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CS340
Relational Algebra Assignment
November 11th, 2021

1. Project

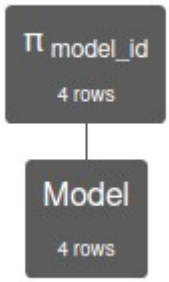
Relational algebra query:

π model_id (Model)

SQL query:

SELECT model_id from Model;

Query output:



Model.model_id
1
2
3
4

Explanation:

The project operator selects the column labeled model_id from the Model table, displaying the columns in the selected table where the criteria is met.

2. Union

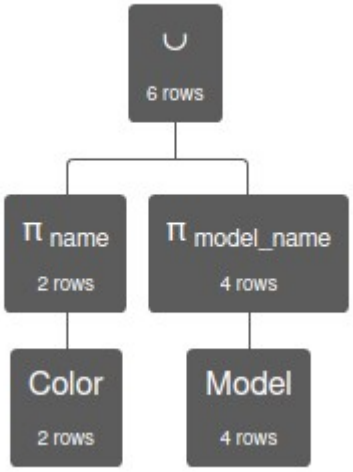
Relational algebra query:

(π name (Color)) ∪ (π model_name (Model))

SQL query:

SELECT name FROM Color UNION SELECT model_name FROM Model;

Query output:



Color.name
'Sky Blue'
'Bold Red'
'Model1'
'Model2'
'2 Series'
'Focus'

Explanation:

The union operator combines the result set of the two select statements, which builds a relation of names from the Color entity and model_names from the Model entity.

3. Cartesian Product

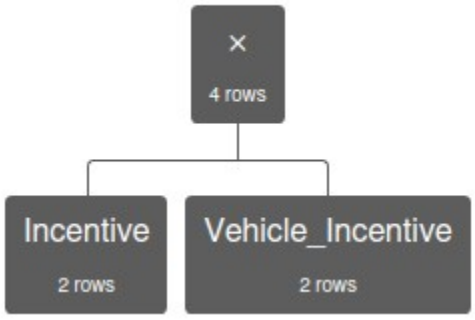
Relational algebra query:

(Incentive) × (Vehicle_Incentive)

SQL query:

```
SELECT * FROM Incentive
CROSS JOIN
Vehicle_Incentive;
```

Query output:



Incentive.incentive_id	Incentive.type	Incentive.amount	Incentive.conditions	Vehicle_Incentive.fk_v
1	'dealer'	400	'only if credit score > 700'	1
1	'dealer'	400	'only if credit score > 700'	2
2	'company'	400	'only if credit score > 600'	1
2	'company'	400	'only if credit score > 600'	2

Explanation:

This operator returns the Cartesian product of the sets of two or more joined tables, o in other words, all combinations of tuples between individual rows of each table. In this case, a 2 x 2 operation results in 4 rows returned.

4. Intersect

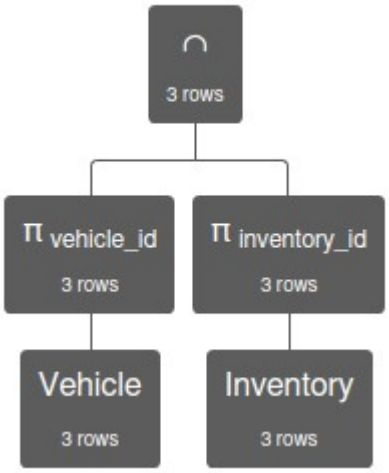
Relational algebra query:

(π vehicle_id (Vehicle)) ∩ (π inventory_id (Inventory))

SQL query:

SELECT vehicle_id FROM Vehicle INTERSECT SELECT inventory_id FROM Inventory

Query output:



Vehicle.vehicle_id
1
2
3

Explanation:

This operator forms an intersection of two sets, returning the row results of common rows by the two select statements. In other words, rows which exist in one table but not the other will not be included in the returned results.

5. Difference

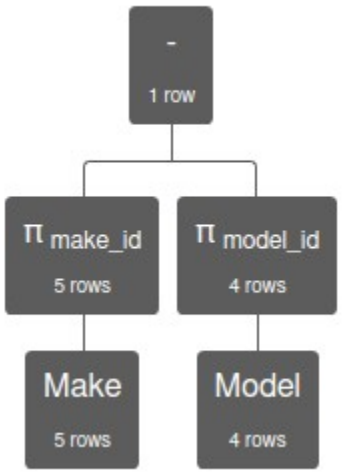
Relational algebra query:

(π make_id (Make)) - (π model_id (Model))

SQL query:

SELECT make_id FROM Make EXCEPT SELECT model_id FROM Model;

Query output:



Make.make_id
5

Explanation:

The difference operator forms a difference of two sets between two tables, removing rows from one table which are shared by the other table. In other words, it is the difference of one result set from another result set. In this case, the row with make_id 5 is returned, as the other rows are shared between the two tables.

6. Join

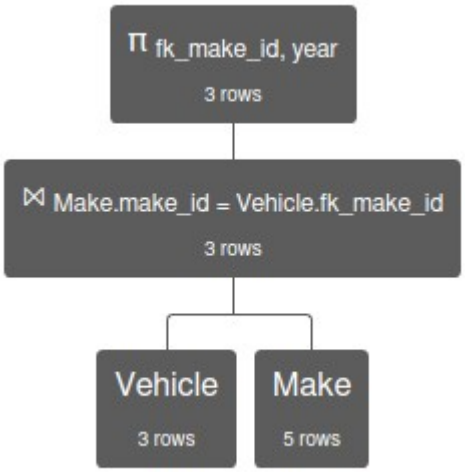
Relational algebra query:

π fk_make_id, year (Vehicle ⋈ Make.make_id = Vehicle.fk_make_id Make)

SQL query:

```
SELECT fk_make_id, year FROM Vehicle
JOIN
Make ON Make.make_id = Vehicle.fk_make_id;
```

Query output:



Vehicle.fk_make_id	Vehicle.year
1	'1985'
4	'1986'
2	'1987'

Explanation:

The join operator returns the result set of all combinations in two tables based on a column relationship specified between them.