More Slides on "Division Operation" in Relational Algebra Query Language

(& together with examples on Assignment operation)

Assignment Operation

The assignment operation (←) provides a convenient way to express complex queries.

• Write query as a sequential program consisting of

- a series of assignments
- Followed by an expression whose value is displayed as a result of the query.

Assignment must always be made to a temporary relation variable.

- Example of assignment comes late with the Division statement

Division Operation

- Suited to queries that include the phrase "for all".
- Let *r* and *s* be relations on schemas *R* and *S* respectively

$$r \div s$$

•
$$R = (A_1, ..., A_m, B_1, ..., B_n)$$

• $S = (B_1, ..., B_n)$

The result of $r \div s$ is a relation on schema

$$R - S = (A_1, ..., A_m)$$

 $r \div s = \{ t \mid t \in \prod_{R-S} (r) \land \forall u \in s (tu \in r) \}$

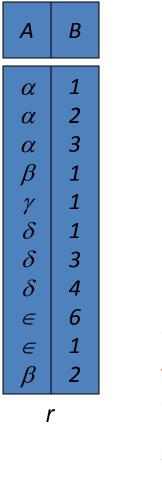
* **u** representing any tuple in s

Where *tu* means the concatenation of a tuple *t* and *u* to produce a single tuple

*** for every tuple in R-S (called t), there are a set of tuples in R, such that for all tuples (such as u) in s, the tu is a tuple in R.

Division Operation – Example

Relations r, s:





e.g.

A is customer name

B is branch-name

1and 2 here show two specific branchnames

(Find customers who have an account in all branches of the bank)

r ÷ *s*:

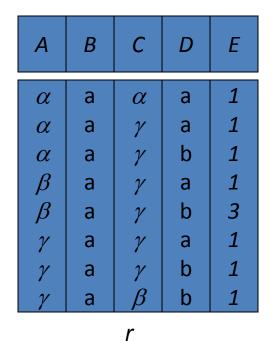
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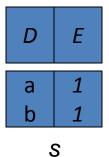
α

В

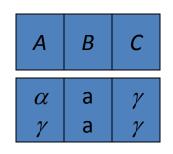
Another Division Example

Relations r, s:





 $r \div s$:



e.g.

Students who have taken both "a" and "b" courses, with instructor "1"

(Find students who have taken all courses given by instructor 1)

Assignment Operation

 Example of writing division with set difference, projection, and assignments: r ÷ s

```
temp1 \leftarrow \prod R-S(r)
temp2 \leftarrow \prod R-S ((temp1 x s) - \prod R-S,S(r))
result = temp1 - temp2
```

- The result to the right of the \leftarrow is assigned to relation variable on the left of the \leftarrow .
- May use variables in subsequent expressions

* Try executing the above query at home on the previous example, to convince yourself about its equivalence to the division operation