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Database Systems

Projection	π
Selection	σ
Cartesian Product	$\times$
Join	$\bowtie$
Left Outer Join	$⟕$
Right Outer Join	$⟖$
Union	$\cup$
Intersection	$\cap$
Set Difference	$-$
Rename	ρ

1.

a. $T_1 ⟖ T_1.P = T_2.A\ T_2$

Q	R	A	B	C
a	5	10	b	6
a	6	25	c	3
a	5	10	b	5

b. $T_1 ⟖ T_1.Q = T_2.B\ T_2$

P	R	A	B	C
15	8	10	b	6
NULL	NULL	25	c	3
15	8	10	b	5

c. $T_1 ⟕ T_1.P = T_2.A\ T_2$

P	Q	R	B	C
10	a	5	b	6
15	b	8	NULL	NULL
25	a	6	c	3

d. $T_1 ⟕ T_1.Q = T_2.B\ T_2$

P	Q	R	A	C
10	a	5	NULL	NULL
15	b	8	10	6
15	b	8	10	5
25	a	6	NULL	NULL

e. $T_1 \cup T_2$

P	Q	R
10	a	5
15	b	8
25	a	6
10	b	6
25	c	3
10	b	5

f. $T_1 \bowtie (T_1.P = T_2.A$ **AND** $T_1.R = T_2.C)\ T_2$

P	Q	T	B
10	a	5	b

2.

red	plaid	stripe	dot
red	plaid	stripe	dot
red	plaid	stripe	dot
yellow	plaid	stripe	dot
yellow	plaid	stripe	dot
yellow	plaid	stripe	dot
green	plaid	stripe	dot
green	plaid	stripe	dot
green	plaid	stripe	dot

3.

a. $(\sigma$lastName=’Adams’(Emp)) $\bowtie$ Assign

empId	lastName
E110	Adams

empId	lastName	projNo	hours
E110	Adams	P15	700
E110	Adams	P20	350

b. π empID((σbudgent > 400000(Proj)) ⋈ Assign)

projNo	ProjName	budget
P10	Hudson	500000
P23	Arkansas	600000

projNo	ProjName	budget	empId	hours
P10	Hudson	500000	E101	200
P10	Hudson	500000	E105	400
P10	Hudson	500000	E115	300

empId
E101
E105
E115

c. πbudget(πprojNo(Assign) ⋈ Proj)

projNo
P10
P15
P20

projNo	projName	budget
P10	Hudson	500000
P15	Columbia	350000
P20	Wabash	350000

budget
500000
350000

4.

a. σ Quarter = 'W09' ((σ Name='John Smith' (STUDENT)) ⋈ ENROLL)

b. π Course#, Book_isbn, Book_title (σ Dept = 'CS' (COURSE) ⋈ BOOK_ADOPTION) ⋈ TEXT

c. πDept, Book_title, Publisher (COURSE ⋈ (BOOKADOPTION ⋈ (σ Publisher = 'Pearson Publishing'(TEXT))))

5.

a. πDestinationCity(TRIP)

b. σDeptNo = 10(EMPLOYEE)

c. σAmount > 2000(EXPENSE)

d. πSSN, Name, DestinationCity (σDestinationCity = 'Honolulu'(TRIP) ⋈ EMPLOYEE)

e. EXPENSE ⋈ (πSSN, Name, TripId(σSSN = '234-56-7890'(EMPLOYEE) ⋈ TRIP))

f. πName, TripId, DepartureCity(EMPLOYEE ⋈ (σDepartureCity = 'London'(TRIP)))

g. πSNN, Name, Item, Amount(EMPLOYEE ⋈ (TRIP ⋈ (σAmount > 1000(EXPENSE))))

h. π Name, Item, Amount(EMPLOYEE ⋈ (TRIP ⋈ (σItem = 'Entertainment'(EXPENSE))))

i. πDestinationCity, Name, JobTitle(TRIP ⋈ (σJobTitle = 'Consultant'(EMPLOYEE)))

j. πItem, Amount, DestinationCity, Name(EXPENSE ⋈ (σ(DestinationCity = 'Cario AND DepartureDate = 'January 3')(TRIP) ⋈ (σName = 'Jones'(EMPLOYEE)))

k. πName, DeptNo, dates, amount, JobTitle(EMPLOYEE ⋈ (σDestinationCity = 'Melbourne'(TRIP) ⋈ (σItem = 'Service Charge'(Expense))))

6.

Relation	Minimum	Maximum
a. R1 ∪ R2	N1	N2
b. R1 ∩ R2	1	N1
c. R1 − R2	N1	N2
d. R1 × R2	N2	N2
e. σ a=5(R1)	1	N1
f. πa(R1)	1	N1
g. R1 / R2	N1	N1