Aggregation Operators:

1.Average GPA of All Students

db.student.aggregate([

{ $group: {_id : null , averageGPA : {$avg: “$gpa”}}}

]);

```
db> db.student.aggregate([ { $group: { _id: null, averageGPA: { $avg: "$gpa" } } }] );
[ { _id: null, averageGPA: 3.7813626373626374 } ]
db>
```

$group: Groups all documents together.

○ _id: null: Sets the group identifier to null .

○ averageGPA: Calculates the average value of the "gpa" using the $avg operator.

2.Minimum and Maximum Age:

db.student.aggregate([

{ $group: {_id:1 , minAge :{$min : “$age”} , maxAge :

{$max: “$age”}}}]);

```
db> db.student.aggregate([{$group:{_id:1 ,minAge:{$min:"$age"},maxAge:{$max:"$age"}}}]);
[ { _id: 1, minAge: 18, maxAge: 25 } ]
```

- Similar to the previous example, it uses $group to group all documents.
- minAge: Uses the $min operator to find the minimum value in the "age" field.

- maxAge: Uses the $max operator to find the maximum value in the "age" field.

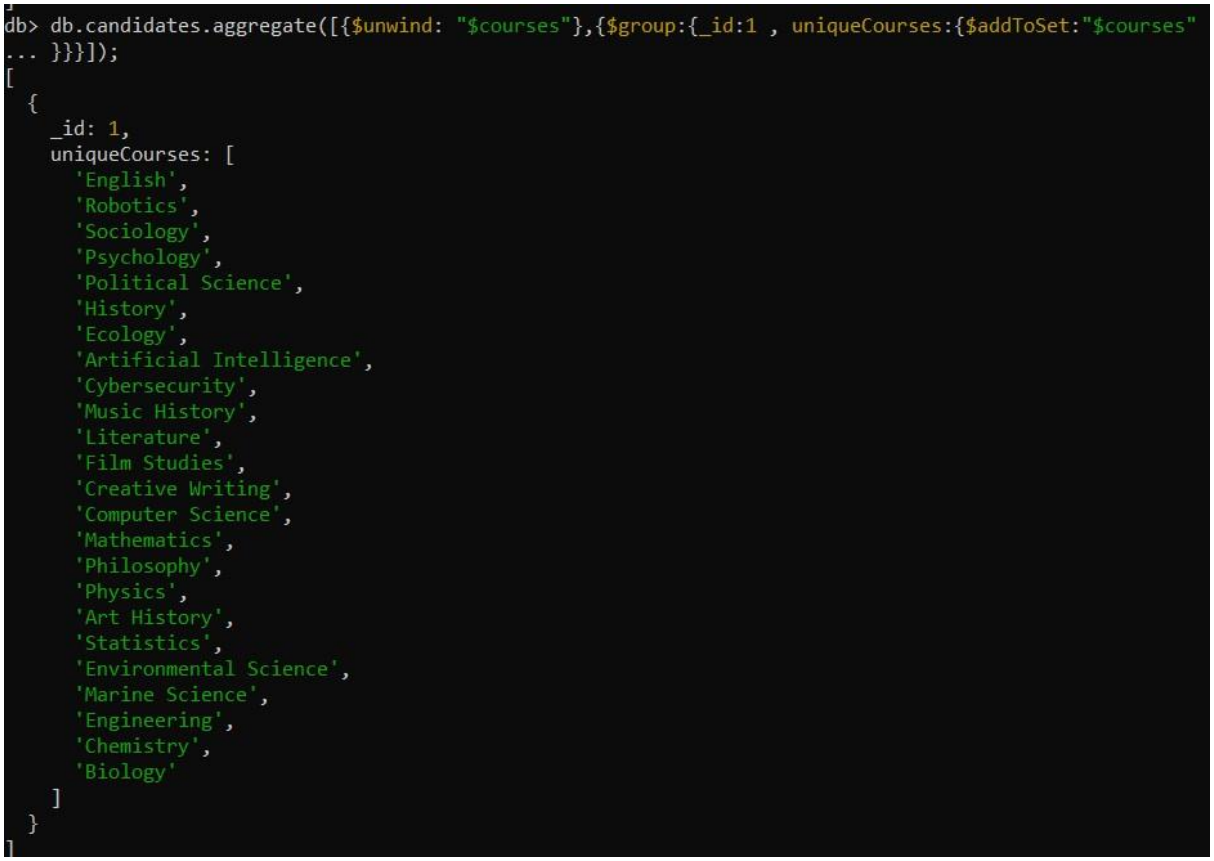
To calculate Average GPA for all home cities

```
db.student.aggregate([
    {$group:{_id: “$home_city” , averageGPA :{$avg : $gpa    } } } ] );
```

```
db> db.student.aggregate([{$group:{_id:"$home_city",averageGPA:{$avg:"$gpa"}}}]);
[
  { _id: 'City 1', averageGPA: 3.8203225806451617 },
  { _id: 'City 7', averageGPA: 3.6064 },
  { _id: 'City 5', averageGPA: 3.8850000000000002 },
  { _id: 'City 9', averageGPA: 3.9200000000000004 },
  { _id: 'City 3', averageGPA: 3.7868965517241375 },
  { _id: 'City 8', averageGPA: 3.8958620689655175 },
  { _id: 'City 2', averageGPA: 3.8329032258064517 },
  { _id: 'City 4', averageGPA: 3.5957692307692306 },
  { _id: 'City 6', averageGPA: 3.7025806451612904 },
  { _id: null, averageGPA: 3.7747857142857146 },
  { _id: 'City 10', averageGPA: 3.7352272727272724 }
```

Collect Unique Courses Offered (Using $addToSet):

```
db.candidates.aggregate([
{ $unwind: "$courses" },
{ $group: { _id: 1 , uniqueCourses: { $addToSet: "$courses" } }
}]);
```



Aggregation pipeline:

Aggregation Pipeline and its operators run with the db.collection.aggregate() method do not modify

documents in a collection , the pipeline contains a $group, $sort, $project , $merge etc stages.

1.Finding students with age greater than 25 , sorted by age in descending order, and only return name and age.

```
db.students6.aggregate([
{$match:{age:{$gt:25}}},
{$sort:{age:-1}},
```

{$project :{_id:1 , name:1 , age:1}}])

Output:

2.Find students with age less than 20, sorted by name in ascending order, and only return name and score

db.students6.aggregate([

{$match:{age:{$lt:23}}},

{$sort:{age:1}},

{$project :{_id:0, name:1 , age:1}}])

Output:

3.Grouping students by major, calculating average age and total number of students in each major:

db.students6.aggregate([

{$group:{_id: “$major” , averageAge :{$avg: “age”},
totalStudents:{$sum :1}}}
]);

Output:

```
db> db.students6.aggregate([ {$group:{_id:"$major" , averageAge:{$avg:"$age"},totalStudents:{$sum:1}}}])
[
  { _id: 'Computer Science', averageAge: 22.5, totalStudents: 2 },
  { _id: 'English', averageAge: 28, totalStudents: 1 },
  { _id: 'Biology', averageAge: 23, totalStudents: 1 },
  { _id: 'Mathematics', averageAge: 22, totalStudents: 1 }
]
db>
```

4.Finding students with an average above 90 .

db.students6.aggregate([
{$project:{_id:1 , name:1, averageScore :{$avg:”$scores}
}},{$match:{averageScore:{$gt:90}}}]);

Output:

```
db> db.students6.aggregate([{ $project: { _id: 1, name: 1, averageScore: { $avg: "$scores" } } }, { $match: { averageScore: { $gt: 90 } } }]);
[
  { _id: 2, name: 'Bob', averageScore: 91 },
  { _id: 4, name: 'David', averageScore: 93.33333333333333 }
]
db>
```

5.Finding students with an average score below 80 and skip the first document .

db.students6.aggregate([

{$project:{_id:1 , name:1, averageScore :{$avg:”$scores}

}},{$match:{averageScore:{$lt:85}}},{skip:1}]);

Output: