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In order to join the two files on a common key, 3 rounds of map-reduce will be required.

The two files employee_names.csv and employee_pay.csv before giving as input to map-reduce are as follows:

employee_names			
id	first_name	last_name	
59ea7840fc13ae1f6d000096	Benny	Ventom	
59ea7840fc13ae1f6d000097	Cara	Motherwell	
59ea7840fc13ae1f6d000098	Willem	Haresign	
59ea7840fc13ae1f6d000099	Trish	Farlane	
59ea7840fc13ae1f6d00009a	Camilla	Limpkin	
59ea7840fc13ae1f6d00009b	Godwin	Caffrey	
59ea7840fc13ae1f6d00009c	Elvera	Custed	
59ea7840fc13ae1f6d00009d	Vinson	Farres	
59ea7840fc13ae1f6d00009e	Kliment	Pitchford	
59ea7840fc13ae1f6d00009f	Matty	Heater	
59ea7840fc13ae1f6d0000a0	Juana	Begg	
59ea7840fc13ae1f6d0000a1	Alix	Layus	
59ea7840fc13ae1f6d0000a2	Tessa	Brandes	
59ea7840fc13ae1f6d0000a3	Hedwig	Fishley	
59ea7840fc13ae1f6d0000a4	Cordelia	Aubray	

id	salary	bonus
59ea7840fc13ae1f6d000096	\$84217.20	
59ea7840fc13ae1f6d000097	\$54737.84	
59ea7840fc13ae1f6d000098	\$92092.21	
59ea7840fc13ae1f6d000099	\$86117.63	
59ea7840fc13ae1f6d00009a	\$92821.29	
59ea7840fc13ae1f6d00009b	\$60633.55	\$1779.07
59ea7840fc13ae1f6d00009c	\$94483.80	\$4328.59
59ea7840fc13ae1f6d00009d	\$93127.77	
59ea7840fc13ae1f6d00009e	\$90581.06	
59ea7840fc13ae1f6d00009f	\$86947.54	
59ea7840fc13ae1f6d0000a0	\$80646.00	\$2924.69
59ea7840fc13ae1f6d0000a1	\$50423.64	\$1495.33
59ea7840fc13ae1f6d0000a2	\$60695.47	
59ea7840fc13ae1f6d0000a3	\$85763.22	
59ea7840fc13ae1f6d0000a4	\$60600.37	

Round 1	Output of round 1:
Mapper: Inserts "A" into employee_names.csv records	
Reducer: Identity reducer is used.	

59ea7840fc13ae1f6d000096	А	Benny	Ventom
59ea7840fc13ae1f6d000097	А	Cara	Motherwel
59ea7840fc13ae1f6d000098	Α	Willem	Haresign
59ea7840fc13ae1f6d000099	А	Trish	Farlane
59ea7840fc13ae1f6d00009a	Α	Camilla	Limpkin
59ea7840fc13ae1f6d00009b	Α	Godwin	Caffrey
59ea7840fc13ae1f6d00009c	Α	Elvera	Custed
59ea7840fc13ae1f6d00009d	Α	Vinson	Farres
59ea7840fc13ae1f6d00009e	Α	Kliment	Pitchford
59ea7840fc13ae1f6d00009f	Α	Matty	Heater
59ea7840fc13ae1f6d0000a0	Α	Juana	Begg
59ea7840fc13ae1f6d0000a1	Α	Alix	Layus
59ea7840fc13ae1f6d0000a2	Α	Tessa	Brandes
59ea7840fc13ae1f6d0000a3	Α	Hedwig	Fishley
59ea7840fc13ae1f6d0000a4	Α	Cordelia	Aubray

Round 2

Mapper: Inserts "B" into employee_pay.csv

records

Reducer: Identity reducer is used.

Output of round 2:

59ea7840fc13ae1f6d000096	В	\$84217.20	
59ea7840fc13ae1f6d000097	В	\$54737.84	
59ea7840fc13ae1f6d000098	В	\$92092.21	
59ea7840fc13ae1f6d000099	В	\$86117.63	
59ea7840fc13ae1f6d00009a	В	\$92821.29	
59ea7840fc13ae1f6d00009b	В	\$60633.55	\$1779.07
59ea7840fc13ae1f6d00009c	В	\$94483.80	\$4328.59
59ea7840fc13ae1f6d00009d	В	\$93127.77	
59ea7840fc13ae1f6d00009e	В	\$90581.06	
59ea7840fc13ae1f6d00009f	В	\$86947.54	
59ea7840fc13ae1f6d0000a0	В	\$80646.00	\$2924.69
59ea7840fc13ae1f6d0000a1	В	\$50423.64	\$1495.33
59ea7840fc13ae1f6d0000a2	В	\$60695.47	
59ea7840fc13ae1f6d0000a3	В	\$85763.22	
59ea7840fc13ae1f6d0000a4	В	\$60600.37	

Round 3

Mapper: Identity mapper is used thus combining the outputs of both the previous steps. The identity mapper will combine and sort the results by key where key is the first 2 columns (id and A/B).

Output of mapper phase after combining and sorting (input to the reducer step):

Reducer:

String firstname = null String lastname = null

For each line read from the input file:

- Look at the second column, if it's A, update values of firstname and lastname with 3rd and 4th column.
- If it's B, check if variables firstname and lastname are null.
 - If either of them is not null, then append to output, the 1st column, firstname, lastname
 3rd column, and 4th column of the current line and set firstname and lastname to null.
 - If both firstname and lastname are null, do nothing.

59ea7840fc13ae1f6d000096 A Benny Ventorm 59ea7840fc13ae1f6d000097 A Cara Motherwell 59ea7840fc13ae1f6d000098 B \$54737.84 59ea7840fc13ae1f6d000098 A Willem Haresign 59ea7840fc13ae1f6d000099 B \$92092.21 59ea7840fc13ae1f6d000099 A Trish Farlane 59ea7840fc13ae1f6d000099 B \$86117.63 59ea7840fc13ae1f6d00009a A Camilla Limpkin 59ea7840fc13ae1f6d00009a A Godwin Caffrey 59ea7840fc13ae1f6d00009b B \$60633.55 \$1779.07 59ea7840fc13ae1f6d00009c A Elvera Custed 59ea7840fc13ae1f6d00009c B \$94483.80 \$4328.59 59ea7840fc13ae1f6d00009d A Vinson Farres 59ea7840fc13ae1f6d00009d B \$993127.77 59ea7840fc13ae1f6d00009e B \$99581.06 59ea7840fc13ae1f6d00009e B \$99581.06 59ea7840fc13ae1f6d00009f B \$86947.54 59ea7840fc13ae1f6d00000a B \$80646.00 \$2924.69 59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d00000a2				
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59ea7840fc13ae1f6d00009f A Matty Heater 59ea7840fc13ae1f6d00009f B \$86947.54 59ea7840fc13ae1f6d0000a0 A Juana Begg 59ea7840fc13ae1f6d0000a0 B \$80646.00 \$2924.69 59ea7840fc13ae1f6d0000a1 A Alix Layus 59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d00009e	Α	Kliment	Pitchford
59ea7840fc13ae1f6d00009f B \$86947.54 59ea7840fc13ae1f6d0000a0 A Juana Begg 59ea7840fc13ae1f6d0000a0 B \$80646.00 \$2924.69 59ea7840fc13ae1f6d0000a1 A Alix Layus 59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d00009e	В	\$90581.06	
59ea7840fc13ae1f6d0000a0 A Juana Begg 59ea7840fc13ae1f6d0000a0 B \$80646.00 \$2924.69 59ea7840fc13ae1f6d0000a1 A Alix Layus 59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a2 B \$60695.47 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d00009f	Α	Matty	Heater
59ea7840fc13ae1f6d0000a0 B \$80646.00 \$2924.69 59ea7840fc13ae1f6d0000a1 A Alix Layus 59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d00009f	В	\$86947.54	
59ea7840fc13ae1f6d0000a1 A Alix Layus 59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a0	Α	Juana	Begg
59ea7840fc13ae1f6d0000a1 B \$50423.64 \$1495.33 59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a2 B \$60695.47 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a0	В	\$80646.00	\$2924.69
59ea7840fc13ae1f6d0000a2 A Tessa Brandes 59ea7840fc13ae1f6d0000a2 B \$60695.47 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a1	Α	Alix	Layus
59ea7840fc13ae1f6d0000a2 B \$60695.47 59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a1	В	\$50423.64	\$1495.33
59ea7840fc13ae1f6d0000a3 A Hedwig Fishley 59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a2	Α	Tessa	Brandes
59ea7840fc13ae1f6d0000a3 B \$85763.22 59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a2	В	\$60695.47	
59ea7840fc13ae1f6d0000a4 A Cordelia Aubray	59ea7840fc13ae1f6d0000a3	Α	Hedwig	Fishley
, , , , , , , , , , , , , , , , , , , ,	59ea7840fc13ae1f6d0000a3	В	\$85763.22	
59ea7840fc13ae1f6d0000a4 B \$60600.37	59ea7840fc13ae1f6d0000a4	Α	Cordelia	Aubray
	59ea7840fc13ae1f6d0000a4	В	\$60600.37	

Output of the reducer phase: (Same as the expected output)

59ea7840fc13ae1f6d000096	Benny	Ventom	\$84217.20	
59ea7840fc13ae1f6d000097	Cara	Motherwell	\$54737.84	
59ea7840fc13ae1f6d000098	Willem	Haresign	\$92092.21	
59ea7840fc13ae1f6d000099	Trish	Farlane	\$86117.63	
59ea7840fc13ae1f6d00009a	Camilla	Limpkin	\$92821.29	
59ea7840fc13ae1f6d00009b	Godwin	Caffrey	\$60633.55	\$1779.07
59ea7840fc13ae1f6d00009c	Elvera	Custed	\$94483.80	\$4328.59
59ea7840fc13ae1f6d00009d	Vinson	Farres	\$93127.77	
59ea7840fc13ae1f6d00009e	Kliment	Pitchford	\$90581.06	
59ea7840fc13ae1f6d00009f	Matty	Heater	\$86947.54	
59ea7840fc13ae1f6d0000a0	Juana	Begg	\$80646.00	\$2924.69
59ea7840fc13ae1f6d0000a1	Alix	Layus	\$50423.64	\$1495.33
59ea7840fc13ae1f6d0000a2	Tessa	Brandes	\$60695.47	
59ea7840fc13ae1f6d0000a3	Hedwig	Fishley	\$85763.22	
59ea7840fc13ae1f6d0000a4	Cordelia	Aubray	\$60600.37	