

SQL

TABLE R { UNION
INTERSECT } TABLE S
EXCEPT

or

SELECT * FROM R { UNION
INTERSECT }
EXCEPT
SELECT * FROM S

Cross Product X

$R \times S$

SQL

SELECT * FROM R, S;

NATURAL JOIN

$R \bowtie S$

SQL.

SELECT * FROM R NATURAL JOIN S

Theta Join

$R \bowtie_P S = \sigma_P (R \times S)$

SQL:

SELECT * FROM

R JOIN S ON (p);

NULLS (6.1)

SQL has a special value: NULL .

⇒ unknown.

Example :

- Next year champion of the Stanley Cup.
- Grades of students currently enrolled in this course.
- SQL has special considerations for expressions involving NULL
- SQL Logic 3 valued:
 - True
 - False
 - Unknown
- Any expression involving NULL results into UNKNOWN

IMPORTANT

$$\left. \begin{array}{l} X = \text{NULL} \\ X > \text{NULL} \end{array} \right\} \Rightarrow \text{UNKNOWN} .$$

To test if attr is NULL use
$$X \text{ IS NULL}$$

Ex:

$NULL > 5 \Rightarrow UNKNOWN$

$X \text{ IS } NULL \Rightarrow \text{True if } X \text{ contains } NULL$

$UNKNOWN \text{ is } \underline{\underline{NOT}} \text{ TRUE}$

Ex:

$UNKNOWN \text{ OR TRUE} \Rightarrow \text{TRUE}$

$UNKNOWN \text{ AND FALSE} \Rightarrow \text{FALSE}$

Text Matching.

Regular expressions. (Postgres)

$\text{expr} \sim \text{RegExp}$

Ex

$a \sim '^ab'$

attribute a starts with string ab

$a \sim '\.txt\$'$

attribute a end with string .txt

FULL { NATURAL JOIN $R \bowtie S$
 THETA JOIN $R \bowtie_P S$

- Compute. non-full join
- Add tuples in R not in join padded with NULL
- Add tuple in S not in join padded with NULL

$\therefore R(a,b)$

a	b
3	x
1	y

 $S(a,c)$

a	c
2	3.1
5	2.5

$R \bowtie S$

a	b	c
1	y	2.5
3	x	<u>⊥</u>
5	<u>⊥</u>	3.1

← Represents NULL in RA

SELECT * FROM R NATURAL FULL JOIN S

$R \bowtie_{R.a > S.a} S$

R.a	b	S.a	c
3	x	2	3.1
1	y	<u>⊥</u>	<u>⊥</u>
<u>⊥</u>	<u>⊥</u>	5	2.5

SELECT * FROM R FULL JOIN S
 ON (R.a > S.a)

LEFT } JOINS.
RIGHT }

Similar to full join but only add tuples from one side (left or right).

Natural Left Join

\therefore

$R(a, b)$	a	b	$S(a, c)$	a	c
	3	x		2	3.1
	1	y		5	2.5

$R \bowtie^L S$

a	b	c
1	y	2.5
3	x	1

SELECT * FROM R NATURAL LEFT JOIN S

Natural Right Join

$R \bowtie^R S$

a	b	c
1	y	2.5
5	1	3.1

SELECT * FROM R NATURAL RIGHT JOIN S

LEFT THETA JOIN

$R \bowtie^L S$
 $R.a > S.a$

R.a	b	S.a	c
3	x	2	3.1
1	y	1	1

RIGHT THETA JOIN

$R \bowtie^R S$
 $R.a > S.a$

R.a	b	S.a	c
3	x	2	3.1
1	1	5	2.5

SELECT * FROM R RIGHT JOIN S
ON (R.a > S.a)