

Assignment: Aggregate Operations

Date: 12/10/2020 Name: D.Saravanan

1. Perform aggregate operations in MongoDB (sum, avg, unwind, group, match, ...) from your created collection and display the output.

Import file zips.json

```
raman@fdcfebec1e9:~$ # Load JSON file to a MongoDB database using mongoimport
raman@fdcfebec1e9:~$ ls -l
total 42
drwxrwxr-x 2 raman raman 4096 Oct 20 05:42 Documents/
drwxrwxr-x 2 raman raman 4096 Oct 20 05:51 Downloads/
drwxrwxr-x 2 raman raman 4096 Oct 20 07:15 Scripts/
raman@fdcfebec1e9:~$ ls -l Downloads/
total 3108
-rw-r--r-- 1 raman raman 3182409 Oct 20 05:51 zips.json
raman@fdcfebec1e9:~$ # Number of records in file zips.json
raman@fdcfebec1e9:~$ wc -l Downloads/zips.json
29353 Downloads/zips.json
raman@fdcfebec1e9:~$ # display the first 15 records in file zips.json
raman@fdcfebec1e9:~$ head -15 Downloads/zips.json
{ "id": "01001", "city": "AGAWAM", "loc": [ -72.622739, 42.070206 ], "pop": 15338, "state": "MA" }
{ "id": "01002", "city": "CUSHMAN", "loc": [ -72.51549999999999, 42.377017 ], "pop": 36963, "state": "MA" }
{ "id": "01005", "city": "BARRE", "loc": [ -72.10835409999999, 42.409698 ], "pop": 4546, "state": "MA" }
{ "id": "01007", "city": "BELCHERTOWN", "loc": [ -72.41095300000001, 42.275103 ], "pop": 10570, "state": "MA" }
{ "id": "01008", "city": "BLANDFORD", "loc": [ -72.936114, 42.182949 ], "pop": 1240, "state": "MA" }
{ "id": "01010", "city": "BRIMFIELD", "loc": [ -72.188455, 42.116543 ], "pop": 3706, "state": "MA" }
{ "id": "01011", "city": "CHESTER", "loc": [ -72.988761, 42.279421 ], "pop": 1688, "state": "MA" }
{ "id": "01012", "city": "CHESTERFIELD", "loc": [ -72.833309, 42.38167 ], "pop": 177, "state": "MA" }
{ "id": "01013", "city": "CHICOPEE", "loc": [ -72.607962, 42.162046 ], "pop": 23396, "state": "MA" }
{ "id": "01020", "city": "CHICOPEE", "loc": [ -72.576142, 42.176443 ], "pop": 31495, "state": "MA" }
{ "id": "01022", "city": "WESTOVER AFB", "loc": [ -72.558657, 42.196672 ], "pop": 1764, "state": "MA" }
{ "id": "01026", "city": "CUMMINGTON", "loc": [ -72.905767, 42.435296 ], "pop": 1484, "state": "MA" }
{ "id": "01027", "city": "MOUNT TOM", "loc": [ -72.67992099999999, 42.264319 ], "pop": 16864, "state": "MA" }
{ "id": "01028", "city": "EAST LONGMEADOW", "loc": [ -72.505565, 42.067203 ], "pop": 13367, "state": "MA" }
{ "id": "01030", "city": "FEEDING HILLS", "loc": [ -72.675077, 42.07182 ], "pop": 11985, "state": "MA" }
raman@fdcfebec1e9:~$ # display the last 15 records in file zips.json
raman@fdcfebec1e9:~$ tail -15 Downloads/zips.json
{ "id": "99827", "city": "HAINES", "loc": [ -135.542032, 59.251886 ], "pop": 2246, "state": "AK" }
{ "id": "99829", "city": "HOONAH", "loc": [ -135.558435, 58.032237 ], "pop": 1670, "state": "AK" }
{ "id": "99833", "city": "PETERSBURG", "loc": [ -133.160683, 56.827134 ], "pop": 4253, "state": "AK" }
{ "id": "99835", "city": "SITKA", "loc": [ -135.316569, 57.051436 ], "pop": 8638, "state": "AK" }
{ "id": "99849", "city": "SKAGWAY", "loc": [ -135.301794, 59.408471 ], "pop": 692, "state": "AK" }
{ "id": "99901", "city": "KETCHIKAN", "loc": [ -131.603175, 55.372028 ], "pop": 13886, "state": "AK" }
{ "id": "99919", "city": "THORNE BAY", "loc": [ -132.513815, 55.66086 ], "pop": 744, "state": "AK" }
{ "id": "99921", "city": "CRAIG", "loc": [ -133.117081, 55.47317 ], "pop": 1398, "state": "AK" }
{ "id": "99922", "city": "HYDABURG", "loc": [ -132.633175, 55.137406 ], "pop": 891, "state": "AK" }
{ "id": "99923", "city": "HYDER", "loc": [ -130.124915, 55.925867 ], "pop": 116, "state": "AK" }
{ "id": "99925", "city": "KLAWOCK", "loc": [ -133.055503, 55.552611 ], "pop": 851, "state": "AK" }
{ "id": "99926", "city": "METLAKATLA", "loc": [ -131.579001, 55.121491 ], "pop": 1469, "state": "AK" }
{ "id": "99927", "city": "POINT BAKER", "loc": [ -133.376372, 56.307858 ], "pop": 426, "state": "AK" }
{ "id": "99929", "city": "WRANGELL", "loc": [ -132.352918, 56.433524 ], "pop": 2573, "state": "AK" }
{ "id": "99950", "city": "KETCHIKAN", "loc": [ -133.18479, 55.942471 ], "pop": 422, "state": "AK" }
raman@fdcfebec1e9:~$ # import zips.json file to MongoDB in databaseName: assignment and collectionName: ZipCode
raman@fdcfebec1e9:~$ mongoimport -d assignment -c ZipCode --file /home/raman/Downloads/zips.json
2020-10-20T09:18:31.251+0000 connected to: mongodb://localhost/
2020-10-20T09:18:32.341+0000 29353 document(s) imported successfully. 0 document(s) failed to import.
raman@fdcfebec1e9:~$
```

ZipCode collection

```
> db
test
> show databases
admin      0.000GB
assignment 0.000GB
config     0.000GB
local      0.000GB
module     0.000GB
> use assignment
switched to db assignment
> db
assignment
> show collections
Schedule
ZipCode
> // Number of documents in collection ZipCode
> db.ZipCode.countDocuments({})
29353
> // display the first 15 documents in collection ZipCode
> db.ZipCode.find().sort({id:1}).limit(15)
{ "id": "01001", "city": "AGAWAM", "loc": [ -72.622739, 42.070206 ], "pop": 15338, "state": "MA" }
{ "id": "01002", "city": "CUSHMAN", "loc": [ -72.515499, 42.377017 ], "pop": 36963, "state": "MA" }
{ "id": "01005", "city": "BARRE", "loc": [ -72.108354, 42.409698 ], "pop": 4546, "state": "MA" }
{ "id": "01007", "city": "BELCHERTOWN", "loc": [ -72.410953, 42.275103 ], "pop": 10570, "state": "MA" }
{ "id": "01008", "city": "BLANDFORD", "loc": [ -72.936114, 42.182949 ], "pop": 1240, "state": "MA" }
{ "id": "01010", "city": "BRIMFIELD", "loc": [ -72.188455, 42.116543 ], "pop": 3706, "state": "MA" }
{ "id": "01011", "city": "CHESTER", "loc": [ -72.988761, 42.279421 ], "pop": 1688, "state": "MA" }
{ "id": "01012", "city": "CHESTERFIELD", "loc": [ -72.833309, 42.38167 ], "pop": 177, "state": "MA" }
{ "id": "01013", "city": "CHICOPEE", "loc": [ -72.607962, 42.162046 ], "pop": 23396, "state": "MA" }
{ "id": "01020", "city": "CHICOPEE", "loc": [ -72.576142, 42.176443 ], "pop": 31495, "state": "MA" }
{ "id": "01022", "city": "WESTOVER AFB", "loc": [ -72.558657, 42.196672 ], "pop": 1764, "state": "MA" }
{ "id": "01026", "city": "CUMMINGTON", "loc": [ -72.905767, 42.435296 ], "pop": 1484, "state": "MA" }
{ "id": "01027", "city": "MOUNT TOM", "loc": [ -72.679921, 42.264319 ], "pop": 16864, "state": "MA" }
{ "id": "01028", "city": "EAST LONGMEADOW", "loc": [ -72.505565, 42.067203 ], "pop": 13367, "state": "MA" }
{ "id": "01030", "city": "FEEDING HILLS", "loc": [ -72.675077, 42.07182 ], "pop": 11985, "state": "MA" }
> // display the last 15 documents in collection ZipCode
> db.ZipCode.find().sort({id:-1}).limit(15)
{ "id": "99950", "city": "KETCHIKAN", "loc": [ -133.18479, 55.942471 ], "pop": 422, "state": "AK" }
{ "id": "99929", "city": "WRANGELL", "loc": [ -132.352918, 56.433524 ], "pop": 2573, "state": "AK" }
{ "id": "99927", "city": "POINT BAKER", "loc": [ -133.376372, 56.307858 ], "pop": 426, "state": "AK" }
{ "id": "99926", "city": "METLAKATLA", "loc": [ -131.579001, 55.121491 ], "pop": 1469, "state": "AK" }
{ "id": "99925", "city": "KLAWOCK", "loc": [ -133.055503, 55.552611 ], "pop": 851, "state": "AK" }
{ "id": "99923", "city": "HYDER", "loc": [ -130.124915, 55.925867 ], "pop": 116, "state": "AK" }
{ "id": "99922", "city": "HYDABURG", "loc": [ -132.633175, 55.137406 ], "pop": 891, "state": "AK" }
{ "id": "99921", "city": "CRAIG", "loc": [ -133.117081, 55.47317 ], "pop": 1398, "state": "AK" }
{ "id": "99919", "city": "THORNE BAY", "loc": [ -132.513815, 55.66086 ], "pop": 744, "state": "AK" }
{ "id": "99849", "city": "SKAGWAY", "loc": [ -135.301794, 59.408471 ], "pop": 692, "state": "AK" }
{ "id": "99835", "city": "SITKA", "loc": [ -135.316569, 57.051436 ], "pop": 8638, "state": "AK" }
{ "id": "99833", "city": "PETERSBURG", "loc": [ -133.160683, 56.827134 ], "pop": 4253, "state": "AK" }
{ "id": "99829", "city": "HOONAH", "loc": [ -135.558435, 58.032237 ], "pop": 1670, "state": "AK" }
{ "id": "99827", "city": "HAINES", "loc": [ -135.542032, 59.251886 ], "pop": 2246, "state": "AK" }
```

\$project

```
> // $project
>
> // project_id, city, state in ZipCode collection
> db.ZipCode.aggregate([{$project: {id: 1, city: 1, state: 1}}, {$limit: 10} ])
{ "id" : "01007", "city" : "BELCHERTOWN", "state" : "MA" }
{ "id" : "01005", "city" : "BARRE", "state" : "MA" }
{ "id" : "01008", "city" : "BLANDFORD", "state" : "MA" }
{ "id" : "01010", "city" : "BRIMFIELD", "state" : "MA" }
{ "id" : "01011", "city" : "CHESTER", "state" : "MA" }
{ "id" : "01012", "city" : "CHESTERFIELD", "state" : "MA" }
{ "id" : "01001", "city" : "AGAWAM", "state" : "MA" }
{ "id" : "01002", "city" : "CUSHMAN", "state" : "MA" }
{ "id" : "01013", "city" : "CHICOPEE", "state" : "MA" }
{ "id" : "01027", "city" : "MOUNT TOM", "state" : "MA" }
>
> // project_id, city, loc, pop in ZipCode collection
> db.ZipCode.aggregate([{$project: {id: 1, city: 1, loc: 1, pop: 1}}, {$limit: 10} ])
{ "id" : "01007", "city" : "BELCHERTOWN", "loc" : [ -72.410953, 42.275103 ], "pop" : 10579 }
{ "id" : "01005", "city" : "BARRE", "loc" : [ -72.108354, 42.409698 ], "pop" : 4546 }
{ "id" : "01008", "city" : "BLANDFORD", "loc" : [ -72.936114, 42.182949 ], "pop" : 1240 }
{ "id" : "01010", "city" : "BRIMFIELD", "loc" : [ -72.188455, 42.116543 ], "pop" : 3706 }
{ "id" : "01011", "city" : "CHESTER", "loc" : [ -72.988761, 42.279421 ], "pop" : 1688 }
{ "id" : "01012", "city" : "CHESTERFIELD", "loc" : [ -72.833309, 42.38167 ], "pop" : 177 }
{ "id" : "01001", "city" : "AGAWAM", "loc" : [ -72.622739, 42.070206 ], "pop" : 15338 }
{ "id" : "01002", "city" : "CUSHMAN", "loc" : [ -72.51565, 42.377017 ], "pop" : 36963 }
{ "id" : "01013", "city" : "CHICOPEE", "loc" : [ -72.607962, 42.162046 ], "pop" : 23396 }
{ "id" : "01027", "city" : "MOUNT TOM", "loc" : [ -72.679921, 42.264319 ], "pop" : 16864 }
>
> // project_id, city, loc, state in ZipCode collection
> db.ZipCode.aggregate([{$project: {id: 1, city: 1, loc: 1, state: 1}}, {$limit: 10} ])
{ "id" : "01007", "city" : "BELCHERTOWN", "loc" : [ -72.410953, 42.275103 ], "state" : "MA" }
{ "id" : "01005", "city" : "BARRE", "loc" : [ -72.108354, 42.409698 ], "state" : "MA" }
{ "id" : "01008", "city" : "BLANDFORD", "loc" : [ -72.936114, 42.182949 ], "state" : "MA" }
{ "id" : "01010", "city" : "BRIMFIELD", "loc" : [ -72.188455, 42.116543 ], "state" : "MA" }
{ "id" : "01011", "city" : "CHESTER", "loc" : [ -72.988761, 42.279421 ], "state" : "MA" }
{ "id" : "01012", "city" : "CHESTERFIELD", "loc" : [ -72.833309, 42.38167 ], "state" : "MA" }
{ "id" : "01001", "city" : "AGAWAM", "loc" : [ -72.622739, 42.070206 ], "state" : "MA" }
{ "id" : "01002", "city" : "CUSHMAN", "loc" : [ -72.51565, 42.377017 ], "state" : "MA" }
{ "id" : "01013", "city" : "CHICOPEE", "loc" : [ -72.607962, 42.162046 ], "state" : "MA" }
{ "id" : "01027", "city" : "MOUNT TOM", "loc" : [ -72.679921, 42.264319 ], "state" : "MA" }
>
> // project city, loc, pop, state in ZipCode collection
> db.ZipCode.aggregate([{$project: {id: 0, city: 1, loc: 1, pop: 1, state: 1}}, {$limit: 10} ])
{ "city" : "BELCHERTOWN", "loc" : [ -72.410953, 42.275103 ], "pop" : 10579, "state" : "MA" }
{ "city" : "BARRE", "loc" : [ -72.108354, 42.409698 ], "pop" : 4546, "state" : "MA" }
{ "city" : "BLANDFORD", "loc" : [ -72.936114, 42.182949 ], "pop" : 1240, "state" : "MA" }
{ "city" : "BRIMFIELD", "loc" : [ -72.188455, 42.116543 ], "pop" : 3706, "state" : "MA" }
{ "city" : "CHESTER", "loc" : [ -72.988761, 42.279421 ], "pop" : 1688, "state" : "MA" }
{ "city" : "CHESTERFIELD", "loc" : [ -72.833309, 42.38167 ], "pop" : 177, "state" : "MA" }
{ "city" : "AGAWAM", "loc" : [ -72.622739, 42.070206 ], "pop" : 15338, "state" : "MA" }
{ "city" : "CUSHMAN", "loc" : [ -72.51565, 42.377017 ], "pop" : 36963, "state" : "MA" }
{ "city" : "CHICOPEE", "loc" : [ -72.607962, 42.162046 ], "pop" : 23396, "state" : "MA" }
{ "city" : "MOUNT TOM", "loc" : [ -72.679921, 42.264319 ], "pop" : 16864, "state" : "MA" }
>
```

\$match

```
> // $match
>
> // project_id, city, state match by state: "DC"
> db.ZipCode.aggregate([{$project: {id: 1, city: 1, state: 1}}, {$match: {state: "DC"}}, {$limit: 10} ])
{ "id" : "20001", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20002", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20003", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20006", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20005", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20004", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20008", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20010", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20009", "city" : "WASHINGTON", "state" : "DC" }
{ "id" : "20011", "city" : "WASHINGTON", "state" : "DC" }
>
> // count No. of cities in state: "DC"
> db.ZipCode.aggregate([{$match: {state: "DC"}}, {$count: "city"} ])
{ "city" : 24 }
>
> // project_id, city, state match by states: "MA", "NC", "NY", "SC", "TX"
> db.ZipCode.aggregate([{$project: {id: 1, city: 1, state: 1}}, {$match: {state: {$in: ["MA", "NC", "NY", "SC", "TX"]}}}, {$limit: 10} ])
{ "id" : "01007", "city" : "BELCHERTOWN", "state" : "MA" }
{ "id" : "01005", "city" : "BARRE", "state" : "MA" }
{ "id" : "01008", "city" : "BLANDFORD", "state" : "MA" }
{ "id" : "01010", "city" : "BRIMFIELD", "state" : "MA" }
{ "id" : "01011", "city" : "CHESTER", "state" : "MA" }
{ "id" : "01012", "city" : "CHESTERFIELD", "state" : "MA" }
{ "id" : "01001", "city" : "AGAWAM", "state" : "MA" }
{ "id" : "01002", "city" : "CUSHMAN", "state" : "MA" }
{ "id" : "01013", "city" : "CHICOPEE", "state" : "MA" }
{ "id" : "01027", "city" : "MOUNT TOM", "state" : "MA" }
>
> // count No. of cities in states: "MA", "NC", "NY", "SC", "TX"
> db.ZipCode.aggregate([{$match: {state: {$in: ["MA", "NC", "NY", "SC", "TX"]}}}, {$count: "city"} ])
{ "city" : 4795 }
>
> // project_id, city, state, pop match by pop < 1000 and in states: "DE", "MN"
> db.ZipCode.aggregate([{$project: {id: 1, city: 1, state: 1, pop: 1}}, {$match: {$and: [{pop: {$lt: 1000}}, {state: {$in: ["DE", "MN"]}}]}}, {$limit: 10} ])
{ "id" : "19930", "city" : "BETHANY BEACH", "pop" : 769, "state" : "DE" }
{ "id" : "19931", "city" : "BETHEL", "pop" : 108, "state" : "DE" }
{ "id" : "19951", "city" : "HARBESON", "pop" : 598, "state" : "DE" }
{ "id" : "19967", "city" : "MILLVILLE", "pop" : 623, "state" : "DE" }
{ "id" : "19964", "city" : "MARYDEL", "pop" : 975, "state" : "DE" }
{ "id" : "19979", "city" : "VIOLA", "pop" : 153, "state" : "DE" }
{ "id" : "55019", "city" : "DUNDAS", "pop" : 803, "state" : "MN" }
{ "id" : "55017", "city" : "DALBO", "pop" : 616, "state" : "MN" }
{ "id" : "55053", "city" : "NERSTRAND", "pop" : 687, "state" : "MN" }
{ "id" : "55065", "city" : "RANDOLPH", "pop" : 370, "state" : "MN" }
>
> // count No. of cities match by pop < 1000 and in states: "DE", "MN"
> db.ZipCode.aggregate([{$match: {$and: [{pop: {$lt: 1000}}, {state: {$in: ["DE", "MN"]}}]}}, {$count: "city"} ])
{ "city" : 325 }
>
```

\$group

```
> // $group
>
> // count number of documents in ZipCode collection
> db.ZipCode.aggregate([ {$group: { _id: null, No_of_documents: { $sum: 1 } } } ] )
{ "_id" : null, "No_of_documents" : 29353 }

> // group "state" and count
> db.ZipCode.aggregate([ {$group: { _id: "$state", NCount: { $sum: 1 } } }, { $limit: 10 } ] )
{ "_id" : "IL", "NCount" : 1237 }
{ "_id" : "KY", "NCount" : 898 }
{ "_id" : "MS", "NCount" : 368 }
{ "_id" : "IA", "NCount" : 922 }
{ "_id" : "WV", "NCount" : 656 }
{ "_id" : "TX", "NCount" : 1671 }
{ "_id" : "DE", "NCount" : 53 }
{ "_id" : "ID", "NCount" : 244 }
{ "_id" : "MA", "NCount" : 474 }
{ "_id" : "NM", "NCount" : 276 }

> // group "state" by population sum and display population >= 10000000
> db.ZipCode.aggregate([ {$group: { _id: "$state", Population: { $sum: "$pop" } } }, { $match: { Population: { $gte: 10000000 } } } ] )
{ "_id" : "IL", "Population" : 11427576 }
{ "_id" : "TX", "Population" : 16984601 }
{ "_id" : "OH", "Population" : 10846517 }
{ "_id" : "PA", "Population" : 11981648 }
{ "_id" : "FL", "Population" : 12686644 }
{ "_id" : "NY", "Population" : 17996402 }
{ "_id" : "CA", "Population" : 29754890 }

> // group "state" by population average and display average population <= 3000
> db.ZipCode.aggregate([ {$group: { _id: "$state", Average: { $avg: "$pop" } } }, { $match: { Average: { $lte: 3000 } } } ] )
{ "_id" : "WV", "Average" : 2732.45268292683 }
{ "_id" : "ME", "Average" : 2991.8249802498026 }
{ "_id" : "NE", "Average" : 2749.3710801393727 }
{ "_id" : "ND", "Average" : 1632.4992071611253 }
{ "_id" : "MT", "Average" : 2544.420382165605 }
{ "_id" : "AK", "Average" : 2793.3230769230768 }
{ "_id" : "SD", "Average" : 1810.9296875 }
{ "_id" : "VT", "Average" : 2315.876543298767 }

> // group "state" and "city" by population sum and display average population for cities in each state
> db.ZipCode.aggregate([ {$group: { _id: { state: "$state", city: "$city" }, Population: { $sum: "$pop" } } }, { $group: { _id: "$_id.state", Average: { $avg: "$Population" } } }, { $limit: 10 } ] )
{ "_id" : "IL", "Average" : 9954.334494773519 }
{ "_id" : "KY", "Average" : 4767.164721441375 }
{ "_id" : "MS", "Average" : 7524.023391812865 }
{ "_id" : "IA", "Average" : 3123.0821147356583 }
{ "_id" : "WV", "Average" : 2771.4775888717154 }
{ "_id" : "TX", "Average" : 13775.02108678021 }
{ "_id" : "ID", "Average" : 4320.811158798283 }
{ "_id" : "DE", "Average" : 14481.91304347826 }
{ "_id" : "MA", "Average" : 14855.37037037037 }
{ "_id" : "NM", "Average" : 5872.360465116279 }
```

\$sort

```
> // $sort
>
> // sort "states" alphabetically in ascending order and count number of "cities"
> db.ZipCode.aggregate([ {$group: { _id: "$state", Count: { $sum: 1 } } }, { $sort: { _id: 1 } }, { $limit: 5 } ] )
{ "_id" : "AK", "Count" : 195 }
{ "_id" : "AL", "Count" : 567 }
{ "_id" : "AR", "Count" : 578 }
{ "_id" : "AZ", "Count" : 270 }
{ "_id" : "CA", "Count" : 1516 }

> // sort "states" alphabetically in descending order and count number of "cities"
> db.ZipCode.aggregate([ {$group: { _id: "$state", Count: { $sum: 1 } } }, { $sort: { _id: -1 } }, { $limit: 5 } ] )
{ "_id" : "WY", "Count" : 140 }
{ "_id" : "WV", "Count" : 656 }
{ "_id" : "WI", "Count" : 716 }
{ "_id" : "WA", "Count" : 484 }
{ "_id" : "VT", "Count" : 243 }

> // count number of "cities" in a "state" by group and sort in ascending order
> db.ZipCode.aggregate([ {$group: { _id: "$state", Count: { $sum: 1 } } }, { $sort: { Count: 1 } }, { $limit: 5 } ] )
{ "_id" : "DC", "Count" : 24 }
{ "_id" : "DE", "Count" : 53 }
{ "_id" : "RI", "Count" : 60 }
{ "_id" : "HI", "Count" : 80 }
{ "_id" : "NV", "Count" : 104 }

> // count number of "cities" in a "state" by group and sort in descending order
> db.ZipCode.aggregate([ {$group: { _id: "$state", Count: { $sum: 1 } } }, { $sort: { Count: -1 } }, { $limit: 5 } ] )
{ "_id" : "TX", "Count" : 1671 }
{ "_id" : "NY", "Count" : 1595 }
{ "_id" : "CA", "Count" : 1516 }
{ "_id" : "PA", "Count" : 1458 }
{ "_id" : "IL", "Count" : 1237 }

> // sort "cities" by population for each "state" in ascending order and returns the smallest "cities" by population for each "state"
> db.ZipCode.aggregate([ {$group: { _id: { State: "$state", City: "$city" }, Population: { $sum: "$pop" } } }, { $sort: { Population: 1 } }, { $limit: 5 } ] )
{ "_id" : { "State" : "NM", "City" : "ALGODONES" }, "Population" : 0 }
{ "_id" : { "State" : "KS", "City" : "ARNOLD" }, "Population" : 0 }
{ "_id" : { "State" : "VA", "City" : "WALLOPS ISLAND" }, "Population" : 0 }
{ "_id" : { "State" : "NM", "City" : "KIRTLAND A F B E" }, "Population" : 0 }
{ "_id" : { "State" : "CA", "City" : "TWIN BRIDGES" }, "Population" : 0 }

> // sort "cities" by population for each "state" in descending order and returns the largest "cities" by population for each "state"
> db.ZipCode.aggregate([ {$group: { _id: { State: "$state", City: "$city" }, Population: { $sum: "$pop" } } }, { $sort: { Population: -1 } }, { $limit: 5 } ] )
{ "_id" : { "State" : "IL", "City" : "CHICAGO" }, "Population" : 2452177 }
{ "_id" : { "State" : "NY", "City" : "BROOKLYN" }, "Population" : 2300504 }
{ "_id" : { "State" : "CA", "City" : "LOS ANGELES" }, "Population" : 2102295 }
{ "_id" : { "State" : "TX", "City" : "HOUSTON" }, "Population" : 2095918 }
{ "_id" : { "State" : "PA", "City" : "PHILADELPHIA" }, "Population" : 1610956 }

> // sort "cities" by population of state: "TX" and return the "city" with maximum population
> db.ZipCode.aggregate([ {$group: { _id: { State: "$state", City: "$city" }, Population: { $sum: "$pop" } } }, { $match: { "_id.State" : "TX" } }, { $sort: { Population: -1 } }, { $limit: 1 } ] )
{ "_id" : { "State" : "TX", "City" : "HOUSTON" }, "Population" : 2095918 }
```

\$skip & \$limit

```
> // $skip & $limit
>
> // sort "states" alphabetically in ascending order and count number of "cities" skip by 5 and limit by 5
> db.ZipCode.aggregate([{$group: {_id: "$state", Count: {$sum: 1}}}, {$sort: {_id: 1}}, {$skip: 5}, {$limit: 5} ])
{ "id" : "CO", "Count" : 414 }
{ "id" : "CT", "Count" : 263 }
{ "id" : "DC", "Count" : 24 }
{ "id" : "DE", "Count" : 53 }
{ "id" : "FL", "Count" : 804 }
>
> // sort "states" alphabetically in descending order and count number of "cities" skip by 5 and limit by 5
> db.ZipCode.aggregate([{$group: {_id: "$state", Count: {$sum: 1}}}, {$sort: {_id: -1}}, {$skip: 5}, {$limit: 5} ])
{ "id" : "VA", "Count" : 816 }
{ "id" : "UT", "Count" : 205 }
{ "id" : "TX", "Count" : 1671 }
{ "id" : "TN", "Count" : 582 }
{ "id" : "SD", "Count" : 384 }
>
> // count number of "cities" in a "state" by group and sort in ascending order skip by 5 and limit by 5
> db.ZipCode.aggregate([{$group: {_id: "$state", Count: {$sum: 1}}}, {$sort: {Count: 1}}, {$skip: 5}, {$limit: 5} ])
{ "id" : "WY", "Count" : 140 }
{ "id" : "AK", "Count" : 195 }
{ "id" : "UT", "Count" : 205 }
{ "id" : "NH", "Count" : 218 }
{ "id" : "VT", "Count" : 243 }
>
> // count number of "cities" in a "state" by group and sort in descending order skip by 5 and limit by 5
> db.ZipCode.aggregate([{$group: {_id: "$state", Count: {$sum: 1}}}, {$sort: {Count: -1}}, {$skip: 5}, {$limit: 5} ])
{ "id" : "OH", "Count" : 1007 }
{ "id" : "MO", "Count" : 994 }
{ "id" : "IA", "Count" : 922 }
{ "id" : "MN", "Count" : 882 }
{ "id" : "MI", "Count" : 876 }
>
> // sort "cities" by population for each "state" in ascending order and returns the smallest "cities" by population for each "state" skip by 5 and limit by 5
> db.ZipCode.aggregate([{$group: {_id: {$state: "$state", City: "$city", Population: {$sum: "$pop"}}}, {$sort: {Population: 1}}, {$skip: 5}, {$limit: 5} ])
{ "id" : { "State" : "NM", "City" : "ALGODONES" }, "Population" : 0 }
{ "id" : { "State" : "CO", "City" : "CHEYENNE MTN AFB" }, "Population" : 0 }
{ "id" : { "State" : "ME", "City" : "BUSTINS ISLAND" }, "Population" : 0 }
{ "id" : { "State" : "TX", "City" : "FULTON" }, "Population" : 0 }
{ "id" : { "State" : "NM", "City" : "KIRTLAND A F B E" }, "Population" : 0 }
>
> // sort "cities" by population for each "state" in descending order and returns the largest "cities" by population for each "state" skip by 5 and limit by 5
> db.ZipCode.aggregate([{$group: {_id: {$state: "$state", City: "$city", Population: {$sum: "$pop"}}}, {$sort: {Population: -1}}, {$skip: 5}, {$limit: 5} ])
{ "id" : { "State" : "NY", "City" : "NEW YORK" }, "Population" : 1476790 }
{ "id" : { "State" : "NY", "City" : "BRONX" }, "Population" : 1209548 }
{ "id" : { "State" : "CA", "City" : "SAN DIEGO" }, "Population" : 1048298 }
{ "id" : { "State" : "MI", "City" : "DETROIT" }, "Population" : 963243 }
{ "id" : { "State" : "TX", "City" : "DALLAS" }, "Population" : 940191 }
>
> // sort "cities" by population of state: "TX" and return the "city" with minimum population
> db.ZipCode.aggregate([{$group: {_id: {$state: "$state", City: "$city", Population: {$sum: "$pop"}}}, {$match: {"_id.State": "TX"}}, {$sort: {Population: 1}}, {$limit: 1} ])
{ "_id" : { "State" : "TX", "City" : "FULTON" }, "Population" : 0 }
>
```

\$first & \$last and \$unwind

```
> // $first & $last
>
> // display smallest city by population for each state
> db.ZipCode.aggregate([
... {$group: {_id: {$state: "$state", City: "$city", Population: {$sum: "$pop"}}},
... {$sort: {Population: 1}},
... {$group: {_id: "$_id.State", sc: {$first: "$_id.City", sp: {$first: "$_id.Population"}}},
... {$project: {_id: 0, City: "$sc", State: "$_id.State", Population: "$_id.Population"}}, {$limit: 10} ])
{ "City" : "TATEVILLE", "State" : "KY" }
{ "City" : "ANCONA", "State" : "IL" }
{ "City" : "CHUNKY", "State" : "MS" }
{ "City" : "FULTON", "State" : "TX" }
{ "City" : "MOUNT CARBON", "State" : "WV" }
{ "City" : "DOUDS", "State" : "IA" }
{ "City" : "KEUTERVILLE", "State" : "ID" }
{ "City" : "BETHEL", "State" : "DE" }
{ "City" : "BUCKLAND", "State" : "MA" }
{ "City" : "KIRTLAND A F B E", "State" : "NM" }
>
> // display largest city by population for each state
> db.ZipCode.aggregate([
... {$group: {_id: {$state: "$state", City: "$city", Population: {$sum: "$pop"}}},
... {$sort: {Population: 1}},
... {$group: {_id: "$_id.State", sc: {$last: "$_id.City", sp: {$last: "$_id.Population"}}},
... {$project: {_id: 0, City: "$sc", State: "$_id.State", Population: "$_id.Population"}}, {$limit: 10} ])
{ "City" : "MILWAUKEE", "State" : "WI" }
{ "City" : "TULSA", "State" : "OK" }
{ "City" : "LAS VEGAS", "State" : "NV" }
{ "City" : "BURLINGTON", "State" : "VT" }
{ "City" : "PHOENIX", "State" : "AZ" }
{ "City" : "SALT LAKE CITY", "State" : "UT" }
{ "City" : "INDIANAPOLIS", "State" : "IN" }
{ "City" : "MEMPHIS", "State" : "TN" }
{ "City" : "WASHINGTON", "State" : "DC" }
{ "City" : "SIOUX FALLS", "State" : "SD" }
>
> // $unwind
>
> // unwind loc of city match by state: "DC"
> db.ZipCode.aggregate([{$project: {_id: 0, city: 1, loc: 1, state: 1}}, {$unwind: "$loc"}, {$match: {state: "DC"}}, {$skip: 4}, {$limit: 10} ])
{ "city" : "WASHINGTON", "loc" : -76.989539, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : 38.882941, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : -77.044701, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : 38.896444, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : -77.031236, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : 38.906731, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : -77.026393, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : 38.892955, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : -77.059936, "state" : "DC" }
{ "city" : "WASHINGTON", "loc" : 38.936282, "state" : "DC" }
>
```