

Relational Algebra Cheatsheet

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Relational Algebra

A		B	
x	y	y	f
1	a	a	true
2	b	b	false
3	c	c	true
4	k	d	false

Projection (π)

$$C := \pi_x(A)$$

L^AT_EX: C:= \pi_{\{x\}}(A)

C
x
1
2
3
4

Selection (σ)

$$D := \sigma_{x>2}(A)$$

L^AT_EX: D:= \sigma_{\{x>2\}}(A)

D	
x	y
3	c
4	k

Renaming (ρ)

$$E := \rho_{x/foo}(A)$$

L^AT_EX: E:= \rho_{\{x/foo\}}(A)

E	
foo	y
1	a
2	b
3	c
4	k

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Product, Division and Joins

Cartesian Product (\times)

$$E := C \times D$$

$\text{\LaTeX: } E := C \times D$

E		
C.x	D.x	y
1	3	c
1	4	k
2	3	c
2	4	k
3	3	c
3	4	k
4	3	c
4	4	k

Division ($/$)

$$E/D = C$$

$\text{\LaTeX: } E / D = E$

For result see C.

Natural Join (\bowtie)

$$F := A \bowtie B$$

$\text{\LaTeX: } F := A \bowtie B$

F		
x	y	z
1	a	true
2	b	false
3	c	true

Theta Join (\bowtie_C)

$$G := C \bowtie_{C.x=D.x} D$$

$\text{\LaTeX: } G := C \bowtie_{\{C.x = D.x\}} D$

Which is equivalent to:

$$G := \sigma_{C.x=D.x}(C \times D)$$

$\text{\LaTeX: } G := \pi_{\{C.x = D.x\}}(C \times D)$

G		
C.x	D.x	y
3	3	c
4	4	k

Set Operations

NOTE: Set operations only work if the relations have the exact same attributes.

$H := \pi_y(A)$	$I := \pi_y(B)$
y	y
a	a
b	b
c	c
k	d

Union (\cup)

$$J := H \cup I$$

$\text{\LaTeX: } J := H \cup I$

J
y
a
b
c
k
d

Intersection (\cap)

$$K := H \cap I$$

$\text{\LaTeX: } K := H \cap I$

K
y
a
b
c

Difference ($-$)

$$L := J - K$$

$\text{\LaTeX: } L := J - K$

L
y
k
d

Extended Relational Algebra

Duplicate Elimination (δ)

$$M := \delta(\pi_{C.x}(E))$$

\LaTeX : $M := \delta(\pi_{C.x}(E))$

For result, see C.

Sorting (τ)

$$N := \tau_y(J)$$

\LaTeX : $N := \tau_{\{y\}}(J)$

N
y
a
b
c
d
k

Grouping (γ)

$$N := \gamma_{C.x, \text{SUM}(D.x) \rightarrow dsum}(E)$$

\LaTeX :

$N := \gamma_{C.x, \text{SUM}(D.x) \rightarrow dsum}(E)$

N	
x	dsum
1	7
2	7
3	7
4	7

Extended Projection ($\pi_{X+Y \rightarrow Z}$)

$$O := \pi_{C.x+D.x \rightarrow foo, y}$$

\LaTeX : $O := \pi_{C.x + D.x \rightarrow foo, y}$

O	
foo	y
4	c
5	k
5	c
6	k
6	c
7	k
7	c
8	k

Outer Joins

Left Outer Join (\bowtie_L)

$$P := A \bowtie_L B$$

\LaTeX : $P := A \stackrel{\circ}{\bowtie}_L B$

P		
x	y	z
1	a	true
2	b	false
3	c	true
4	k	\perp

Right Outer Join (\bowtie_R)

$$Q := A \bowtie_R B$$

\LaTeX : $Q := A \stackrel{\circ}{\bowtie}_R B$

Q		
x	y	z
1	a	true
2	b	false
3	c	true
\perp	d	false

Full Outer Join (\bowtie)

$$R := A \bowtie B$$

\LaTeX : $R := A \stackrel{\circ}{\bowtie} B$

R		
x	y	z
1	a	true
2	b	false
3	c	true
4	k	\perp
\perp	d	false