Division

Reservations: R

sailors

what ships & boats they reserved

x	y
Max	s_1
Max	s_2
Max	b_1
John	s_1
John	s_2
John	s_3
John	b_{25}

Ships: S

y
s_1
s_2
s_3

Find the names of sailors who reserved <u>all</u> the ships

$R \div S$

$=$

x
John

Antijoin

$R \overline{\ltimes}_{B<B'} S$

$R - \Pi_{AB}(R \bowtie_{B<B'} S)$

attributes of R

R

A	B
a	1
b	2
c	3

S

A'	B'
a	1
b	2
c	3

$R \bowtie_{B<B'} S$

A	B	A'	B'
a	1	b	2
a	1	c	3
b	2	c	3

Π_{AB}

A	B
c	3

R × S

A	B	A'	B'
a	1	a	1
a	1	b	2
a	1	c	3
b	2	a	1
b	2	b	2
b	2	c	3
c	3	a	1
c	3	b	2
c	3	c	3

Find customers with the biggest balance

Customer (ID, Name, City)

Account (Number, Branch, CustID, Balance)

1) ID & Name of customers who own an account in a branch in their city

$Answer_1(ID, Name) :=$

$$\Pi_{ID, Name}\ (Customer \bowtie_{ID = CustID \wedge City = Bruch} Account)$$

Customer (ID, Name, City)
Account (Number, Branch, CustID, Balance)

2) ID & Name of customers who do not own any account

$$\Pi_{ID, Name}(Customer) - \Pi_{ID, Name}(Customer \bowtie_{ID = CustID} Account)$$

$$\Pi_{ID, Name}\left(Customer - \left(Customer \ltimes_{ID = CustID} Account\right)\right)$$

Customer (ID, Name, City)

Account (Number, Branch, CustID, Balance)

3) ID & Name of customers who own an account in every branch

$$Answer_3(ID, Name) :=$$

$$\pi_{\substack{ID \\ Name \\ Branch}} \left(Customer \bowtie_{CustID = ID} Account \right) \div \pi_{Branch} Account$$

Customer (ID, Name, City)

Account (Number, Branch, CustID, Balance)

4) ID & Name of customers who own an account with a balance which is no less than the balance of any other account

$$\Pi_{ID, Name}\left(Customer \bowtie_{CustID = ID} \left(Account \overline{\times}_{Balance < Bal} Acc\right)\right)$$

where $Acc = \rho_{Number \to Num,\ Branch \to Br,\ CustID \to Cust,\ Balance \to Bal}(Account)$