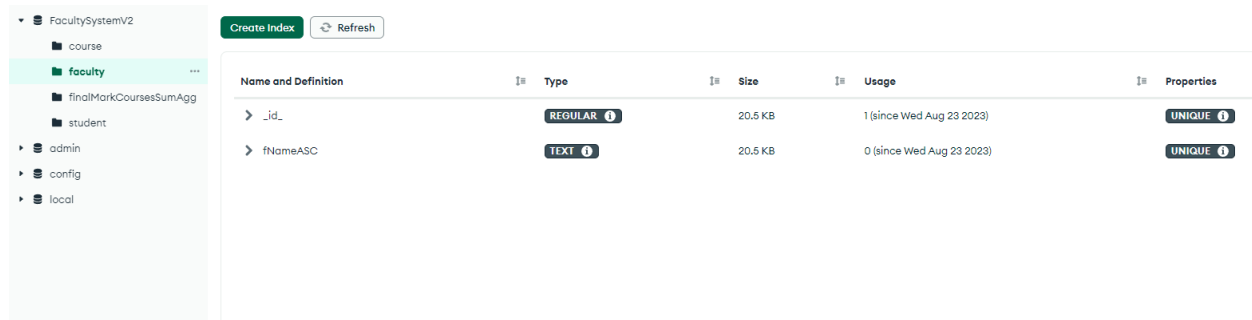


Day 2 Lab Assignments

Use [FacultySystemV2] DB the following assignments (Use GUI App for mongoDB):

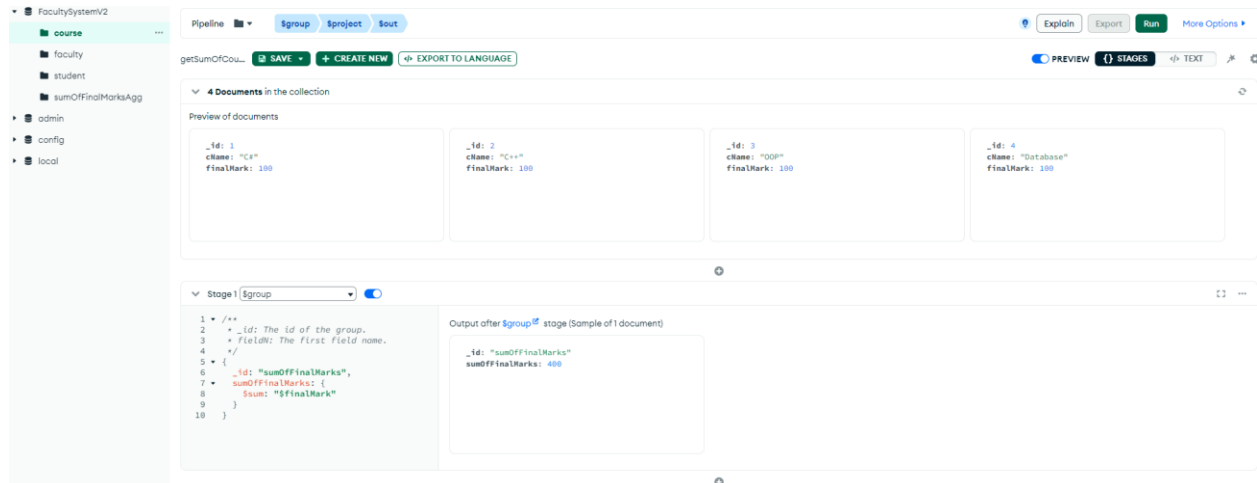
1. Create unique index on FacultyName on the Faculty collection.



The screenshot shows the MongoDB GUI interface for the FacultySystemV2 database. The left sidebar lists the database structure, including collections like 'course', 'faculty', 'finalMarkCoursesSumAgg', 'student', 'admin', 'config', and 'local'. The 'faculty' collection is selected. The main panel displays the index status for the 'faculty' collection. It shows two indexes: '_id_' (REGULAR) and 'fNameASC' (TEXT). Both indexes are listed with their size (20.5 KB) and usage (1 (since Wed Aug 23 2023) and 0 (since Wed Aug 23 2023) respectively). The 'Properties' column indicates that both indexes are UNIQUE.

Name and Definition	Type	Size	Usage	Properties
> _id_	REGULAR	20.5 KB	1 (since Wed Aug 23 2023)	UNIQUE
> fNameASC	TEXT	20.5 KB	0 (since Wed Aug 23 2023)	UNIQUE

2. Using aggregation display the sum of final mark for all courses in Course collection.



The screenshot shows the MongoDB GUI interface for the FacultySystemV2 database. The left sidebar lists the database structure, including collections like 'course', 'faculty', 'student', 'sumOffFinalMarksAgg', 'admin', 'config', and 'local'. The 'course' collection is selected. The main panel displays an aggregation pipeline for the 'course' collection. The pipeline is named 'getSumOfCou...' and is saved. It shows the output of the aggregation, which is a single document with the sum of final marks for all courses. The output is displayed as a table with 4 columns: '_id', 'cName', 'finalMark', and 'sumOffFinalMarks'. The output shows a single document with the sum of final marks for all courses.

```
1 // **
2 // _id: The id of the group.
3 // fieldName: The first field name.
4 //
5 {
6   _id: "sumOffFinalMarks",
7   sumOffFinalMarks: {
8     $sum: "$finalMark"
9   }
10 }
```

Output after \$group stage (Sample of 1 document)

_id	cName	finalMark	sumOffFinalMarks
1	Cs	100	400

FacultySystemV2

- course
- faculty
- student
- sumOfFinalMarksAgg
- admin
- config
- local

Pipeline
\$group
\$project
\$out

getSumOfCou...
SAVE
CREATE NEW
EXPORT TO LANGUAGE

Stage 2 \$project

```

1 /**
2  * specifications: The fields to
3  * include or exclude.
4  */
5 {
6   _id:0
7 }

```

Output after \$project stage (Sample of 1 document)

sumOfFinalMarks: 400

Stage 3 \$out

```

1 /**
2  * Provide the name of the output collect
3  */
4 'sumOfFinalMarksAgg'

```

Documents will be saved to FacultySystemV2.sumOfFinalMarksAgg.

The \$out operator will cause the pipeline to persist the

FacultySystemV2

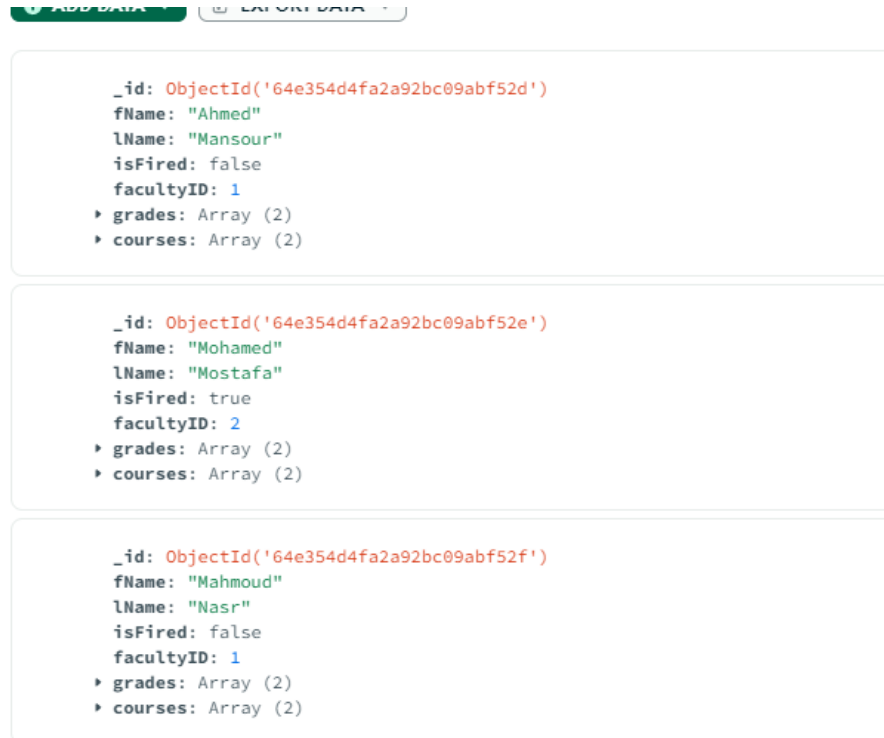
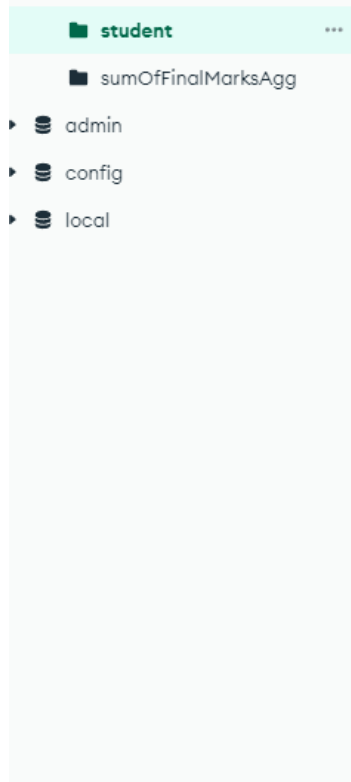
- course
- faculty
- student
- sumOfFinalMarksAgg
- admin

Filter
Type a query: { field: 'value' }

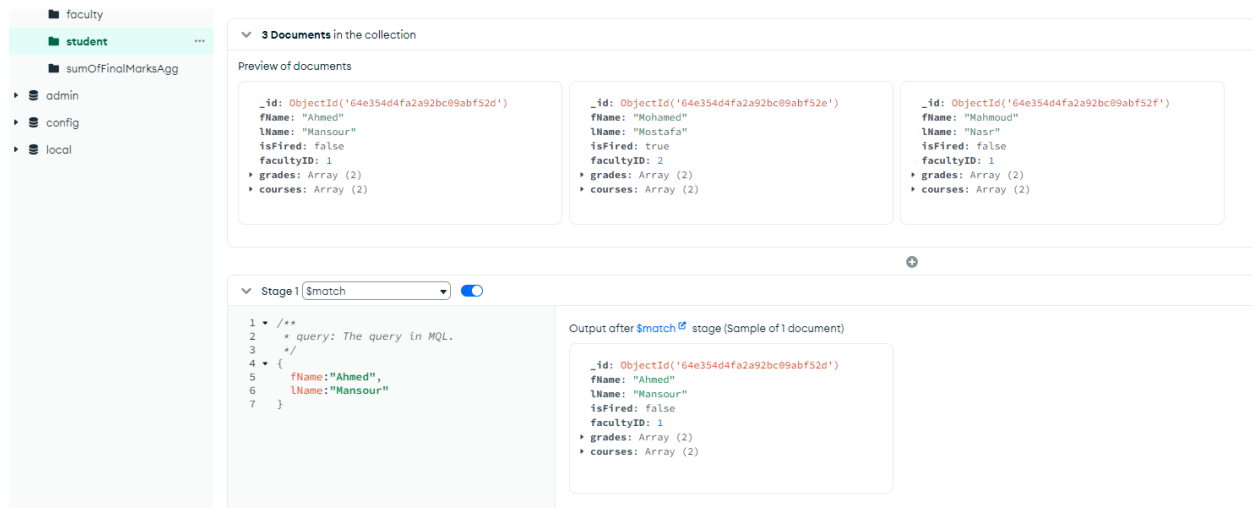
ADD DATA
EXPORT DATA

_id: ObjectId('64e5e7b0941918b6895a00bd')
sumOfFinalMarks: 400

- Implement (one to many) relation between Student and Course, by adding array of Courses IDs in the student object.



- Select specific student with his name, and then display his courses.



student

sumOfFinalMarksAgg

admin

config

local

Stage 2 \$unwind

```
1 /**
2  * path: Path to the array field.
3  * includeArrayIndex: Optional name for the
4  * preserveNullAndEmptyArrays: Optional
5  * toggle to unwind null and empty values
6  */
7 {
8   path: "$courses"
9 }
```

Output after \$unwind stage (Sample of 2 documents)

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2)
}
```

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2)
}
```

Stage 3 \$lookup

```
1 /**
2  * from: The target collection.
3  * localField: The local join field.
4  * foreignField: The target join field.
5  * as: The name for the results.
6  * pipeline: Optional pipeline to run on the
7  * let: Optional variables to use in the pipeline
8  */
9 {
10  from: "course",
11  localField: "courses",
12  foreignField: "_id",
13  as: "courseAsArray"
14 }
```

Output after \$lookup stage (Sample of 2 documents)

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2)
}
```

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2)
}
```

student

sumOfFinalMarksAgg

admin

config

local

Stage 4 \$replaceRoot

```
1 /**
2  * replacementDocument: A document or string
3  */
4 {
5   newRoot: {
6     $mergeObjects: [
7       "$$ROOT",
8       {
9         "courseObject": {
10           $arrayElemAt: ["$courseAsArray",
11             0]
12         }
13       }
14     ]
15   }
16 }
```

Output after \$replaceRoot stage (Sample of 2 documents)

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2)
}
```

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2)
}
```

Stage 5 \$project

```
1 /**
2  * specifications: The fields to
3  * include or exclude.
4  */
5 {
6   {
7     id: 0,
8     fName: 1,
9     lName: 1,
10    courseObject: 1
11  }
12 }
```

Output after \$project stage (Sample of 2 documents)

```
{
  "fName": "Ahmed",
  "lName": "Mansour",
  "courseObject": Object
}
```

```
{
  "fName": "Ahmed",
  "lName": "Mansour",
  "courseObject": Object
}
```

▼ Stage 6

\$out

1

▼

/**

2

* Provide the name of the output collect

3

*/

4

'allCoursesInfoForOneStudent'

allCoursesInfoForOn... ...

course

faculty

student

sumOfFinalMarksAgg

▶ admin

▶ config

▶ local

Filter type a query: { field: 'value' }

+ ADD DATA ▼

EXPORT DATA ▼

_id: ObjectId('64e5ec32941918b6895a035c')

fName: "Ahmed"

lName: "Mansour"

▶ courseObject: Object

_id: ObjectId('64e5ec32941918b6895a035d')

fName: "Ahmed"

lName: "Mansour"

▶ courseObject: Object

4. Implement relation between Student and faculty by adding the faculty object in the student using `_id` Relation.

course

faculty

student

sumOfFinalMarksAgg

admin

config

local

ADD DATA

EXPORT DATA

`_id: 1`
`name: "MET Academy"`
`address: "Mansoura"`

`_id: 2`
`name: "Mansoura University"`
`address: "Mansoura"`

faculty

student

sumOfFinalMarksAgg

admin

config

local

`_id: ObjectId('64e354d4fa2a92bc09abf52d')`
`fName: "Ahmed"`
`lName: "Mansour"`
`isFired: false`
`facultyID: 1` → MET Academy
`grades: Array (2)`
`courses: Array (2)`

`_id: ObjectId('64e354d4fa2a92bc09abf52e')`
`fName: "Mohamed"`
`lName: "Mostafa"`
`isFired: true`
`facultyID: 2` → Mansoura University
`grades: Array (2)`
`courses: Array (2)`

`_id: ObjectId('64e354d4fa2a92bc09abf52f')`
`fName: "Mahmoud"`
`lName: "Nasr"`
`isFired: false`
`facultyID: 1` → MET Academy
`grades: Array (2)`
`courses: Array (2)`

- Using \$Lookup Select specific student with his name, and then display his faculty.

FacultSystemV2

- allCoursesInfoForOneStu...
- course
- faculty
- facultyForOneStudent
- student**
- sumOffFinalMarksAgg
- admin
- config
- local

Pipeline **\$match** **\$lookup** **\$replaceRoot** **\$out**

getFacultyFor... - modified **SAVE** **+ CREATE NEW** **EXPORT TO LANGUAGE**

3 Documents in the collection

Preview of documents

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52d"),
  "fName": "Ahmed",
  "lName": "Mansour",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2),
  "courses": Array (2)
}
```

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52e"),
  "fName": "Mohamed",
  "lName": "Mostafa",
  "isFired": true,
  "facultyID": 2,
  "grades": Array (2),
  "courses": Array (2)
}
```

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52f"),
  "fName": "Mahmoud",
  "lName": "Nasr",
  "isFired": false,
  "facultyID": 1,
  "grades": Array (2),
  "courses": Array (2)
}
```

Stage1 **\$match** ☒

```
1 /**
2  * query: The query in MQL.
3  */
4 {
5
6   fName:"Mohamed",
7   lName:"Mostafa",
8
9 }
```

Output after **\$match** stage (Sample of 1 document)

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52e"),
  "fName": "Mohamed",
  "lName": "Mostafa",
  "isFired": true,
  "facultyID": 2,
  "grades": Array (2),
  "courses": Array (2)
}
```

facultyForOneStudent

- student**
- sumOffFinalMarksAgg
- admin
- config
- local

Stage2 **\$lookup** ☒

```
1 /**
2  * from: The target collection.
3  * localField: The local join field.
4  * foreignField: The target join field.
5  * as: The name for the results.
6  * pipeline: Optional pipeline to run on t
7  * let: Optional variables to use in the p
8  */
9 {
10   from: "faculty",
11   localField: "facultyID",
12   foreignField: "_id",
13   as: "facultyAsArray"
14 }
```

Output after **\$lookup** stage (Sample of 1 document)

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52e"),
  "fName": "Mohamed",
  "lName": "Mostafa",
  "isFired": true,
  "facultyID": 2,
  "grades": Array (2),
  "courses": Array (2),
  "facultyAsArray": Array (1)
}
```

Stage3 **\$replaceRoot** ☒

```
1 /**
2  * replacementDocument: A document or stri
3  */
4 {
5   newRoot: {
6     $mergeObjects: [
7       "$$ROOT",
8       {
9         "facultyObject": {
10           $arrayElemAt: ["$facultyAsArray", 0]
11         }
12       }
13     ]
14 }
```

Output after **\$replaceRoot** stage (Sample of 1 document)

```
{
  "_id": ObjectId("64e354d4fa2a92bc09abf52e"),
  "fName": "Mohamed",
  "lName": "Mostafa",
  "isFired": true,
  "facultyID": 2,
  "grades": Array (2),
  "courses": Array (2),
  "facultyAsArray": Array (1),
  "facultyObject": Object
}
```

▼ Stage 4 \$out

1 ▼ /**

2 * Provide the name of the output collect

3 */

4 'facultyForOneStudent'

Docur

▼ FacultySystemV2

- allCoursesInfoForOneStu...
- course
- faculty
- facultyForOneStudent ...**
- student
- sumOfFinalMarksAgg

▶ admin

▶ config

▶ local

Filter ⌚ ▼ Type a query: { field: 'value' }

+ ADD DATA ▼

EXPORT DATA ▼

```
_id: ObjectId('64e354d4fa2a92bc09abf52e')
fName: "Mohamed"
lName: "Mostafa"
isFired: true
facultyID: 2
▸ grades: Array (2)
▸ courses: Array (2)
▸ facultyAsArray: Array (1)
▸ facultyObject: Object
```


5. Display each student Full Name along with his average grade in all courses.

\$concat

3 Documents in the collection

Preview of documents

```

1 { "_id": ObjectId("64e354d4fa2a92bc89abf52d"),
2   "fName": "Ahmed",
3   "lName": "Mansour",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Array (2),
7   "courses": Array (2) }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52e"),
2   "fName": "Mohamed",
3   "lName": "Mostafa",
4   "isFired": true,
5   "facultyID": 2,
6   "grades": Array (2),
7   "courses": Array (2) }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52f"),
2   "fName": "Mahmoud",
3   "lName": "Nasr",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Array (2),
7   "courses": Array (2) }

```

Stage 1 [Match] ☒

```

1 /**
2  * query: The query in MQL.
3  */
4 {
5   $grades: {
6     $exists: true,
7   },
8 }
9 /**

```

Output after \$match stage (Sample of 3 documents)

```

1 { "_id": ObjectId("64e354d4fa2a92bc89abf52d"),
2   "fName": "Ahmed",
3   "lName": "Mansour",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Array (2),
7   "courses": Array (2) }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52e"),
2   "fName": "Mohamed",
3   "lName": "Mostafa",
4   "isFired": true,
5   "facultyID": 2,
6   "grades": Array (2),
7   "courses": Array (2) }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52f"),
2   "fName": "Mahmoud",
3   "lName": "Nasr",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Array (2),
7   "courses": Array (2) }

```

Stage 2 [Unwind] ☒

```

1 /**
2  * path: Path to the array field.
3  * includeArrayIndex: Optional name for i
4  * preserveNullAndEmptyArrays: Optional
5  * toggle to unwind null and empty valu
6  */
7 {
8   $path: "$grades",
9 }

```

Output after \$unwind stage (Sample of 6 documents)

```

1 { "_id": ObjectId("64e354d4fa2a92bc89abf52d"),
2   "fName": "Ahmed",
3   "lName": "Mansour",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Object,
7   "courses": Array (2) }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52e"),
2   "fName": "Mohamed",
3   "lName": "Mansour",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Object,
7   "courses": Array (2) }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52e"),
2   "fName": "Mohamed",
3   "lName": "Mostafa",
4   "isFired": true,
5   "facultyID": 2,
6   "grades": Object,
7   "courses": Array (2) }

```

Stage 3 [ReplaceRoot] ☒

```

1 /**
2  * replacementDocument: A document or str
3  */
4 {
5   $newRoot: {
6     $mergeObjects: [
7       "$$ROOT",
8       {
9         fullName: {
10           $concat: ["$fName", " ", "$lName"]
11         },
12       },
13     ],
14   },
15 }

```

Output after \$replaceRoot stage (Sample of 6 documents)

```

1 { "_id": ObjectId("64e354d4fa2a92bc89abf52d"),
2   "fName": "Ahmed",
3   "lName": "Mansour",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Object,
7   "courses": Array (2),
8   "fullName": "Ahmed Mansour" }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52e"),
2   "fName": "Mohamed",
3   "lName": "Mansour",
4   "isFired": false,
5   "facultyID": 1,
6   "grades": Object,
7   "courses": Array (2),
8   "fullName": "Mohamed Mansour" }
1 { "_id": ObjectId("64e354d4fa2a92bc89abf52e"),
2   "fName": "Mohamed",
3   "lName": "Mostafa",
4   "isFired": true,
5   "facultyID": 2,
6   "grades": Object,
7   "courses": Array (2),
8   "fullName": "Mohamed Mostafa" }

```

Stage 4 [Group] ☒

```

1 /**
2  * _id: The id of the group.
3  * fieldIn: The first field name.
4  */
5 {
6   $id: "$fullName",
7   $average: {
8     $avg: "$grades.grade",
9   },
10 }

```

Output after \$group stage (Sample of 3 documents)

```

1 { "_id": "Ahmed Mansour",
2   "average": 71 }
1 { "_id": "Mohamed Mostafa",
2   "average": 37.5 }
1 { "_id": "Mahmoud Nasr",
2   "average": 59 }

```

Stage 5 [ReplaceRoot] ☒

```

1 /**
2  * replacementDocument: A document or str
3  */
4 {
5   $newRoot: {
6     $mergeObjects: [
7       "$$ROOT",
8       {
9         information: {
10           $concat: [
11             "$_id",
12             ", AVG is: ",
13             "$average",
14           ],
15         },
16       },
17     ],
18   },
19 }

```

Output after \$replaceRoot stage (Sample of 3 documents)

```

1 { "_id": "Ahmed Mansour",
2   "average": 71,
3   "information": "Ahmed Mansour, AVG is: 71" }
1 { "_id": "Mohamed Mostafa",
2   "average": 37.5,
3   "information": "Mohamed Mostafa, AVG is: 37.5" }
1 { "_id": "Mahmoud Nasr",
2   "average": 59,
3   "information": "Mahmoud Nasr, AVG is: 59" }

```

Stage 6 \$project

```

1 //
2 * specifications: The fields to
3 * include or exclude.
4 */
5 {
6   information: 1,
7   _id: 0,
8 }

```

Output after \$project stage (Sample of 3 documents)

information: "Ahmed Mansour, AVG is: 71"

information: "Mohamed Mostafa, AVG is: 37.5"

information: "Mahmoud Nasr, AVG is: 59"

faculty

facultyForOneStudent

student

studentGradesAvera... ***

sumOfFinalMarksAgg

admin

config

local

_id: ObjectId('64e6210777c6b6b68ea6c8cd')

information: "Ahmed Mansour, AVG is: 71"

_id: ObjectId('64e6210777c6b6b68ea6c8ce')

information: "Mohamed Mostafa, AVG is: 37.5"

_id: ObjectId('64e6210777c6b6b68ea6c8cf')

information: "Mahmoud Nasr, AVG is: 59"

Bonus:

1. In Assignment No.4, Display Student data along with his faculty data (in one Object).
2. Re-implement the relation between Student and faculty, by Adding a list of students in the faculty object using DBRef.
 - Select specific faculty and display the students on it.
3. Retrieve and insert to MongoDB using a C# Desktop / Web application.
4. Install Redis database, and try to insert and select data from it.

<Script>document.write("Thank YOU") </Script>