

DBMS - I
Assignment - I

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1) $\pi_{sname} \left(\pi_{sid} \left(\left(\pi_{bid} \sigma_{color='red'} Boats \right) \bowtie Reserves \right) \bowtie Sailors \right)$

↓
Extract all boat ID's after σ

↓
Select tuples having color = 'red'

$\pi_{sname} \left(\pi_{sid} \left(\begin{array}{l} \text{Table of Boat ID's of boats} \\ \text{having red color} \end{array} \right) \bowtie Reserves \right) \bowtie Sailors$

↓
Extract sailor ID's after \bowtie

↓
Both have bid as common attribute

So this join extracts the tuples which have been reserved boats of color red.

After Join, attributes ^{are} (bid, sid, bid, day)

$\pi_{sname} \left(\begin{array}{l} \text{sailor ID's of sailors who have} \\ \text{reserved boats having color red} \end{array} \right) \bowtie Sailors$

↓
Extract all Sailor Names after \bowtie

↓
Both have sid as common attribute

So this join extracts the details of Sailors who have reserved boats having red color

After join, the attributes are (sid, sid, sname, rating, age)

∴ The resultant table will have names of sailors who have reserved boats having color as red.

(1)

2) $\rho(\text{Tempboats}, (\sigma_{\text{color} = 'red' \vee \text{color} = 'green'} \text{Boats}))$

↓
Rename

↓
New name

↓
selects the tuples from Boats having
color as either red or green

So, this operation creates a new table with name
Tempboats having tuples as details of Boats
having color as either red or green

$\pi_{\text{sname}}(\text{Tempboats} \bowtie \text{Reserves} \bowtie \text{Sailors})$

↓
Extract all
snames after
natural joins

Common Attribute as bid
So this join extracts the tuples
of (boats X reserves) for boats
having color as red or
green and have been
reserved. (and same bid)

attributes are (bid, bname, color, sid, bid, day)

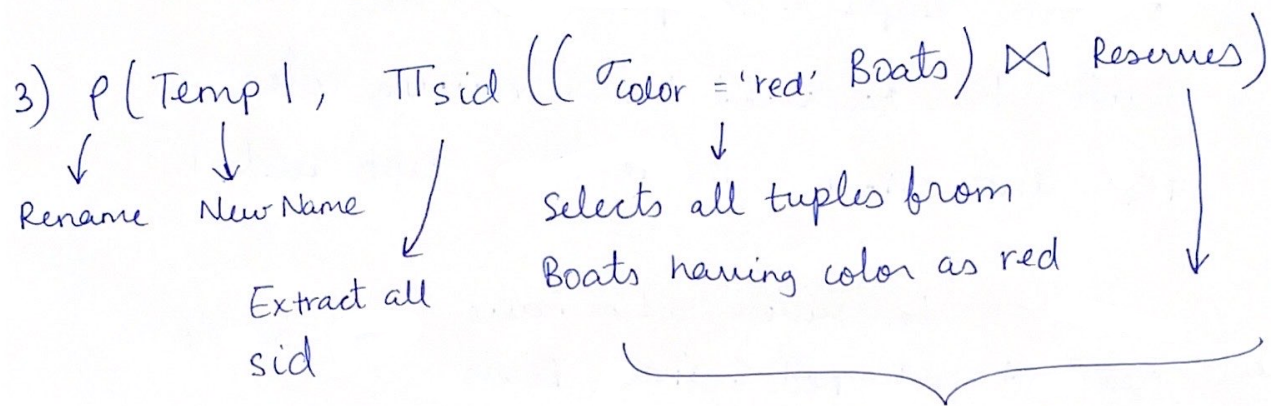
$\pi_{\text{sname}}(\text{Table having attributes from both boats \& reserves for boats which have been reserved and are of color red or green} \bowtie \text{Sailors})$

↓
Extract all
sname after \bowtie

Common attribute as sid

So this join extracts tuples with attributes from
all 3 tables, sailors, boats & reserves for boats which
are reserved and having color as either red or green

∴ The resultant table has names of sailors who have reserved boats having color as either red or green.



So this join extracts tuples with attributes from both tables for reserved boats having red color

$\rho(\text{Temp1}, \text{TTsid}(\text{Table having attributes from both Boats \& Reserves for reserved boats having red color}))$

This operation creates table with name Temp1 having sailor ID's of sailors who have reserved boats of red color.

$\rho(\text{Temp2}, \text{TTsid}((\sigma_{\text{color} = \text{'green'}} \text{Boats}) \bowtie \text{Reserves}))$

This query is similar to the above one, so it creates a table with name Temp2 having sailor ID's of sailors who have reserved boats of green color.

$\Pi_{sname} ((Temp1 \cap Temp2) \bowtie Sailors)$

This operation extracts sailor ID's common to both Temp1 & Temp2 such that the sailor has reserved boats having color as red and green (more than two boats)

$\Pi_{sname} \left(\begin{array}{l} \text{sailor ID's for sailors who have} \\ \text{reserved both red \& green boats} \end{array} \bowtie Sailors \right)$

↓
Extract all sname

after \bowtie

Common attribute sid

So this operation extracts details of sailors who have reserved both red and green type of boats.

attributes (s.id, sname, rating, age)

∴ The resultant table has names of sailors who have reserved both red and green type of boats

4) $\rho(\text{Reservations}, \pi_{\text{sid}, \text{sname}, \text{bid}}(\text{Sailors} \bowtie \text{Reserves}))$
 \downarrow \downarrow $\underbrace{\hspace{10em}}$
 Rename Newname common attributes sid

So this operation creates a table Reservations with attributes as (sid, sname, bid) for sailors & boats who have reserved boat(s)

$\rho(\text{ReservationPairs}(1 \rightarrow \text{sid1}, 2 \rightarrow \text{sname1}, 3 \rightarrow \text{bid1}, 4 \rightarrow \text{sid2}, 5 \rightarrow \text{sname2}, 6 \rightarrow \text{bid2}), \text{Reservations} \times \text{Reservations})$
 \downarrow \downarrow $\underbrace{\hspace{10em}}$
 Rename new name Cartesian product of table Reservation

$\pi_{\text{sname1}} \sigma_{(\text{sid1} = \text{sid2}) \wedge (\text{bid1} \neq \text{bid2})} \text{ReservationPairs}$
 \hookrightarrow This will select the tuples for which $\text{sid1} = \text{sid2}$ and $\text{bid1} \neq \text{bid2}$, i.e. the tuples in which the same sailor has reserved two boats (or more)

\therefore The resultant table has names of the sailors who have reserved two or more boats.

5) $\Pi_{sid} (\sigma_{age > 20} \text{ Sailors}) - \Pi_{sid} ((\sigma_{color = 'red'} \text{ Boats}) \bowtie \text{Reserves} \bowtie \text{Sailors})$

$\sigma_{age > 20} \text{ Sailors}$: Selects the sailors details who are older than 20 years
 $\sigma_{color = 'red'} \text{ Boats}$: Selects all boats having red color
 $\bowtie \text{Reserves} \bowtie \text{Sailors}$: From Q2, this selects the details of boats, reserves and sailors for the reserved boats having red color

Selects all sid (for $\Pi_{sid} (\sigma_{age > 20} \text{ Sailors})$)
 Selects all sid (for $\Pi_{sid} ((\sigma_{color = 'red'} \text{ Boats}) \bowtie \text{Reserves} \bowtie \text{Sailors})$)

$\left(\text{Sailor ID's for Sailors over age 20} \right) - \left(\text{Sailor ID's for sailors who have reserved red color boats} \right)$
 ↓
 Set difference operator

\therefore The above query gives a list of sailor ID's for sailors who are over the age 20 but have not reserved red color boats.

(6)