

$$T(R \bowtie_{A,B} S) = T(R) T(S) / \max(V(R,A), V(S,A)) \max(V(R,B), V(S,B))$$

$$\text{Cost: } 5B(R) + 5B(S)$$

$$\text{Output size: } T(R) \cdot T(S) / \max(V(R,A), V(S,A))$$

$$\text{Cardinality of } R \bowtie S \Rightarrow \min(V(R,A), V(S,A))$$

$$\begin{array}{r} 2500 \\ 1250 \\ \hline 3750 \\ 1250 \\ \hline 500 \end{array}$$

Cost	B(R)	Relation	Number of Tuples	Cardinality A	Cardinality B	Cardinality C	Cardinality D
500	1000	R(A,B,C)	T(R) = 4000	V(R,A) = 100	V(R,B) = 200	V(R,C) = 100	
3750	750	S(B,C)	T(S) = 3000		V(S,B) = 100	V(S,C) = 300	
2800	500	W(B,D)	T(W) = 2000		V(W,B) = 100		V(W,D) = 50
1250	250	U(A,D)	T(U) = 1000	V(U,A) = 100			V(U,D) = 100
5000-3750 = 1250	250	<u>R ⋈<sub>B,C</sub> S</u>	4000 · 3000 / 200 = 60k	100	100	100	
5000-2500 = 2500	500	<u>R ⋈<sub>B</sub> W</u>	4000 · 2000 / 200 = 40k	100	100	100	50
5000-1250 = 3750	500	<u>R ⋈<sub>A</sub> U</u>	4000 · 1000 / 100 = 40k	100	200	100	100
6200	1500	<u>S ⋈<sub>B</sub> W</u>	3000 · 2000 / 100 = 60k		100	300	50
3750	500	<u>W ⋈<sub>B</sub> U</u>	2000 · 1000 / 100 = 20k	100	100		50
11500	2500	<u>R ⋈<sub>B</sub> W</u>	2000 · 2000 / 200 = 2k				
10250	2500	<u>R ⋈<sub>A</sub> U</u>	2000 · 1000 / 100 = 2k				
61250	500	<u>R ⋈<sub>B,C</sub> S</u>	40k · 3k / 100 · 300 = 4k				
56750	500	<u>R ⋈<sub>A</sub> U</u>	40k · 1k / 100 · 100 = 4k				
60k	500	<u>R ⋈<sub>B,C</sub> S</u>	40k · 3k / 300 · 200 = 2k				
54750	500	<u>R ⋈<sub>B</sub> W</u>	40k · 2k / 200 · 100 = 4k				
60250	500	<u>S ⋈<sub>B</sub> W</u>	60k · 4k / 300 · 200 = 4k				
82500	1500	<u>S ⋈<sub>B</sub> U</u>	60k · 1k / 100 · 100 = 60k				
33750	500	<u>W ⋈<sub>B</sub> U</u>	20k · 4k / 200 · 100 = 4k				
32500	1500	<u>W ⋈<sub>B</sub> S</u>	20k · 3k / 100 = 60k				

$$RSWU \Rightarrow \text{~~2500 + 1250 + 11500 = 15250~~}$$

$$2500 + 1250 + 11500 = 15250$$

$$RSUW \Rightarrow 2500 + 10250 + 2500 = 15250$$

$$RWSU \Rightarrow 5000 + 61250 + 1250 = 67500$$

$$RWUS \Rightarrow 3000 + 58750 + 3550 = 67500$$

$$RUWS \Rightarrow 5000 + 58750 + 3750 = 67500$$

$$RUSW \Rightarrow 2500 + 60000 + 2500 = 65000$$

$$SWUR \Rightarrow 150000 + 82500 + 5000 = 837500$$

$$SWAU \Rightarrow 5000 + 86250 + 1250 = 92500$$

$$WURS \Rightarrow 5000 + 33750 + 3750 = 42500$$

$$WUSR \Rightarrow 150000 + 32500 + 5000 = 187500$$