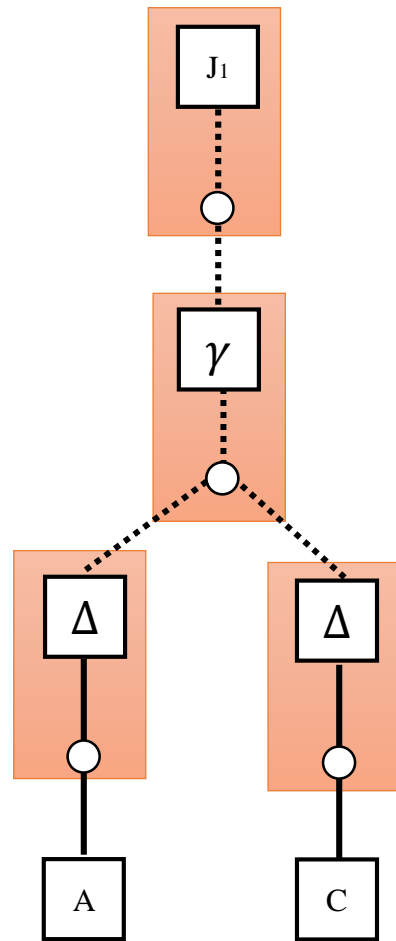# 2T JOIN (equal join-keys)

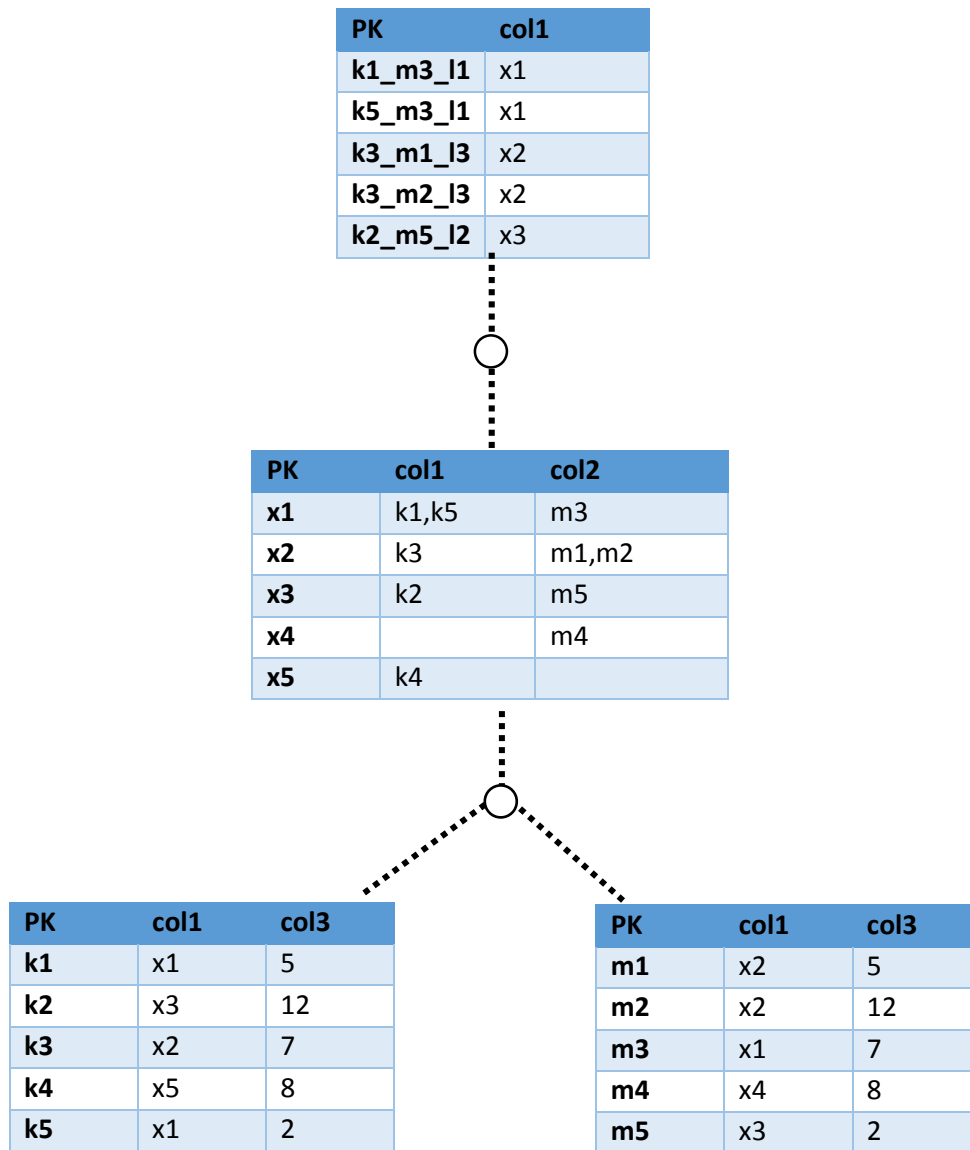Update propagation:

$$J_1 = \gamma^{-1}{}_{PK_A \times PK_B \times PK_C, \ JK_{AB}, \ JK_{BC}} (R_1)$$
$$= A \bowtie B$$

$$R_1 = \gamma_{JK, \ CONCAT(PK_A), \ CONCAT(PK_B)} (A, B)$$
$$= A \bowtie_R B$$

2T JOIN Tables(equal join-keys)

PK	col1
k1_m3_l1	x1
k5_m3_l1	x1
k3_m1_l3	x2
k3_m2_l3	x2
k2_m5_l2	x3

PK	col1	col2
x1	k1,k5	m3
x2	k3	m1,m2
x3	k2	m5
x4		m4
x5	k4	

PK	col1	col3
k1	x1	5
k2	x3	12
k3	x2	7
k4	x5	8
k5	x1	2

PK	col1	col3
m1	x2	5
m2	x2	12
m3	x1	7
m4	x4	8
m5	x3	2

2T JOIN Streams(equal join-keys)

Seq	Op	Tuples
1	get	(x1)
	put	(x1,(k1))
2	get	(x1)
	put	(x1, (k1),(m1))
3	get	(x2)
	put	(x2,(k2))
4	get	(x1)
	put	(x1,(k1),(m2))
5	get	(x1)
	put	(x1,10)
6	get	(x1)
	put	(x1,38)
7	get	(x1)
	put	(x1,10)
8	get	(x1)
	delete	(x1)
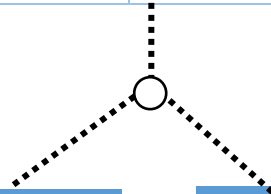
Seq	Op	Tuples
1	put	(k1,(**null, null**), (x1,15))
3	put	(k2,(**null,null**),(x2,8))
6	put	(k3,(x2,8), (x1,8))
8	put	(k3, (x1,15), (**null,null**))

Seq	Op	Tuples
2	put	(m1,(**null, null**), (x1,5))
4	put	(m2,(**null,null**),(x1,8))
5	put	(m1,(x2,8), (**null,null**))
7	put	(m4, (x1,15), (x1,10))

3T JOIN (equal join-keys)

Update propagation:

$$J_1 = \gamma^{-1}_{PK_A \times PK_B \times PK_C,\ JK_{AB},\ JK_{BC}} (R_1)$$
$$= A \bowtie B \bowtie C$$
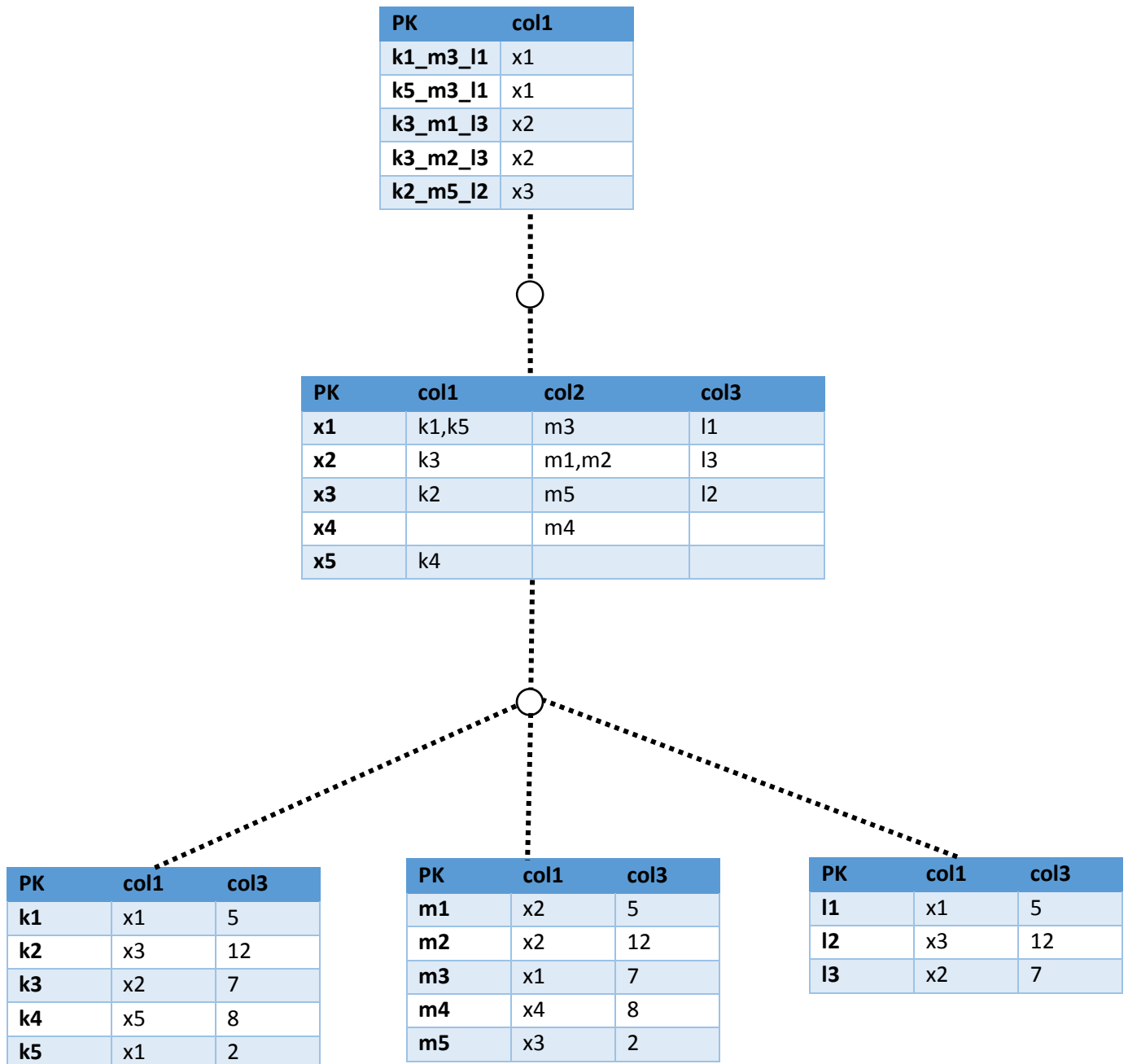
$$R_1 = \gamma_{JK,\ CONCAT(PK_A),\ CONCAT(PK_B)\ CONCAT(PK_C)} (A,B,C) =$$
$$A \bowtie_R B \bowtie_R C$$
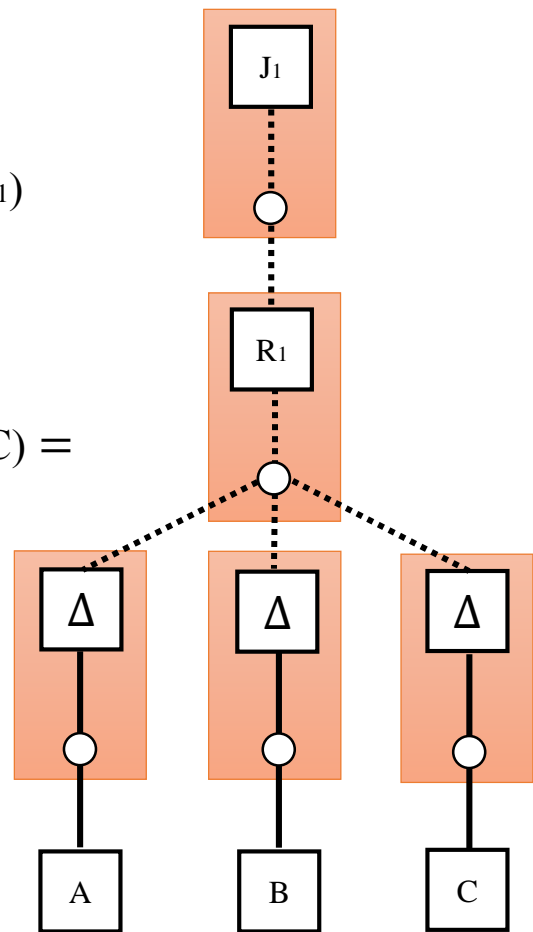
3T JOIN(equal join-keys)- Tables

PK	col1
k1_m3_l1	x1
k5_m3_l1	x1
k3_m1_l3	x2
k3_m2_l3	x2
k2_m5_l2	x3

PK	col1	col2	col3
x1	k1,k5	m3	l1
x2	k3	m1,m2	l3
x3	k2	m5	l2
x4		m4	
x5	k4		

PK	col1	col3
k1	x1	5
k2	x3	12
k3	x2	7
k4	x5	8
k5	x1	2

PK	col1	col3
m1	x2	5
m2	x2	12
m3	x1	7
m4	x4	8
m5	x3	2

PK	col1	col3
l1	x1	5
l2	x3	12
l3	x2	7

3T JOIN(different join-keys)- Calculation

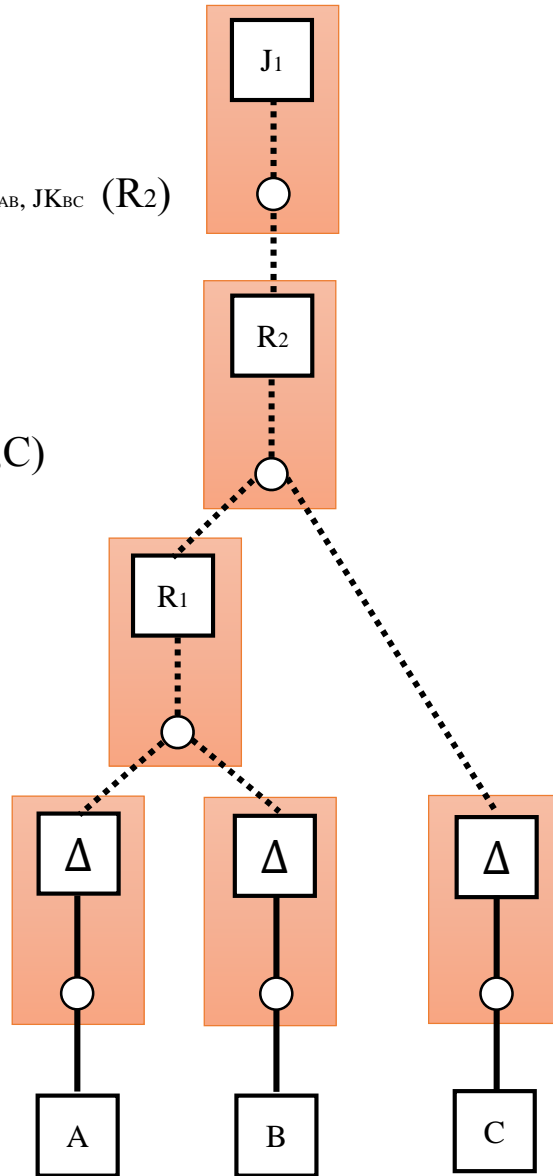$J_1 = \gamma^{-1}_{PK_A \times PK_B \times PK_C, JK_{AB}, JK_{BC}} (R_2)$
$= (A \bowtie B) \bowtie C$

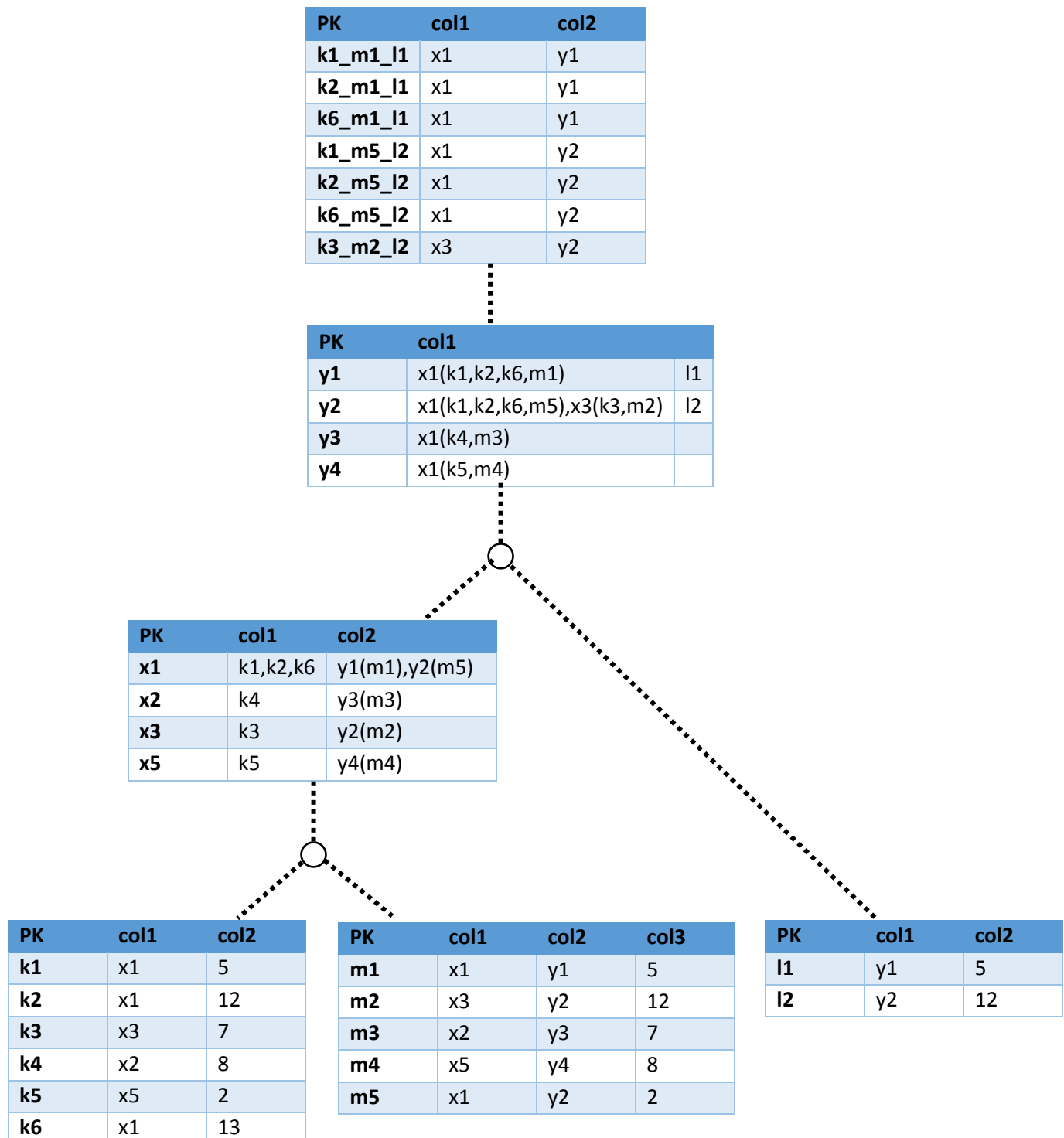$R_2 = \gamma_{JK_{BC}, CONCAT(JK_{AB}), CONCAT(PK_C)} (R_1, C)$
$= (A \bowtie_R B) \bowtie_R C$

$R_1 = \gamma_{JK_{AB}, CONCAT(PK_A), CONCAT(PK_B)} (A, B)$
$= A \bowtie_R B$

3T JOIN(different join-keys)- Tables

PK	col1	col2
k1_m1_l1	x1	y1
k2_m1_l1	x1	y1
k6_m1_l1	x1	y1
k1_m5_l2	x1	y2
k2_m5_l2	x1	y2
k6_m5_l2	x1	y2
k3_m2_l2	x3	y2

PK	col1	
y1	x1(k1,k2,k6,m1)	l1
y2	x1(k1,k2,k6,m5),x3(k3,m2)	l2
y3	x1(k4,m3)	
y4	x1(k5,m4)	

PK	col1	col2
x1	k1,k2,k6	y1(m1),y2(m5)
x2	k4	y3(m3)
x3	k3	y2(m2)
x5	k5	y4(m4)

PK	col1	col2
k1	x1	5
k2	x1	12
k3	x3	7
k4	x2	8
k5	x5	2
k6	x1	13

PK	col1	col2	col3
m1	x1	y1	5
m2	x3	y2	12
m3	x2	y3	7
m4	x5	y4	8
m5	x1	y2	2

PK	col1	col2
l1	y1	5
l2	y2	12

3T JOIN (different join-keys) - Flow diagram

J_1

200P

200

R_2

250GP

$(A \bowtie_R B) \bowtie_R C \ [MP=0,8]$

150

R_1

100

200GP

$A \bowtie_R B \ [MP=0,75]$

Δ   Δ   Δ

100GP   100GP   100GP

100F   100F   100F

A   B   C