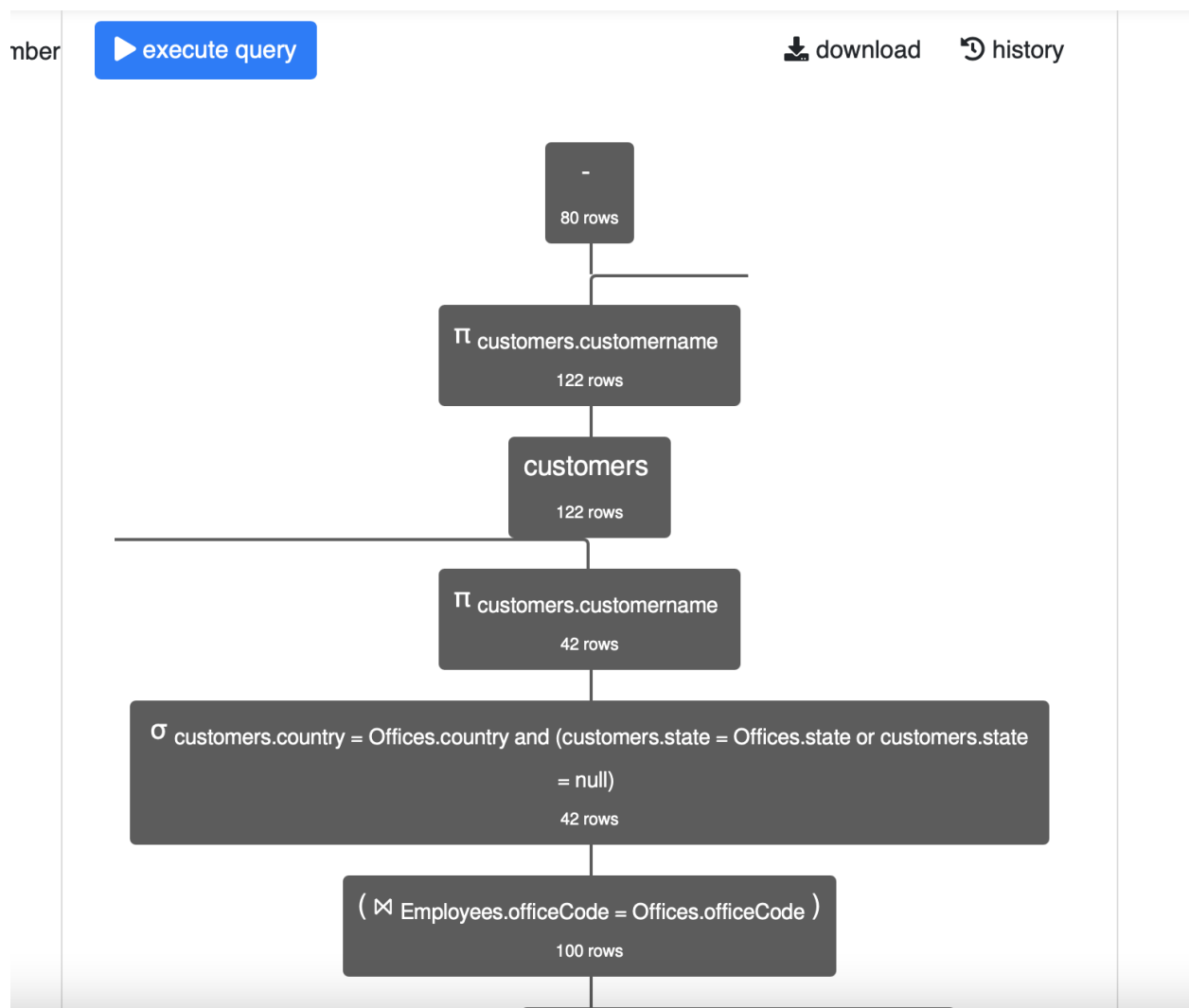
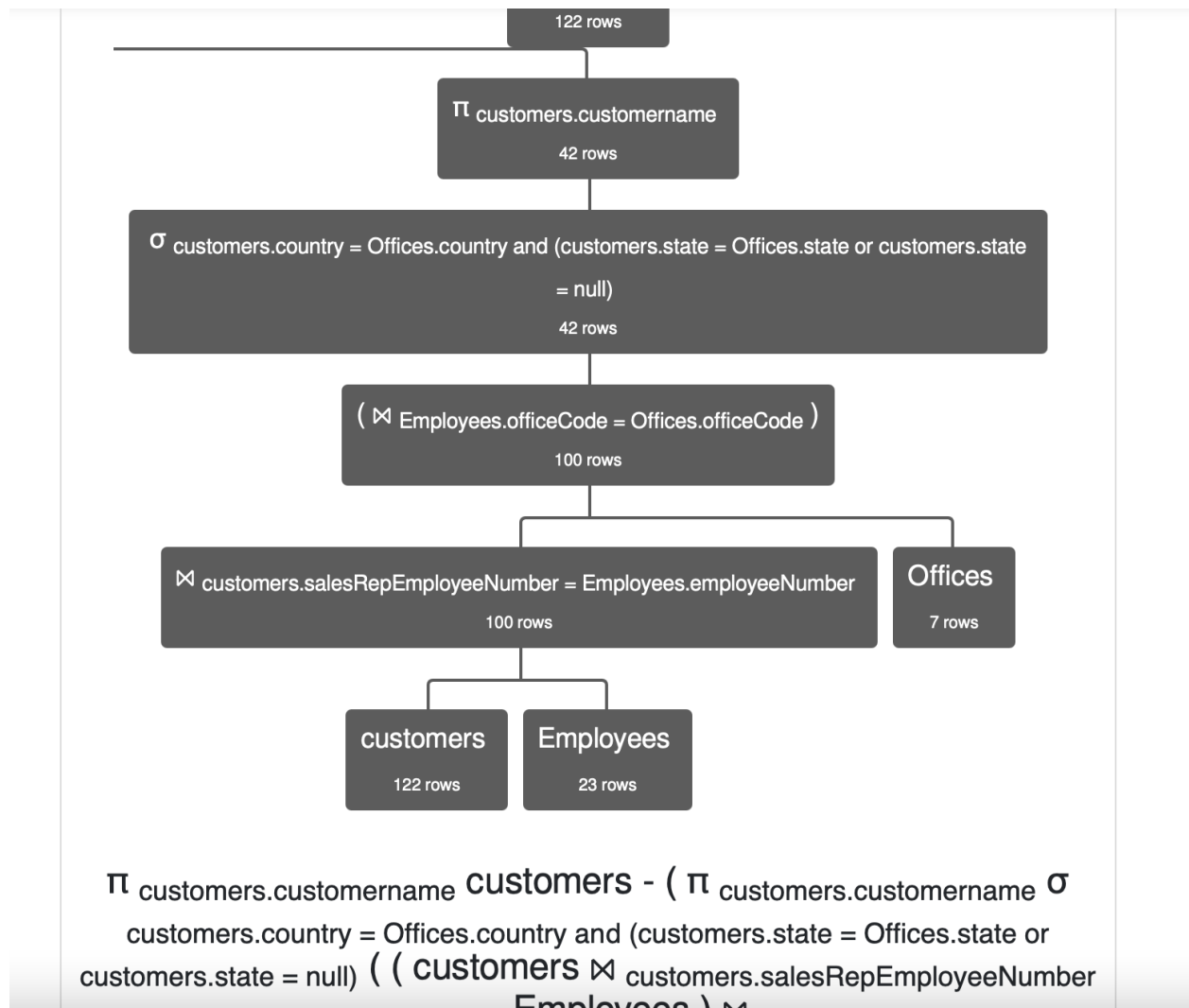


1. List the customerName of all customers who live in a state that does not have one of our offices. Consider that a state name is only unique within a given country. For instance, both Russia and the US have a state called Georgia. Do not worry about the sales representative connection between Employee and Customer. Just compare state to state and country to country between customer and offices.

$\pi_{\text{customers.customername}}$ customers - ($\pi_{\text{customers.customername}}$ $\sigma_{\text{customers.country} = \text{Offices.country} \wedge (\text{customers.state} = \text{Offices.state} \vee \text{customers.state} = \text{null})}$ ($\text{customers} \bowtie \text{customers.salesRepEmployeeNumber} = \text{Employees.employeeNumber}$ $\text{Employees} \bowtie \text{Employees.officeCode} = \text{Offices.officeCode}$ Offices))

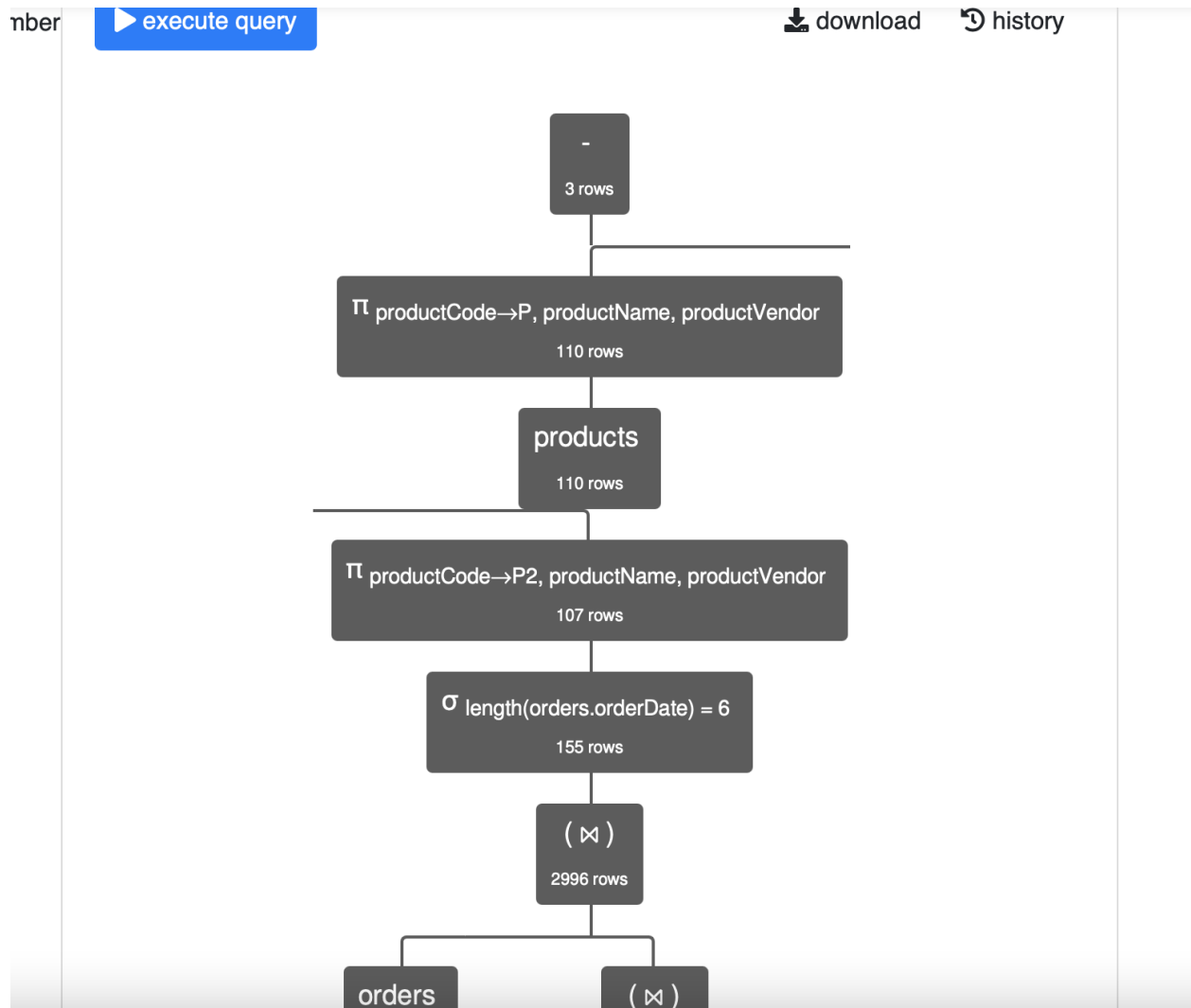


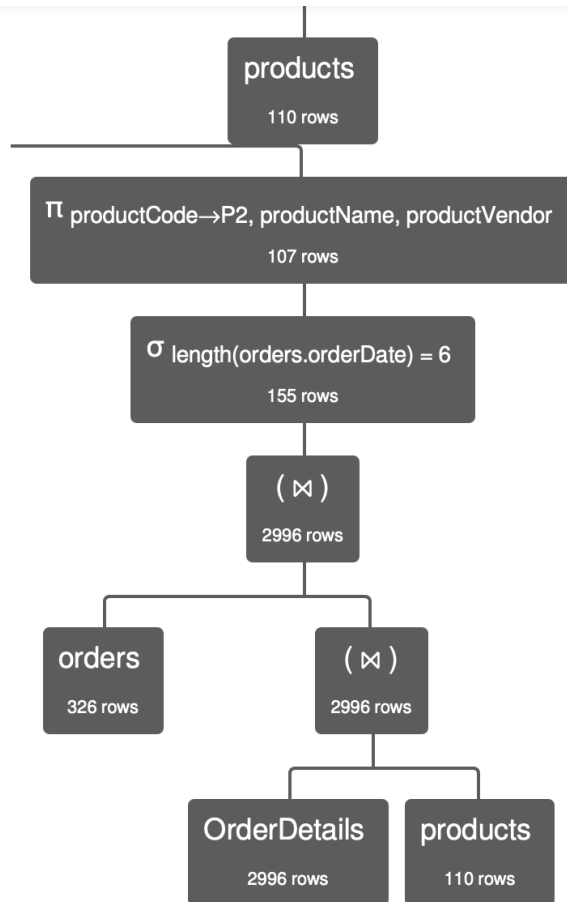


- List productCode, productName, and productVendor for each product that has never been ordered in June. Remember that we have the month function that returns the number of the month component of a data, and January is month number 1. (3)

$\pi P \leftarrow \text{productCode, productName, productVendor products -}$

$(\pi P2 \leftarrow \text{productCode, productName, productVendor } (\sigma \text{ MONTH(orders.orderDate) = 6 (orders} \bowtie \text{(OrderDetails} \bowtie \text{products))))}$

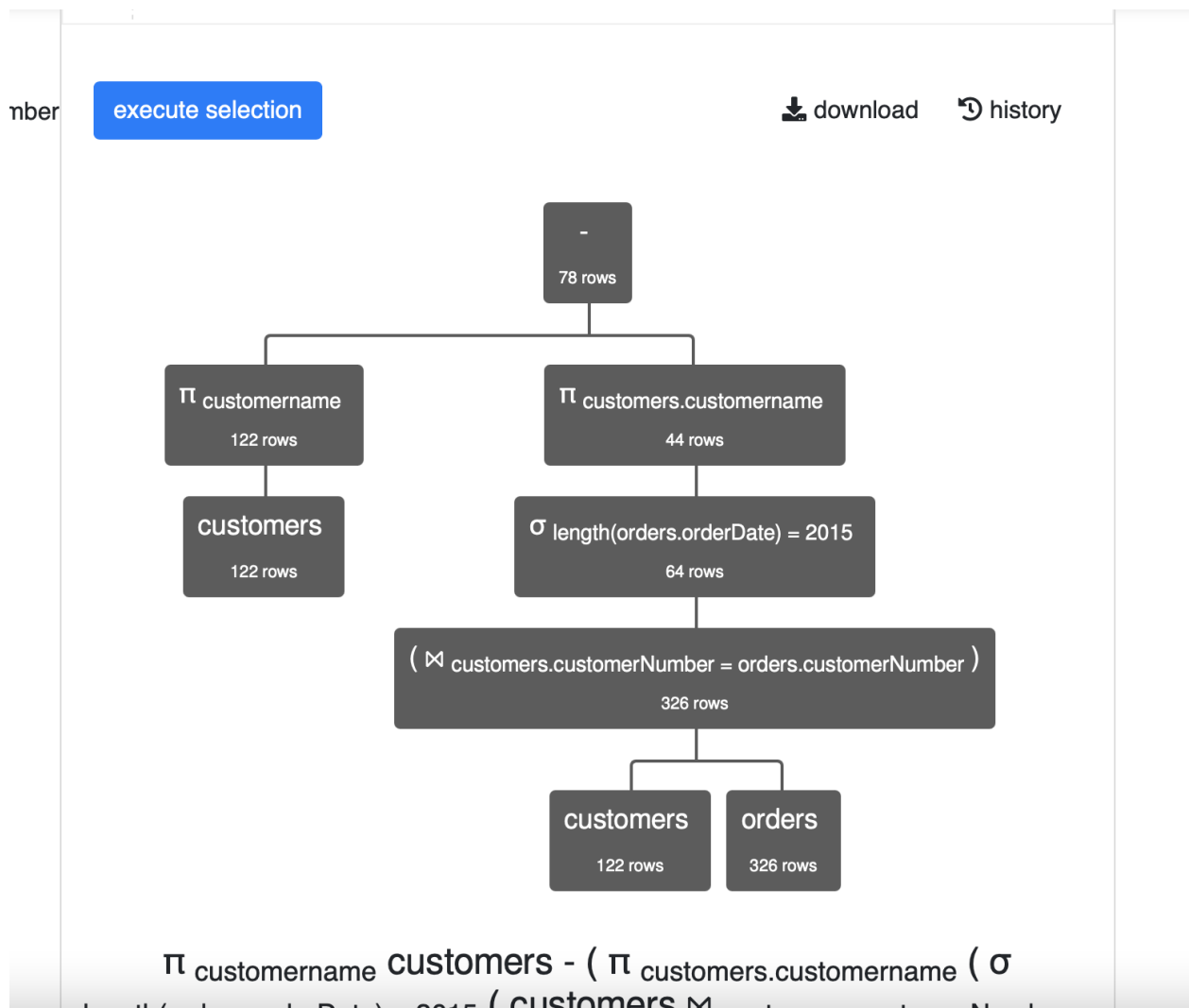




Π productCode→P, productName, productVendor **products** - (Π productCode→P2, productName, productVendor (σ length(orders.orderDate) = 6 (

3. List the Customers that did not Order any products in 2015. (78)

$\pi_{\text{customername}} \text{ customers} - (\pi_{\text{customers.customername}} (\sigma_{\text{year}(\text{orders.orderDate}) = 2015} (\text{customers} \bowtie \text{customers.customerNumber} = \text{orders.customerNumber} \text{ orders})))$

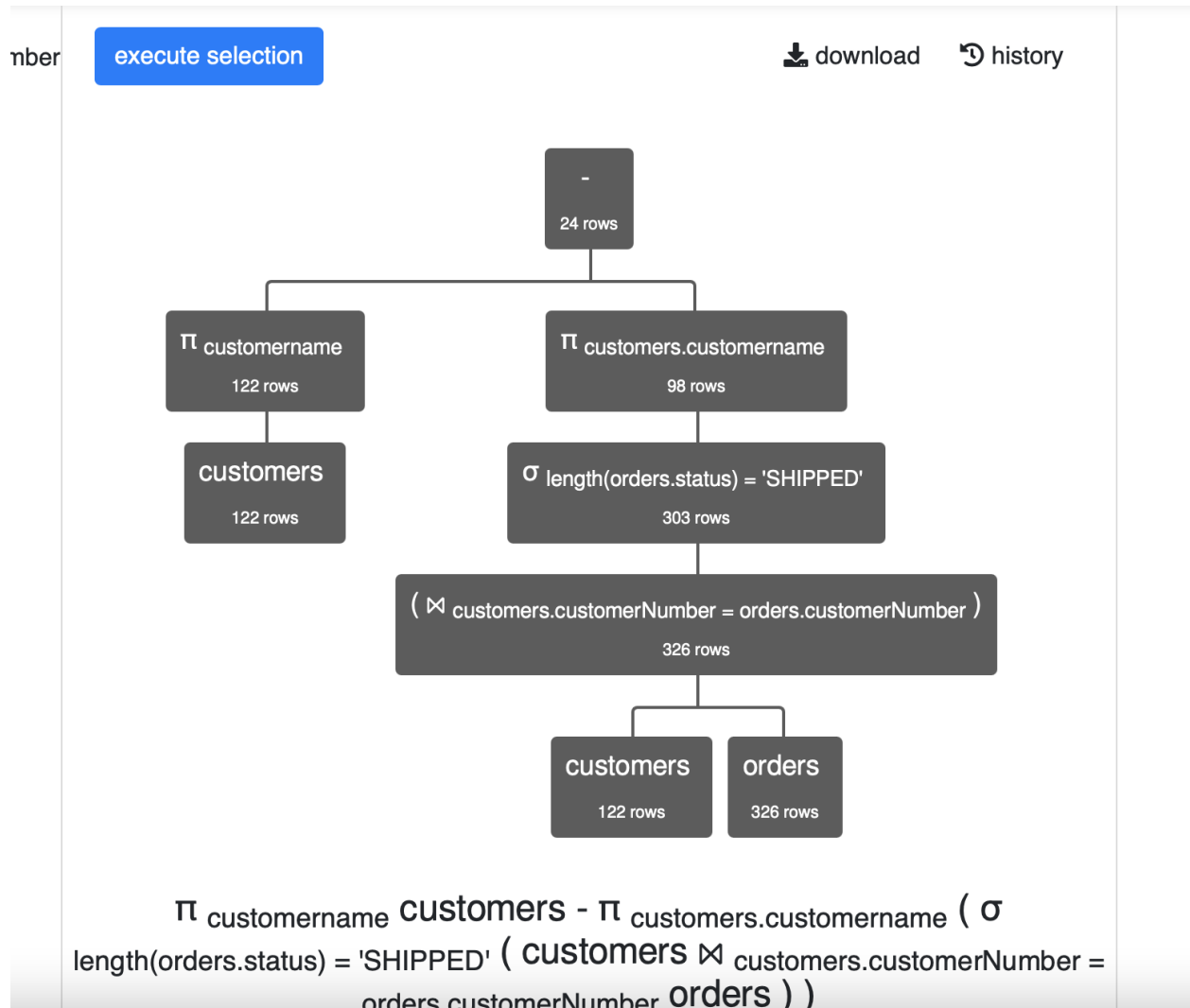


4. List all CustomerNames who have never had an order go to the 'Shipped' status.(24)

π customername customers -

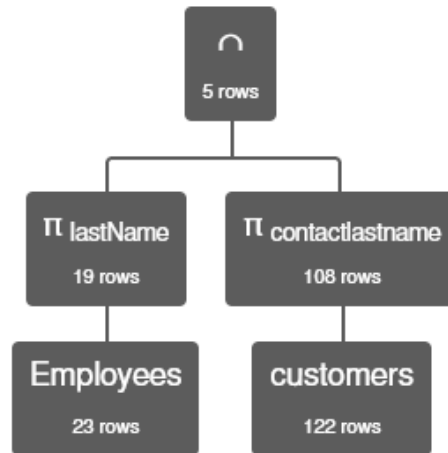
π customers.customername (σ upper(orders.status) = 'SHIPPED'

(customers \bowtie customers.customerNumber = orders.customerNumber orders))



5. Using a set operator, list the last names of those employees if there is at least one customer who also has a contact with that same last name.

$\pi \text{ lastName (Employees)} \cap \pi \text{ contactlastname (customers)}$

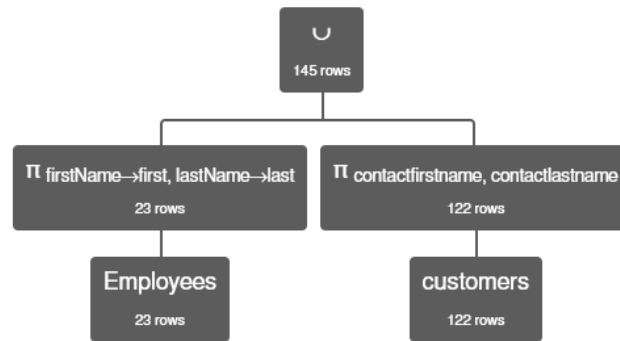


$\pi \text{ lastName (Employees)} \cap \pi \text{ contactlastname (customers)}$

Employees.lastName
'Murphy'
'Thompson'
'Tseng'
'Hernandez'

6. List all people that we deal with (employees and customer contacts). Display first name, last name, customer name (or just the literal 'Employee' for employees).

π first <- firstName, last <- lastName (Employees) \cup π contactfirstname, contactlastname (customers)

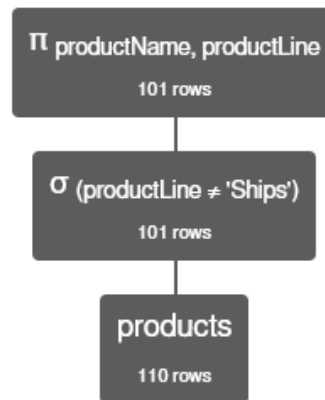


π firstName→first, lastName→last (Employees) \cup π contactfirstname, contactlastname (customers)

first	last
'Diane'	'Murphy'
'Mary'	'Patterson'
'Jeff'	'Firrelli'

7. List the names of each Product and the ProductLine which the product belongs to for all of the Products which are not 'Ships'.

π productName,productLine σ (productLine \neq 'Ships') products

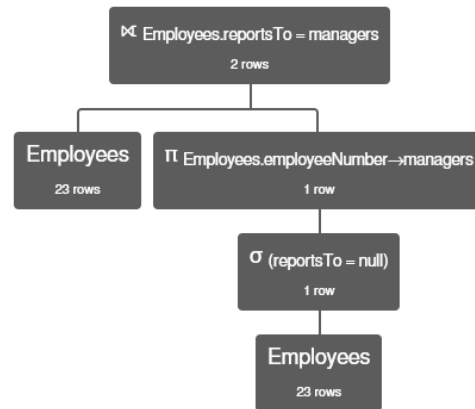


π productName, productLine σ (productLine \neq 'Ships') products

products.productName	products.productLine
'1930 Buick Marquette Phaeton'	'Vintage Cars'
'Diamond T620 Semi-Skirted Tanker'	'Trucks and Buses'
'1962 City of Detroit Streetcar'	'Trains'

8. List the Employee lastName, firstName, that employee's supervisor's lastName and firstName for those employees whose manager does not report to anyone.

Employees \bowtie Employees.reportsTo = managers (π managers \leftarrow Employees.employeeNumber σ (reportsTo = null) Employees)



Employees \bowtie Employees.reportsTo = managers (π Employees.employeeNumber → managers σ (reportsTo = null) Employees)

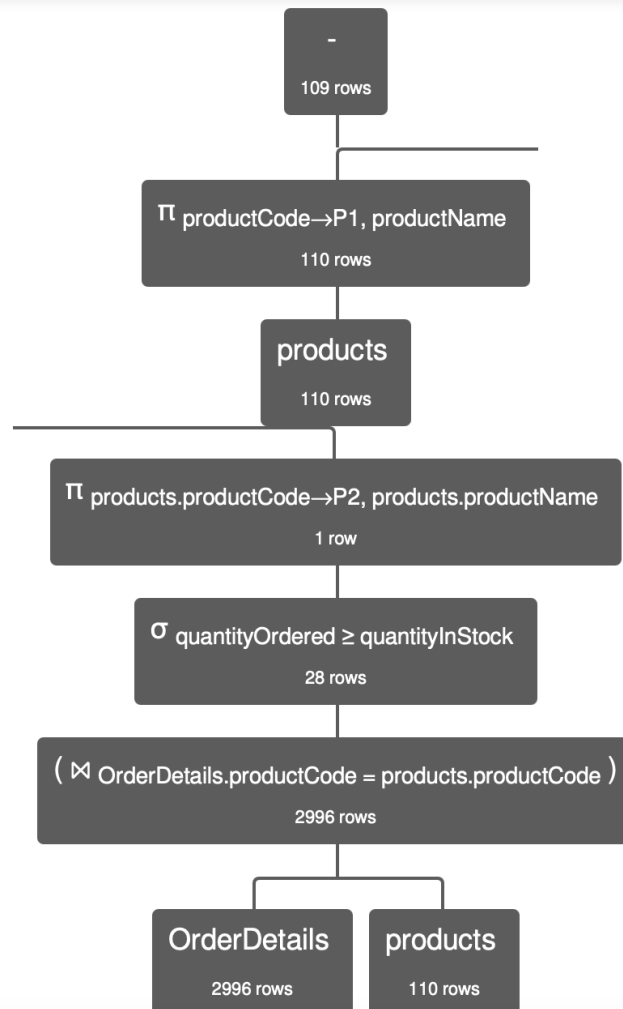
Employees.employeeNumber	Employees.lastName	Employees.firstName	Employees.extension	Employees.email
1056	'Patterson'	'Mary'	'x4611'	'mpatterso@classicmodelcar
1076	'Firrelli'	'Jeff'	'x9273'	'jfirrelli@classicmodelcars.

9. List the Product productCode and productName for each product for which we do not have any orders whose quantityOrdered exceeds the quantityInStock for that product.

π P1 <- productCode, productName products -

π P2 <- products.productCode, products.productName σ quantityOrdered \geq quantityInStock

(OrderDetails \bowtie OrderDetails.productCode = products.productCode products)



10. 1. List all the states and countries that we are involved in. If the state has a customer in it, but no office, then list that state name in one column and “Customer” in the other. If that state has an office with no customers, then list that state in one column and “Office” in the other. Finally, if the state has one or more customer and one or more office, list that state as “Both”. List each state just once. Order by the state name. Be sure to consider that the state name could be null in some cases.

$\pi_{\text{state, country, 'Both'}} \rightarrow \text{Category} (\pi_{\text{state, country}} (\text{customers}) \cap \pi_{\text{state, country}} (\text{Offices}))$
 \cup
 $\pi_{\text{state, country, 'Office'}} \rightarrow \text{Category} (\pi_{\text{state, country}} (\text{Offices}) - \pi_{\text{state, country}} (\text{customers}))$
 \cup
 $\pi_{\text{state, country, 'Customer'}} \rightarrow \text{Category} (\pi_{\text{state, country}} (\text{customers}) - \pi_{\text{state, country}} (\text{Offices}))$

