

Homework #7

CINS 370 Introduction to Databases

2. Question.

Employee table creation and transfer in hadoop,

Vim emp.txt

Cat emp.txt

Hadoop fs -put emp.txt emp.txt

```
[centos@ip-172-31-86-109 ~]$ vim emp.txt
[centos@ip-172-31-86-109 ~]$ cat emp.txt
12345,Ruben,3000,20
19191,Susan,4000,20
88812,Junping,3500,60
65656,Fred,3400,30
[centos@ip-172-31-86-109 ~]$ hadoop fs -put emp.txt emp.txt
[centos@ip-172-31-86-109 ~]$ cat emp.txt
12345,Ruben,3000,20
19191,Susan,4000,20
88812,Junping,3500,60
65656,Fred,3400,30
```

Department table creation and transfer in hadoop

Vim dept.txt

Cat dept.txt

Hadoop fs -put dept.txt dept.txt

```
[centos@ip-172-31-86-109 ~]$ vim dept.txt
[centos@ip-172-31-86-109 ~]$ cat dept.txt
20,IT,PaloAlto
30,HR,SF
50,R&D,NY
70,Finance,Miami
[centos@ip-172-31-86-109 ~]$ hadoop fs -put dept.txt dept.txt
[centos@ip-172-31-86-109 ~]$ cat dept.txt
20,IT,PaloAlto
30,HR,SF
50,R&D,NY
70,Finance,Miami
```

Grunt> cat emp.txt

Grunt> cat dept.txt

```
[grunt> cat emp.txt
12345,Ruben,3000,20
19191,Susan,4000,20
88812,Junping,3500,60
65656,Fred,3400,30
[grunt> cat dept.txt
20,IT,PaloAlto
30,HR,SF
50,R&D,NY
70,Finance,Miami
grunt>
```

Loading employee into E;

E = Load 'emp.txt' using pigstorage(',') as (EmpID:int,ENAME:Chararray,Salary:int, DeptID:int)

Describe E;

Dump E;

```
[grunt> E = LOAD 'emp.txt' USING PigStorage(',') AS (EmpID:int,ENAME:chararray,Salary:int,DeptID:int);
[grunt> DESCRIBE E;
E: {EmpID: int,ENAME: chararray,Salary: int,DeptID: int}
[grunt> DUMP E;
(12345,Ruben,3000,20)
(19191,Susan,4000,20)
(88812,Junping,3500,60)
(65656,Fred,3400,30)
```

Loading Department into D;

D = Load 'dept.txt' using pigstorage(',') as (DepID:int,Dname:Chararray,Location:Chararray)

Describe D;

Dump D;

```
[grunt> D = LOAD 'dept.txt' USING PigStorage(',') AS (DepID:int,Dname:chararray,Location:chararray);
[grunt> DESCRIBE D;;
D: {DepID: int,Dname: chararray,Location: chararray}
[grunt> DUMP D;
(20,IT,PaloAlto)
(30,HR,SF)
(50,R&D,NY)
(70,Finance,Miami)
```

Left Outer Join on E and D via Depid

P = Join E by DepId Left outer, D by DeptId

Describe P;

Dump P;

```
[grunt> P = JOIN E BY DeptID LEFT OUTER, D BY DeptID;
[grunt> Describe P;
P: (E::EmpID: int,E::Ename: chararray,E::Salary: int,E::DeptID: int,D::DepID: int,D::Dname: chararray,D::Location: chararray)
[grunt> DUMP P;;
(12345,Ruben,3000,20,20,IT,PaloAlto)
(19191,Susan,4000,20,20,IT,PaloAlto)
(65656,Fred,3400,30,30,HR,SF)
(88812,Junping,3500,60,,,)

```

Vertical cut on P via Ename, Salary, Dname

O = Foreach P generate Ename, Salary, Dname;

Describe O;

Dump O;

```
[grunt> O = FOREACH P generate Ename,Salary,Dname;
[grunt> Describe O;;
O: {E::Ename: chararray,E::Salary: int,D::Dname: chararray}
[grunt> DUMP O;
(Ruben,3000,IT)
(Susan,4000,IT)
(Fred,3400,HR)
(Junping,3500,)
```

Order by on O via Salary in Ascending

Ot = Order O by Salary ASC;

Dump Ot;

```
[grunt> Ot = ORDER O BY Salary ASC;
[grunt> DUMP Ot;
(Ruben,3000,IT)
(Fred,3400,HR)
(Junping,3500,)
(Susan,4000,IT)
```

3.Question

Creating Count file

Vim Count.txt

Hadoop fs -put Count.txt Count.txt

Pig

Grunt>ls

```
[centos@ip-172-31-86-109 ~]$ vim Count.txt
[centos@ip-172-31-86-109 ~]$ hadoop fs -put Count.txt Count.txt
[centos@ip-172-31-86-109 ~]$ pig
2020-04-10 17:56:29,920 [main] INFO org.apache.pig.Main - Logging error messages to: /home/centos/pig_1586555789917.log
2020-04-10 17:56:30,186 [main] INFO org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to hadoop file system at: hdfs://localhost:8020
2020-04-10 17:56:30,747 [main] INFO org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to map-reduce job tracker at: localhost:8021
grunt> ls
hdfs://localhost:8020/user/centos/1987.csv<r 1> 127162942
hdfs://localhost:8020/user/centos/Count.txt<r 1> 51
hdfs://localhost:8020/user/centos/Viraj <dir>
hdfs://localhost:8020/user/centos/data1.txt<r 1> 36
hdfs://localhost:8020/user/centos/data2.txt<r 1> 28
hdfs://localhost:8020/user/centos/dept.txt<r 1> 51
hdfs://localhost:8020/user/centos/emp.txt<r 1> 81
hdfs://localhost:8020/user/centos/mydat.txt<r 1> 63
hdfs://localhost:8020/user/centos/tmp <dir>
```

Grunt> cat Count.txt

```
grunt> cat Count.txt
Cow Pig Horse Dog Cat Pig Skunk
Cat Fish Pig Skunk
grunt>
```

Loading Count.txt into A

A = Load 'Count.txt' using pigstorage('\t') as (count:Chararray);

Dump A;

```
[grunt> A= LOAD 'Count.txt' USING PigStorage('\t') as (count:CHARARRAY);
[grunt> DUMP A;
(Cow Pig Horse Dog Cat Pig Skunk)
(Cat Fish Pig Skunk)
```

Applying Foreach and Tokenizing count by word

C = Foreach A generate flatten(Tokenize(count)) as word;

Dump C;

```
[grunt> C = FOREACH A GENERATE FLATTEN(TOKENIZE(count)) AS word;
[grunt> DUMP C;
(Cow)
(Pig)
(Horse)
(Dog)
(Cat)
(Pig)
(Skunk)
(Cat)
(Fish)
(Pig)
(Skunk)
```

Grouping C by Word and Generating count

S = Group C by word;

Final = For each S generate group, Count(C);

Dump Final;

```
[grunt> S= Group C by word;
[grunt> Final= FOREACH S GENERATE group, COUNT(C);
[grunt> DUMP Final;
(Cat,2)
(Cow,1)
(Dog,1)
(Pig,3)
(Fish,1)
(Horse,1)
(Skunk,2)
```

4. Question

Uploading Poverty.csv and State.csv

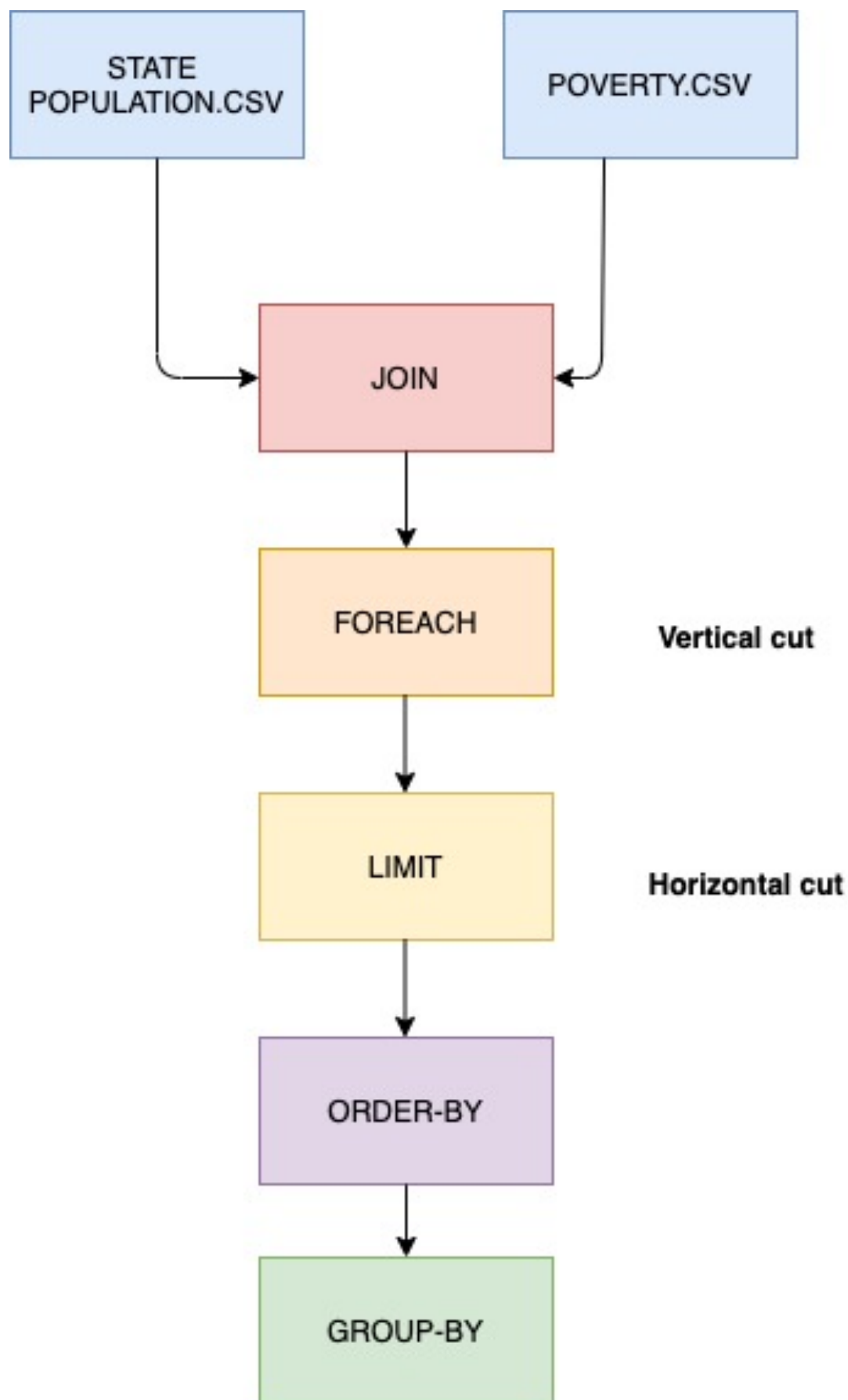
hadoop fs -put Poverty.csv P.txt

hadoop fs -put State.csv S.txt

Pig

Grunt>ls

```
[virajs-air:370 virajsonavane$ sudo scp -i ~/Downloads/370/Vikey.pem ~/Downloads/370/Poverty.csv centos@ec2-54-84-183-153.compute-1.amazonaws.com:~/
Password:
Poverty.csv 100% 2000 20.9KB/s 00:00
[virajs-air:370 virajsonavane$ sudo scp -i ~/Downloads/370/Vikey.pem ~/Downloads/370/State.csv centos@ec2-54-84-183-153.compute-1.amazonaws.com:~/
State.csv 100% 1158 11.7KB/s 00:00
[virajs-air:370 virajsonavane$ sudo ssh -i "Vikey.pem" centos@ec2-54-84-183-153.compute-1.amazonaws.com
Last login: Fri Apr 10 19:15:00 2020 from c-24-5-59-63.hsd1.ca.comcast.net
[[centos@ip-172-31-86-109 ~]$ ls
1987.csv data1.txt mydata.txt pig_1586422034363.log pig_1586498083344.log pig_1586499854932.log pig_1586549828165.log pig_1586557202621.log totalmiles.pig
Count.txt data2.txt pig_1586400808306.log pig_1586466948546.log pig_1586499207278.log pig_1586500506794.log pig_1586552082795.log pig_1586560785839.log
d1.txt dept.txt pig_1586421492518.log pig_1586467425081.log pig_1586499311047.log pig_1586500905359.log pig_158655789917.log Poverty.csv
d2.txt emp.txt pig_1586421639428.log pig_1586467603208.log pig_1586499381504.log pig_1586506943954.log pig_1586557162832.log State.csv
[[centos@ip-172-31-86-109 ~]$ hadoop fs -put Poverty.csv P.txt
[[centos@ip-172-31-86-109 ~]$ hadoop fs -put State.csv S.txt
[[centos@ip-172-31-86-109 ~]$ pig
2020-04-10 19:32:33,375 [main] INFO org.apache.pig.Main - Logging error messages to: /home/centos/pig_1586561553372.log
2020-04-10 19:32:33,651 [main] INFO org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to hadoop file system at: hdfs://localhost:8020
2020-04-10 19:32:34,218 [main] INFO org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to map-reduce job tracker at: localhost:8021
[grunt> ls
hdfs://localhost:8020/user/centos/1987.csv<r 1> 127162942
hdfs://localhost:8020/user/centos/Count.txt<r 1> 51
hdfs://localhost:8020/user/centos/P.txt<r 1> 2000
hdfs://localhost:8020/user/centos/S.txt<r 1> 1158
hdfs://localhost:8020/user/centos/Viraj <dir>
hdfs://localhost:8020/user/centos/data1.txt<r 1> 36
hdfs://localhost:8020/user/centos/data2.txt<r 1> 28
hdfs://localhost:8020/user/centos/dept.txt<r 1> 51
hdfs://localhost:8020/user/centos/emp.txt<r 1> 81
hdfs://localhost:8020/user/centos/mydat.txt<r 1> 63
hdfs://localhost:8020/user/centos/tmp <dir>
```



Overview of Poverty table

```
grunt> cat P.txt
Alabama,784517,820009,253694,272124
Alaska,75273,83583,23957,28201
Arizona,1002773,1043901,324723,347577
Arkansas,463966,487800,149187,162569
California,5111205,5217133,1586526,1645300
Colorado,552126,580110,143486,160312
Connecticut,326360,350942,89324,101814
Delaware,116181,127003,32862,37720
District of Columbia,104105,114899,29285,35421
Florida,2860804,2942948,829310,872538
Georgia,1503877,1568261,513320,550706
Hawaii,126481,137921,32442,38702
Idaho,203631,220243,60371,69421
Illinois,1543257,1594083,470646,500986
Indiana,841903,879603,263205,285029
Iowa,319716,337542,85662,94830
Kansas,325420,345322,97150,108566
Kentucky,723378,753748,211037,226431
Louisiana,875670,911984,293085,312963
Maine,141958,152868,32560,37530
Maryland,541127,571971,157132,173598
Massachusetts,675076,710810,173590,191332
Michigan,1351618,1395098,404866,427744
Minnesota,505806,528890,142348,156088
Mississippi,561749,585685,187869,200803
Missouri,776721,809281,240522,259136
Montana,125024,136208,32971,37675
National,42342619,42824683,13229339,13477065
Nebraska,191439,206529,59898,68064
Nevada,379792,405922,122765,135439
New_Hampshire,95275,105825,22708,27858
New_Jersey,862408,901856,259622,281804
New_Mexico,378032,399548,118269,129821
New_York,2700018,2771138,793426,831246
North_Carolina,1442873,1493191,461659,491217
North_Dakota,70249,77865,17896,21426
Ohio,1551281,1599521,493056,521182
Oklahoma,589591,612231,193877,207017
Oregon,521125,548567,133798,148368
Pennsylvania,1524709,1572405,430076,457254
Rhode_Island,118956,131460,34517,39665
South_Carolina,735356,765362,234515,251123
South_Dakota,103234,111810,31772,36182
Tennessee,961862,998926,303257,323607
Texas,4036102,4124652,1494968,1556920
Utah,284801,307475,90671,103091
Vermont,61032,69104,13200,16112
Virginia,856763,896113,247583,268493
Washington,781803,817547,219520,240494
West_Virginia,316875,336129,83372,91830
Wisconsin,627066,653282,175854,191036
Wyoming,57678,64960,15694,18938
```

Overview of State table

```
grunt> cat S.txt
USA,California,39776830
USA,Texas,28704330
USA,Florida,21312211
USA,New_York,19862512
USA,Pennsylvania,12823989
USA,Illinois,12768320
USA,Ohio,11694664
USA,Georgia,10545138
USA,North_Carolina,10390149
USA,Michigan,9991177
USA,New_Jersey,9032872
USA,Virginia,8525660
USA,Washington,7530552
USA,Arizona,7123898
USA,Massachusetts,6895917
USA,Tennessee,6782564
USA,Indiana,6699629
USA,Missouri,6135888
USA,Maryland,6079602
USA,Wisconsin,5818049
USA,Colorado,5684203
USA,Minnesota,5628162
USA,South_Carolina,5088916
USA,Alabama,4888949
USA,Louisiana,4682509
USA,Kentucky,4472265
USA,Oregon,4199563
USA,Oklahoma,3940521
USA,Connecticut,3588683
USA,Iowa,3160553
USA,Utah,3159345
USA,Nevada,3056824
USA,Arkansas,3020327
USA,Mississippi,2982785
USA,Kansas,2918515
USA,New_Mexico,2090708
USA,Nebraska,1932549
USA,West_Virginia,1803077
USA,Idaho,1753860
USA,Hawaii,1426393
USA,New_Hampshire,1350575
USA,Maine,1341582
USA,Montana,1062330
USA,Rhode_Island,1061712
USA,Delaware,971180
USA,South_Dakota,877790
USA,North_Dakota,755238
USA,Alaska,738068
USA,District_of_Columbia,703608
USA,Vermont,623960
USA,Wyoming,573720
```

Loading Poverty table in to A;

A = Load 'P.txt' using pigstorage(',') as (State:CharArray,LowerPeople:int, Upperpeople:int, LowerChildren:int, UpperChildren:int)

Dump A;

```
grunt> A = LOAD 'P.txt' USING PigStorage(',') AS (State:CharArray,LowerPeople:int,UpperPeople:int,LowerChildren:int,UpperChildren:int);
grunt> DUMP A;
```

```
(Alabama,784517,820009,253694,272124)
(Alaska,75273,83583,23957,28201)
(Arizona,1002773,1043901,324723,347577)
(Arkansas,463966,487800,149187,162569)
(California,5111205,5217133,1586526,1645300)
(Colorado,552126,580110,143486,160312)
(Connecticut,326360,350942,89324,101814)
(Delaware,116181,127003,32862,37720)
(District of Columbia,104105,114899,29285,35421)
(Florida,2860804,2942948,829310,872538)
(Georgia,1503877,1568261,513320,550706)
(Hawaii,126481,137921,32442,38702)
(Idaho,203631,220243,60371,69421)
(Illinois,1543257,1594083,470646,500986)
(Indiana,841903,879603,263205,285029)
(Iowa,319716,337542,85662,94830)
(Kansas,325420,345322,97150,108566)
(Kentucky,723378,753748,211037,226431)
(Louisiana,875670,911984,293085,312963)
(Maine,141958,152868,32560,37530)
(Maryland,541127,571971,157132,173598)
(Massachusetts,675076,710810,173590,191332)
(Michigan,1351618,1395098,404866,427744)
(Minnesota,505806,528890,142348,156088)
(Mississippi,561749,585685,187869,200803)
(Missouri,776721,809281,240522,259136)
(Montana,125024,136208,32971,37675)
(National,42342619,42824683,13229339,13477065)
(Nebraska,191439,206529,59898,68064)
(Nevada,379792,405922,122765,135439)
(New_Hampshire,95275,105825,22708,27858)
(New_Jersey,862408,901856,259622,281804)
(New_Mexico,378032,399548,118269,129821)
(New_York,2700018,2771138,793426,831246)
(North_Carolina,1442873,1493191,461659,491217)
(North_Dakota,70249,77865,17896,21426)
(Ohio,1551281,1599521,493056,521182)
(Oklahoma,589591,612231,193877,207017)
(Oregon,521125,548567,133798,148368)
(Pennsylvania,1524709,1572405,430076,457254)
(Rhode_Island,118956,131460,34517,39665)
(South_Carolina,735356,765362,234515,251123)
(South_Dakota,103234,111810,31772,36182)
(Tennessee,961862,998926,303257,323607)
(Texas,4036102,4124652,1494968,1556920)
(Utah,284801,307475,90671,103091)
(Vermont,61032,69104,13200,16112)
(Virginia,856763,896113,247583,268493)
(Washington,781803,817547,219520,240494)
(West_Virginia,316875,336129,83372,91830)
(Wisconsin,627066,653282,175854,191036)
(Wyoming,57678,64960,15694,18938)
```


Loading State table in to B;

A = Load 'S.txt' using pigstorage(',') as (Country:Chararray,State:Chararray,Population:int)

Dump B;

```
lgrunt> B = LOAD 'S.txt' USING PigStorage(',') AS (Country:chararray,State:chararray,Population:int);
lgrunt> DUMP B;
(USA,California,39776830)
(USA,Texas,28704330)
(USA,Florida,21312211)
(USA,New_York,19862512)
(USA,Pennsylvania,12823989)
(USA,Illinois,12768320)
(USA,Ohio,11694664)
(USA,Georgia,10545138)
(USA,North_Carolina,10390149)
(USA,Michigan,9991177)
(USA,New_Jersey,9032872)
(USA,Virginia,8525660)
(USA,Washington,7530552)
(USA,Arizona,7123898)
(USA,Massachusetts,6895917)
(USA,Tennessee,6782564)
(USA,Indiana,6699629)
(USA,Missouri,6135888)
(USA,Maryland,6079602)
(USA,Wisconsin,5818049)
(USA,Colorado,5684203)
(USA,Minnesota,5628162)
(USA,South_Carolina,5088916)
(USA,Alabama,4888949)
(USA,Louisiana,4682509)
(USA,Kentucky,4472265)
(USA,Oregon,4199563)
(USA,Oklahoma,3940521)
(USA,Connecticut,3588683)
(USA,Iowa,3160553)
(USA,Utah,3159345)
(USA,Nevada,3056824)
(USA,Arkansas,3020327)
(USA,Mississippi,2982785)
(USA,Kansas,2918515)
(USA,New_Mexico,2090708)
(USA,Nebraska,1932549)
(USA,West_Virginia,1803077)
(USA,Idaho,1753860)
(USA,Hawaii,1426393)
(USA,New_Hampshire,1350575)
(USA,Maine,1341582)
(USA,Montana,1062330)
(USA,Rhode_Island,1061712)
(USA,Delaware,971180)
(USA,South_Dakota,877790)
(USA,North_Dakota,755238)
(USA,Alaska,738068)
(USA,District_of_Columbia,703608)
(USA,Vermont,623960)
(USA,Wyoming,573720)
```

Preview of Poverty Table

Illustrate A:

A	State:chararray	LowerPeople:int	UpperPeople:int	LowerChildren:int	UpperChildren:int
Washington		781803	817547	219520	240494

Preview of State Table

Illustrate B:

B	Country:chararray	State:chararray	Population:int
USA		Arkansas	3020327

Applying Left Outer Join on Both the table using State

J = JOIN A by State left outer, B by state;

```
grunt> J = JOIN A BY State LEFT OUTER, B BY State;
grunt> Describe J;
J: (A::State: chararray,A::LowerPeople: int,A::UpperPeople: int,A::LowerChildren: int,A::UpperChildren: int,B::Country: chararray,B::State: chararray,B::Population: int)
grunt> DUMP J;
```

```
(Iowa,319716,337542,85662,94830,USA,Iowa,3160553)
(Ohio,1551281,1599521,493056,521182,USA,Ohio,11694664)
(Utah,284801,307475,90671,103091,USA,Utah,3159345)
(Idaho,203631,220243,60371,69421,USA,Idaho,1753860)
(Maine,141958,152868,32560,37530,USA,Maine,1341582)
(Texas,4036102,4124652,1494968,1556920,USA,Texas,28704330)
(Alaska,75273,83583,23957,28201,USA,Alaska,738068)
(Hawaii,126481,137921,32442,38702,USA,Hawaii,1426393)
(Kansas,325420,345322,97150,108566,USA,Kansas,2918515)
(Nevada,379792,405922,122765,135439,USA,Nevada,3056824)
(Oregon,521125,548567,133798,148368,USA,Oregon,4199563)
(Alabama,784517,820009,253694,272124,USA,Alabama,4888949)
(Arizona,1002773,1043901,324723,347577,USA,Arizona,7123898)
(Florida,2860804,2942948,829310,872538,USA,Florida,21312211)
(Georgia,1503877,1568261,513320,550706,USA,Georgia,10545138)
(Indiana,841903,879603,263205,285029,USA,Indiana,6699629)
(Montana,125024,136208,32971,37675,USA,Montana,1062330)
(Vermont,61032,69104,13200,16112,USA,Vermont,623960)
(Wyoming,57678,64960,15694,18938,USA,Wyoming,573720)
(Arkansas,463966,487800,149187,162569,USA,Arkansas,3020327)
(Colorado,552126,580110,143486,160312,USA,Colorado,5684203)
(Delaware,116181,127003,32862,37720,USA,Delaware,971180)
(Illinois,1543257,1594083,470646,500986,USA,Illinois,12768320)
(Kentucky,723378,753748,211037,226431,USA,Kentucky,4472265)
(Maryland,541127,571971,157132,173598,USA,Maryland,6079602)
(Michigan,1351618,1395098,404866,427744,USA,Michigan,9991177)
(Missouri,776721,809281,240522,259136,USA,Missouri,6135888)
(National,42342619,42824683,13229339,13477065,,,)
(Nebraska,191439,206529,59898,68064,USA,Nebraska,1932549)
(New_York,2700018,2771138,793426,831246,USA,New_York,19862512)
(Oklahoma,589591,612231,193877,207017,USA,Oklahoma,3940521)
(Virginia,856763,896113,247583,268493,USA,Virginia,8525660)
(Louisiana,875670,911984,293085,312963,USA,Louisiana,4682509)
(Minnesota,505806,528890,142348,156088,USA,Minnesota,5628162)
(Tennessee,961862,998926,303257,323607,USA,Tennessee,6782564)
(Wisconsin,627066,653282,175854,191036,USA,Wisconsin,5818049)
(California,5111205,5217133,1586526,1645300,USA,California,39776830)
(New_Jersey,862408,901856,259622,281804,USA,New_Jersey,9032872)
(New_Mexico,378032,399548,118269,129821,USA,New_Mexico,2090708)
(Washington,781803,817547,219520,240494,USA,Washington,7530552)
(Connecticut,326360,350942,89324,101814,USA,Connecticut,3588683)
(Mississippi,561749,585685,187869,200803,USA,Mississippi,2982785)
(North_Dakota,70249,77865,17896,21426,USA,North_Dakota,755238)
(Pennsylvania,1524709,1572405,430076,457254,USA,Pennsylvania,12823989)
(Rhode_Island,118956,131460,34517,39665,USA,Rhode_Island,1061712)
(South_Dakota,103234,111810,31772,36182,USA,South_Dakota,877790)
(Massachusetts,675076,710810,173590,191332,USA,Massachusetts,6895917)
(New_Hampshire,95275,105825,22708,27858,USA,New_Hampshire,1350575)
(West_Virginia,316875,336129,83372,91830,USA,West_Virginia,1803077)
(North_Carolina,1442873,1493191,461659,491217,USA,North_Carolina,10390149)
(South_Carolina,735356,765362,234515,251123,USA,South_Carolina,5088916)
(District of Columbia,104105,114899,29285,35421,,,)

```

Applying Foreach on Join using State, Population, LowerChildren.

G = Foreach J generate State,Population,LowerChildren;

Describe G;

Dump G;

```
[grunt> G = FOREACH J GENERATE B::State,B::Population,A::LowerChildren;
[grunt> Describe G;
G: {B::State: chararray,B::Population: int,A::LowerChildren: int}
[grunt> DUMP G;
(Iowa,3160553,85662)
(Ohio,11694664,493056)
(Utah,3159345,90671)
(Idaho,1753860,60371)
(Maine,1341582,32560)
(Texas,28704330,1494968)
(Alaska,738068,23957)
(Hawaii,1426393,32442)
(Kansas,2918515,97150)
(Nevada,3056824,122765)
(Oregon,4199563,133798)
(Alabama,4888949,253694)
(Arizona,7123898,324723)
(Florida,21312211,829310)
(Georgia,10545138,513320)
(Indiana,6699629,263205)
(Montana,1062330,32971)
(Vermont,623960,13200)
(Wyoming,573720,15694)
(Arkansas,3020327,149187)
(Colorado,5684203,143486)
(Delaware,971180,32862)
(Illinois,12768320,470646)
(Kentucky,4472265,211037)
(Maryland,6079602,157132)
(Michigan,9991177,404866)
(Missouri,6135888,240522)
(.,13229339)
(Nebraska,1932549,59898)
(New_York,19862512,793426)
(Oklahoma,3940521,193877)
(Virginia,8525660,247583)
(Louisiana,4682509,293085)
(Minnesota,5628162,142348)
(Tennessee,6782564,303257)
(Wisconsin,5818049,175854)
(California,39776830,1586526)
(New_Jersey,9032872,259622)
(New_Mexico,2090708,118269)
(Washington,7530552,219520)
(Connecticut,3588683,89324)
(Mississippi,2982785,187869)
(North_Dakota,755238,17896)
(Pennsylvania,12823989,430076)
(Rhode_Island,1061712,34517)
(South_Dakota,877790,31772)
(Massachusetts,6895917,173590)
(New_Hampshire,1350575,22708)
(West_Virginia,1803077,83372)
(North_Carolina,10390149,461659)
(South_Carolina,5088916,234515)
(.,29285)
```

Applying Limit on G of 50

L = Limit G 50;

DUMP L;

```
[grunt> L = Limit G 50;
[grunt> DUMP L;
(Delaware,971180,32862)
(Montana,1062330,32971)
(Rhode_Island,1061712,34517)
(Nebraska,1932549,59898)
(Idaho,1753860,60371)
(West_Virginia,1803077,83372)
(Iowa,3160553,85662)
(Connecticut,3588683,89324)
(Utah,3159345,90671)
(Kansas,2918515,97150)
(New_Mexico,2090708,118269)
(Nevada,3056824,122765)
(Oregon,4199563,133798)
(Minnesota,5628162,142348)
(Colorado,5684203,143486)
(Arkansas,3020327,149187)
(Maryland,6079602,157132)
(Massachusetts,6895917,173590)
(Wisconsin,5818049,175854)
(Mississippi,2982785,187869)
(Oklahoma,3940521,193877)
(Kentucky,4472265,211037)
(Washington,7530552,219520)
(Missouri,6135888,240522)
(Virginia,8525660,247583)
(Alabama,4888949,253694)
(New_Jersey,9032872,259622)
(Indiana,6699629,263205)
(Louisiana,4682509,293085)
(Tennessee,6782564,303257)
(Arizona,7123898,324723)
(Michigan,9991177,404866)
(Pennsylvania,12823989,430076)
(North_Carolina,10390149,461659)
(Illinois,12768320,470646)
(Ohio,11694664,493056)
(Georgia,10545138,513320)
(New_York,19862512,793426)
(Florida,21312211,829310)
(Texas,28704330,1494968)
(California,39776830,1586526)
(,13229339)
(Vermont,623960,13200)
(Wyoming,573720,15694)
(North_Dakota,755238,17896)
(New_Hampshire,1350575,22708)
(Alaska,738068,23957)
(South_Dakota,877790,31772)
(Hawaii,1426393,32442)
(Maine,1341582,32560)
```

Applying Order by on Obtained Limited L

O = Order L by State ASC:

Describe O;

Dump O;

```
[grunt> O = ORDER L By State ASC;
[grunt> O = ORDER L By State ASC;
[grunt> describe O;
O: {B::State: chararray,B::Population: int,A::LowerChildren: int}
[grunt> Dump O;
(, ,13229339)
(Alabama,4888949,253694)
(Alaska,738068,23957)
(Arizona,7123898,324723)
(Arkansas,3020327,149187)
(California,39776830,1586526)
(Colorado,5684203,143486)
(Connecticut,3588683,89324)
(Delaware,971180,32862)
(Florida,21312211,829310)
(Georgia,10545138,513320)
(Hawaii,1426393,32442)
(Idaho,1753860,60371)
(Illinois,12768320,470646)
(Indiana,6699629,263205)
(Iowa,3160553,85662)
(Kansas,2918515,97150)
(Kentucky,4472265,211037)
(Louisiana,4682509,293085)
(Maine,1341582,32560)
(Maryland,6079602,157132)
(Massachusetts,6895917,173590)
(Michigan,9991177,404866)
(Minnesota,5628162,142348)
(Mississippi,2982785,187869)
(Missouri,6135888,240522)
(Montana,1062330,32971)
(Nebraska,1932549,59898)
(Nevada,3056824,122765)
(New_Hampshire,1350575,22708)
(New_Jersey,9032872,259622)
(New_Mexico,2090708,118269)
(New_York,19862512,793426)
(North_Carolina,10390149,461659)
(North_Dakota,755238,17896)
(Ohio,11694664,493056)
(Oklahoma,3940521,193877)
(Oregon,4199563,133798)
(Pennsylvania,12823989,430076)
(Rhode_Island,1061712,34517)
(South_Dakota,877790,31772)
(Tennessee,6782564,303257)
(Texas,28704330,1494968)
(Utah,3159345,90671)
(Vermont,623960,13200)
(Virginia,8525660,247583)
(Washington,7530552,219520)
(West_Virginia,1803077,83372)
(Wisconsin,5818049,175854)
(Wyoming,573720,15694)
```

Applying Group ALL

```
[grunt> Gm = GROUP 0 All;  
[grunt> describe Gm;  
Gm: {group: chararray,0: {(B::State: chararray,B::Population: int,A::LowerChildren: int)}}  
[grunt> Dump Gm;
```

```
(all, {(,13229339)}, (Alabama,4888949,253694)}, (Alaska,738068,23957)}, (Arizona,7123898,324723)}, (Arkansas,3020327,149187)}, (California,39776830,1586526)}, (Colorado,5684203,143486)}, (Connecticut,3588683,89324)}, (Delaware,971180,32862)}, (Florida,21312211,829310)}, (Georgia,10545138,513320)}, (Hawaii,1426393,32442)}, (Idaho,1753860,60371)}, (Illinois,12768320,470646)}, (Indiana,6699629,263205)}, (Iowa,3160553,85662)}, (Kansas,2918515,97150)}, (Kentucky,4472265,211037)}, (Louisiana,4682509,293085)}, (Maine,1341582,32560)}, (Maryland,6079602,157132)}, (Massachusetts,6895917,173590)}, (Michigan,9991177,404866)}, (Minnesota,5628162,142348)}, (Mississippi,2982785,187869)}, (Missouri,6135888,240522)}, (Montana,1062330,32971)}, (Nebraska,1932549,59898)}, (Nevada,3056824,122765)}, (New_Hampshire,1350575,22708)}, (New_Jersey,9032872,259622)}, (New_Mexico,2090708,118269)}, (New_York,19862512,793426)}, (North_Carolina,10390149,461659)}, (North_Dakota,755238,17896)}, (Ohio,11694664,493056)}, (Oklahoma,3940521,193877)}, (Oregon,4199563,133798)}, (Pennsylvania,12823989,430076)}, (Rhode_Island,1061712,34517)}, (South_Dakota,877790,31772)}, (Tennessee,6782564,303257)}, (Texas,28704330,1494968)}, (Utah,3159345,90671)}, (Vermont,623960,13200)}, (Virginia,8525660,247583)}, (Washington,7530552,219520)}, (West_Virginia,1803077,83372)}, (Wisconsin,5818049,175854)}, (Wyoming,573720,15694))
```

Applying Group By State

```
[grunt> Gm = GROUP 0 BY B::State;  
[grunt> DUMP Gm;
```

```
(Iowa, {(Iowa,3160553,85662)})  
(Ohio, {(Ohio,11694664,493056)})  
(Utah, {(Utah,3159345,90671)})  
(Idaho, {(Idaho,1753860,60371)})  
(Maine, {(Maine,1341582,32560)})  
(Texas, {(Texas,28704330,1494968)})  
(Alaska, {(Alaska,738068,23957)})  
(Hawaii, {(Hawaii,1426393,32442)})  
(Kansas, {(Kansas,2918515,97150)})  
(Nevada, {(Nevada,3056824,122765)})  
(Oregon, {(Oregon,4199563,133798)})  
(Alabama, {(Alabama,4888949,253694)})  
(Arizona, {(Arizona,7123898,324723)})  
(Florida, {(Florida,21312211,829310)})  
(Georgia, {(Georgia,10545138,513320)})  
(Indiana, {(Indiana,6699629,263205)})  
(Montana, {(Montana,1062330,32971)})  
(Vermont, {(Vermont,623960,13200)})  
(Wyoming, {(Wyoming,573720,15694)})  
(Arkansas, {(Arkansas,3020327,149187)})  
(Colorado, {(Colorado,5684203,143486)})  
(Delaware, {(Delaware,971180,32862)})  
(Illinois, {(Illinois,12768320,470646)})  
(Kentucky, {(Kentucky,4472265,211037)})  
(Maryland, {(Maryland,6079602,157132)})  
(Michigan, {(Michigan,9991177,404866)})  
(Missouri, {(Missouri,6135888,240522)})  
(Nebraska, {(Nebraska,1932549,59898)})  
(New_York, {(New_York,19862512,793426)})  
(Oklahoma, {(Oklahoma,3940521,193877)})  
(Virginia, {(Virginia,8525660,247583)})  
(Louisiana, {(Louisiana,4682509,293085)})  
(Minnesota, {(Minnesota,5628162,142348)})  
(Tennessee, {(Tennessee,6782564,303257)})  
(Wisconsin, {(Wisconsin,5818049,175854)})  
(California, {(California,39776830,1586526)})  
(New_Jersey, {(New_Jersey,9032872,259622)})  
(New_Mexico, {(New_Mexico,2090708,118269)})  
(Washington, {(Washington,7530552,219520)})  
(Connecticut, {(Connecticut,3588683,89324)})  
(Mississippi, {(Mississippi,2982785,187869)})  
(North_Dakota, {(North_Dakota,755238,17896)})  
(Pennsylvania, {(Pennsylvania,12823989,430076)})  
(Rhode_Island, {(Rhode_Island,1061712,34517)})  
(South_Dakota, {(South_Dakota,877790,31772)})  
(Massachusetts, {(Massachusetts,6895917,173590)})  
(New_Hampshire, {(New_Hampshire,1350575,22708)})  
(West_Virginia, {(West_Virginia,1803077,83372)})  
(North_Carolina, {(North_Carolina,10390149,461659)})
```

Applying Group By LowerChildren

```
[grunt> Dg = GROUP 0 BY LowerChildren;
[grunt> describe Dg;
Dg: {group: int,0: {(B::State: chararray,B::Population: int,A::LowerChildren: int)}}
[grunt> DUMP Dg;
(13200,{(Vermont,623960,13200)})
(15694,{(Wyoming,573720,15694)})
(17896,{(North_Dakota,755238,17896)})
(22708,{(New_Hampshire,1350575,22708)})
(23957,{(Alaska,738068,23957)})
(31772,{(South_Dakota,877790,31772)})
(32442,{(Hawaii,1426393,32442)})
(32560,{(Maine,1341582,32560)})
(32862,{(Delaware,971180,32862)})
(32971,{(Montana,1062330,32971)})
(34517,{(Rhode_Island,1061712,34517)})
(59898,{(Nebraska,1932549,59898)})
(60371,{(Idaho,1753860,60371)})
(83372,{(West_Virginia,1803077,83372)})
(85662,{(Iowa,3160553,85662)})
(89324,{(Connecticut,3588683,89324)})
(90671,{(Utah,3159345,90671)})
(97150,{(Kansas,2918515,97150)})
(118269,{(New_Mexico,2090708,118269)})
(122765,{(Nevada,3056824,122765)})
(133798,{(Oregon,4199563,133798)})
(142348,{(Minnesota,5628162,142348)})
(143486,{(Colorado,5684203,143486)})
(149187,{(Arkansas,3020327,149187)})
(157132,{(Maryland,6079602,157132)})
(173590,{(Massachusetts,6895917,173590)})
(175854,{(Wisconsin,5818049,175854)})
(187869,{(Mississippi,2982785,187869)})
(193877,{(Oklahoma,3940521,193877)})
(211037,{(Kentucky,4472265,211037)})
(219520,{(Washington,7530552,219520)})
(240522,{(Missouri,6135888,240522)})
(247583,{(Virginia,8525660,247583)})
(253694,{(Alabama,4888949,253694)})
(259622,{(New_Jersey,9032872,259622)})
(263205,{(Indiana,6699629,263205)})
(293085,{(Louisiana,4682509,293085)})
(303257,{(Tennessee,6782564,303257)})
(324723,{(Arizona,7123898,324723)})
(404866,{(Michigan,9991177,404866)})
(430076,{(Pennsylvania,12823989,430076)})
(461659,{(North_Carolina,10390149,461659)})
(470646,{(Illinois,12768320,470646)})
(493056,{(Ohio,11694664,493056)})
(513320,{(Georgia,10545138,513320)})
(793426,{(New_York,19862512,793426)})
(829310,{(Florida,21312211,829310)})
(1494968,{(Texas,28704330,1494968)})
(1586526,{(California,39776830,1586526)})
(13229339,{(,13229339)})
```