$\cup$ $-$ ρ σ π $\times$

$A \bowtie_{cond} B$ equijoin

$A \bowtie_{\theta} B$

Theta join

$A * B$

Natural join

Results don't duplicate the attrib. column.

$A(B, C, D)$ $R(S, T, B)$

$A * R(B, C, D, S, T)$

$A \bowtie_{A.B=R.B} R$ $(A.B, C, D, S, T, R.B)$

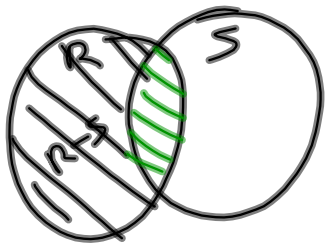
SELECT * FROM DEPARTMENT NATURAL JOIN DEPT_LOCATIONS

complete set

$\{\sigma, \pi, \cup, \rho, -, \times\}$

$$R \bowtie_{\theta} S = \sigma_{\theta}(R \times S)$$

$$R \cap S = (R \cup S) - (R - S) - (S - R)$$



$$= (R \cup S) - ((R - S) \cup (S - R))$$

R1	A1	A2	A3	A4
	a	d	g	1
	a	e	h	2
	b	d	i	3
	c	f	j	4

R2	B1	B2	B3
	a	d	1
	b	f	5
	k	m	9

R3	C1	C2			R4	D1	D2
	a	b				c	d
	c	d				g	h

R3 × R4

C1	C2	D1	D2
a	b	c	d
a	b	g	h
c	d	c	d
c	d	g	h

R3 ∪ R4

a	b
c	d
g	h

R3 − R4

a	b

R1	A1	A2	A3	A4
	a	d	g	1
	a	e	h	2
	b	d	i	3
	c	f	j	4

R2	B1	B2	B3
	a	d	1
	b	f	5
	k	m	9

$R2A \leftarrow P_{(A_1, B_2, B_3)} R_2$

$R_1 * R2A$

A1 A2 A3 A4 B2 B3

$R_1 \bowtie_{A1=B1} R_2$

A1	A2	A3	A4	B1	B2	B3
a	d	g	1	a	d	1
a	e	h	2	a	d	1
b	d	i	3	b	f	5

R	A1	A2	A3	A4		S	A1	A2
	a	d	g	j			a	d
	a	e	g	j			a	e
	b	d	h	l				
	c	f	i	m				

$$T1 \leftarrow \Pi_Y(R)$$

$$T2 \leftarrow \Pi_Y((S \times T1) - R)$$

$$T \leftarrow T1 - T2$$

$$R \div S$$

$$R(Z),\ S(X)$$

$$X \subseteq Z$$

$$Y = Z - X$$

$Z = \{A1, A2, A3, A4\}$

$X = \{A1, A2\}$

$Y = \{A3, A4\}$

R	A1	A2	A3	A4		S	A1	A2
	a	d	g	j			a	d
	a	e	g	j			a	e
	b	d	h	l				
	c	f	i	m				

$T1 \leftarrow \Pi_Y(R)$

$T2 \leftarrow \Pi_Y((S \times T1) - R)$

$T \leftarrow T1 - T2$

T1

A3	A4
g	j
h	l
i	m

$(S \times T1) - R$

~~a d g j~~
a d h l
a d i m
~~a e g j~~
a e h l
a e i m

T2

h	l
i	m

T (g j)