1$ have $a = 5$

then we get all $N_1$ tuples at maximum

(f) projection of column A of $R_1 \longrightarrow$ in this case we get $N_1$ tuples as projection doesn't change # of tuples in the relation

(g) If $R_2$ contains only one column and even $R_1$ contains one same column then at Minimum or Maximum we get 0 tuples in this case

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If case2: $R_2$ contains 1 column and all of its values are present in all of tuples of $R_1$ (in this case $R_1$ has $N_1 \times N_2$ tuples), then output will contain $N_1$ tuples at Max

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If $N_1 < N_2$, then 0 tuples as we do $R_1 / R_2$

(3)