2a) Indianapolis to Milwaukee

Indy

Sales

Store	Dept	AvgSales
PineSt	Wmn	62500
WestRd	Wmn	75000
AndAve	Wmn	81500
PineSt	Men	50000
AndAve	Men	73500
PineSt	Toddler	41250
WestRd	Toddler	55000
AndAve	Toddler	68500

Indy' = $\wp_{\text{Store}}$(Indy)

Indy'

PineSt

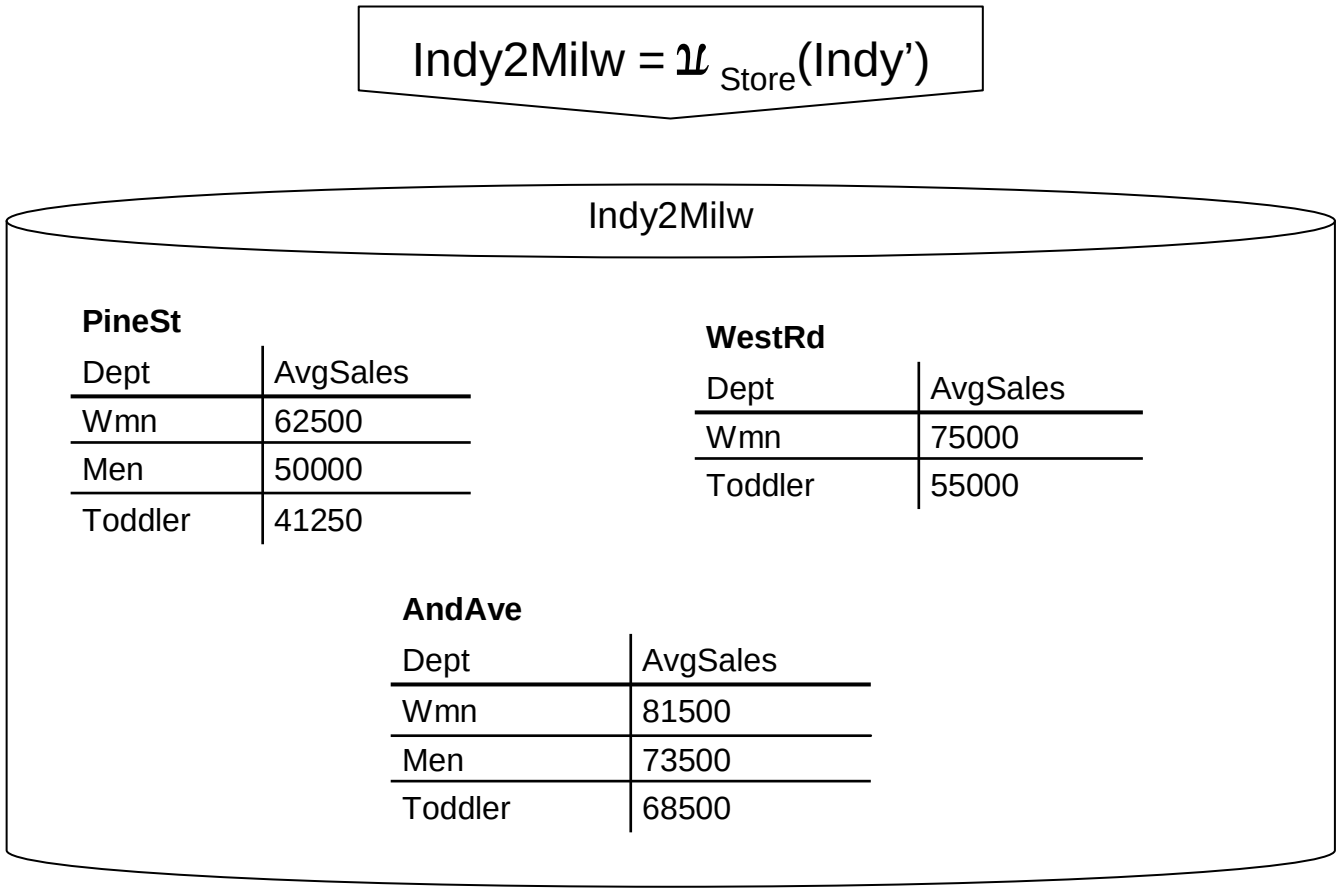
Store	Dept	AvgSales
PineSt	Wmn	62500
PineSt	Men	50000
PineSt	Toddler	41250

WestRd

Store	Dept	AvgSales
WestRd	Wmn	75000
WestRd	Toddler	55000

AndAve

Store	Dept	AvgSales
AndAve	Wmn	81500
AndAve	Men	73500
AndAve	Toddler	68500


Indy2Milw = 𝔘 Store(Indy')
Indy2Milw
PineSt
Dept AvgSales
Wmn 62500
Men 50000
Toddler 41250
WestRd
Dept AvgSales
Wmn 75000
Toddler 55000
AndAve
Dept AvgSales
Wmn 81500
Men 73500
Toddler 68500

2b) Chicago to Indianapolis

Chicago

AvgSales

Store	Wmn	Men	Boy	Girl
CedarRd	48500	35000	25500	-
CtrSqr	55500	50000	32000	52500
WashStr	63500	58500	42250	58500
IllSt	78000	63250	50000	65500

Chicago' =↓1 (Chicago)

Chicago'

AvgSales

r_1	a_1	Store	Wmn	Men	Boy	Girl
AvgSales	Store	CedarRd	48500	35000	25500	-
AvgSales	Wmn	CedarRd	48500	35000	25500	-
AvgSales	Men	CedarRd	48500	35000	25500	-
AvgSales	Boy	CedarRd	48500	35000	25500	-
AvgSales	Girl	CedarRd	48500	35000	25500	-
AvgSales	Store	CtrSqr	55500	50000	32000	52500
AvgSales	Wmn	CtrSqr	55500	50000	32000	52500
AvgSales	Men	CtrSqr	55500	50000	32000	52500
AvgSales	Boy	CtrSqr	55500	50000	32000	52500
AvgSales	Girl	CtrSqr	55500	50000	32000	52500
AvgSales	Store	WashStr	63500	58500	42250	58500
AvgSales	Wmn	WashStr	63500	58500	42250	58500
AvgSales	Men	WashStr	63500	58500	42250	58500
AvgSales	Boy	WashStr	63500	58500	42250	58500
AvgSales	Girl	WashStr	63500	58500	42250	58500
AvgSales	Store	IllSt	78000	63250	50000	65500
AvgSales	Wmn	IllSt	78000	63250	50000	65500
AvgSales	Men	IllSt	78000	63250	50000	65500
AvgSales	Boy	IllSt	78000	63250	50000	65500
AvgSales	Girl	IllSt	78000	63250	50000	65500

Chicago'' = $\sigma_{a1<>\text{ 'Store'}}$(Chicago')

Chicago''

AvgSales

r_1	a_1	Store	Wmn	Men	Boy	Girl
AvgSales	Wmn	CedarRd	48500	35000	25500	-
AvgSales	Men	CedarRd	48500	35000	25500	-
AvgSales	Boy	CedarRd	48500	35000	25500	-
AvgSales	Girl	CedarRd	48500	35000	25500	-
AvgSales	Wmn	CtrSqr	55500	50000	32000	52500
AvgSales	Men	CtrSqr	55500	50000	32000	52500
AvgSales	Boy	CtrSqr	55500	50000	32000	52500
AvgSales	Girl	CtrSqr	55500	50000	32000	52500
AvgSales	Wmn	WashStr	63500	58500	42250	58500
AvgSales	Men	WashStr	63500	58500	42250	58500
AvgSales	Boy	WashStr	63500	58500	42250	58500
AvgSales	Girl	WashStr	63500	58500	42250	58500
AvgSales	Wmn	IllSt	78000	63250	50000	65500
AvgSales	Men	IllSt	78000	63250	50000	65500
AvgSales	Boy	IllSt	78000	63250	50000	65500
AvgSales	Girl	IllSt	78000	63250	50000	65500

$$Chicago''' = \Delta_{a_1}^{AvgSales}(Chicago'')$$

Chicago‘‘‘

AvgSales

r_1	a_1	Store	Wmn	Men	Boy	Girl	AvgSales
AvgSales	Wmn	CedarRd	**48500**	35000	25500	-	48500
AvgSales	Men	CedarRd	48500	**35000**	25500	-	35000
AvgSales	Boy	CedarRd	48500	35000	**25500**	-	25500
AvgSales	Girl	CedarRd	48500	35000	25500	**-**	-
AvgSales	Wmn	CtrSqr	**55500**	50000	32000	52500	55500
AvgSales	Men	CtrSqr	55500	**50000**	32000	52500	50000
AvgSales	Boy	CtrSqr	55500	50000	**32000**	52500	32000
AvgSales	Girl	CtrSqr	55500	50000	32000	**52500**	52500
AvgSales	Wmn	WashStr	**63500**	58500	42250	58500	63500
AvgSales	Men	WashStr	63500	**58500**	42250	58500	58500
AvgSales	Boy	WashStr	63500	58500	**42250**	58500	42250
AvgSales	Girl	WashStr	63500	58500	42250	**58500**	58500
AvgSales	Wmn	IllSt	**78000**	63250	50000	65500	78000
AvgSales	Men	IllSt	78000	**63250**	50000	65500	63250
AvgSales	Boy	IllSt	78000	63250	**50000**	65500	50000
AvgSales	Girl	IllSt	78000	63250	50000	**65500**	65500

$$Chicago2Indy = \pi_{Store,\ Dept,\ AvgSales}\ (\rho_{a1 \rightarrow Dept}(Chicago'''))$$

Chicago2Indy

AvgSales

Dept	Store	AvgSales
Wmn	CedarRd	48500
Men	CedarRd	35000
Boy	CedarRd	25500
Girl	CedarRd	-
Wmn	CtrSqr	55500
Men	CtrSqr	50000
Boy	CtrSqr	32000
Girl	CtrSqr	52500
Wmn	WashStr	63500
Men	WashStr	58500
Boy	WashStr	42250
Girl	WashStr	58500
Wmn	IllSt	78000
Men	IllSt	63250
Boy	IllSt	50000
Girl	IllSt	65500

2c) Milwaukee to Indianapolis

Milw

LincAveSales

Dept	AvgSales	LCode
Girl	45000	1
Boy	55000	2
Men	65000	3
Wmn	80000	4

FreePkSales

Dept	AvgSales	FCode
Girl	35000	A
Men	48500	B
Wmn	55000	C

WashStSales

Dept	AvgSales	WCode
Boy	28500	B38
Men	46500	C18
Wmn	60000	X27

Milw' =↓1 (Milw)

Milw'

LincAveSales

r_1	a_1	Dept	AvgSales	LCode
LincAveSales	Dept	Girl	45000	1
LincAveSales	AvgSales	Girl	45000	1
LincAveSales	LCode	Girl	45000	1
LincAveSales	Dept	Boy	55000	2
LincAveSales	AvgSales	Boy	55000	2
LincAveSales	LCode	Boy	55000	2
LincAveSales	Dept	Men	65000	3
LincAveSales	AvgSales	Men	65000	3
LincAveSales	LCode	Men	65000	3
LincAveSales	Dept	Wmn	80000	4
LincAveSales	AvgSales	Wmn	80000	4
LincAveSales	LCode	Wmn	80000	4

FreePkSales

r_1	a_1	Dept	AvgSales	FCode
FreePkSales	Dept	Girl	35000	A

…

WashStSales

r_1	a_1	Dept	AvgSales	WCode
WashStSales	Dept	Boy	28500	B38

…

Milw'' = Σ (Milw')

Milw''

ε

r_1	a_1	Dept	AvgSales	LCode	FCode	WCode
LincAveSales	Dept	Girl	45000	1	-	-
LincAveSales	AvgSales	Girl	45000	1	-	-
LincAveSales	LCode	Girl	45000	1	-	-
LincAveSales	Dept	Boy	55000	2	-	-
LincAveSales	AvgSales	Boy	55000	2	-	-
LincAveSales	LCode	Boy	55000	2	-	-
LincAveSales	Dept	Men	65000	3	-	-
LincAveSales	AvgSales	Men	65000	3	-	-
LincAveSales	LCode	Men	65000	3	-	-
LincAveSales	Dept	Wmn	80000	4	-	-
LincAveSales	AvgSales	Wmn	80000	4	-	-
LincAveSales	LCode	Wmn	80000	4	-	-
FreePkSales	Dept	Girl	35000	-	A	-
...						
WashStSales	Dept	Boy	28500	-	-	B38
...						

Milw2Indy = $\pi_{\text{Store, Dept, AvgSales}}(\rho^{\varepsilon \rightarrow \text{Sales}}(\rho_{\text{r1->Store}}(\text{Indy''})))$

Milw2Indy

Sales

Store	Dept	AvgSales
LincAveSales	Girl	45000
LincAveSales	Boy	55000
LincAveSales	Men	65000
LincAveSales	Wmn	80000
FreePkSales	Girl	35000
...		
WashStSales	Boy	28500
...		