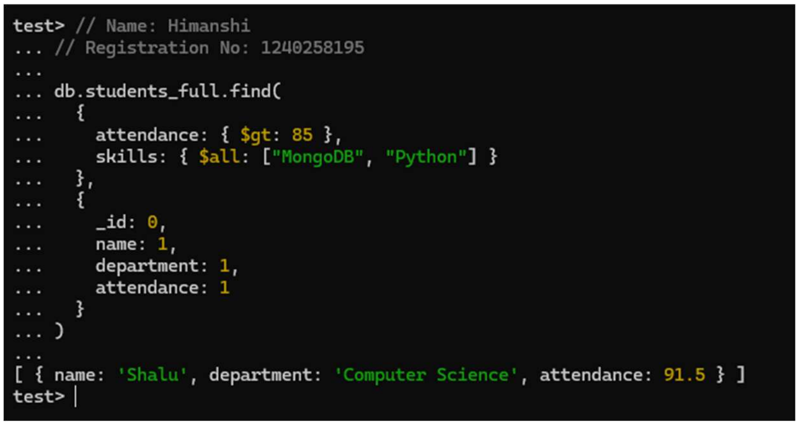
MongoDB Assignment

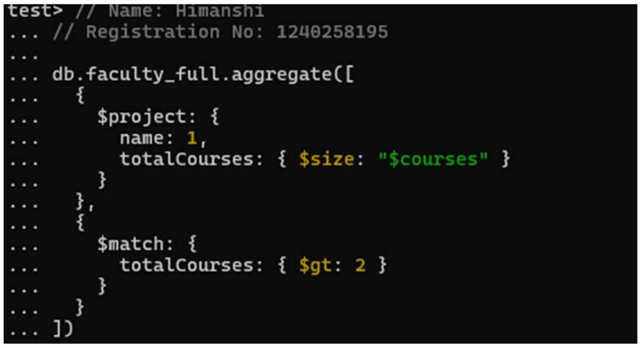
1. Complex Filters & Projections

Q1. List the names and departments of students who have more than 85% attendance and are skilled in both " MongoDB " and " Python ".

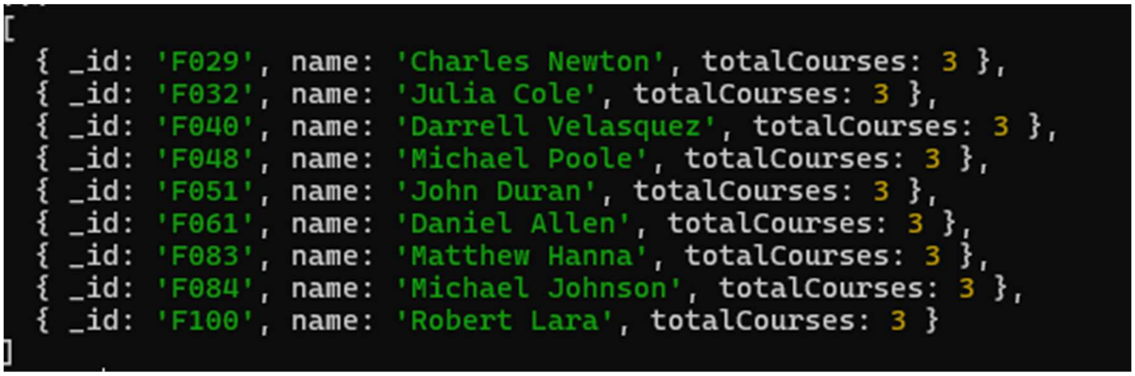


```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.find(
...   {
...     attendance: { $gt: 85 },
...     skills: { $all: ["MongoDB", "Python"] }
...   },
...   {
...     _id: 0,
...     name: 1,
...     department: 1,
...     attendance: 1
...   }
... )
...
[ { name: 'Shalu', department: 'Computer Science', attendance: 91.5 } ]
test> |
```

Q2. Show all faculty who are teaching more than 2 courses. Display their names and the total number of courses they teach.



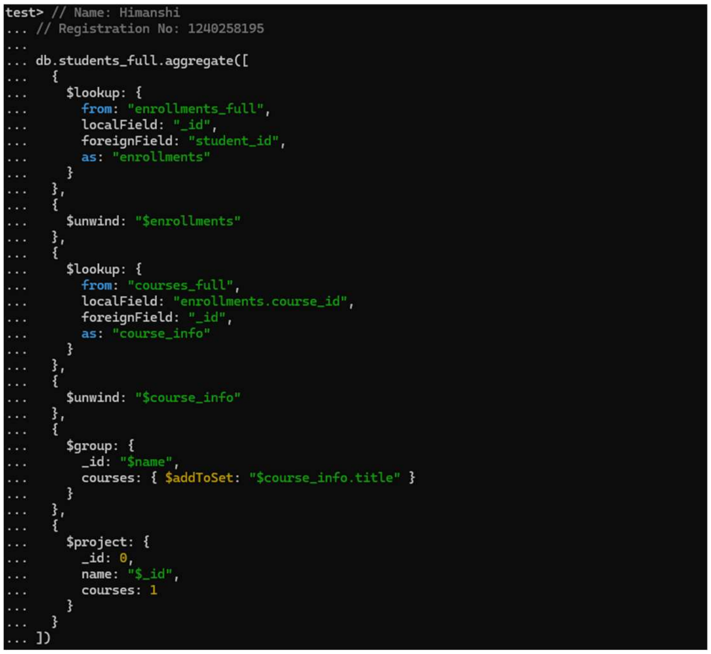
```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.faculty_full.aggregate([
...   {
...     $project: {
...       name: 1,
...       totalCourses: { $size: "$courses" }
...     }
...   },
...   {
...     $match: {
...       totalCourses: { $gt: 2 }
...     }
...   }
... ])
```



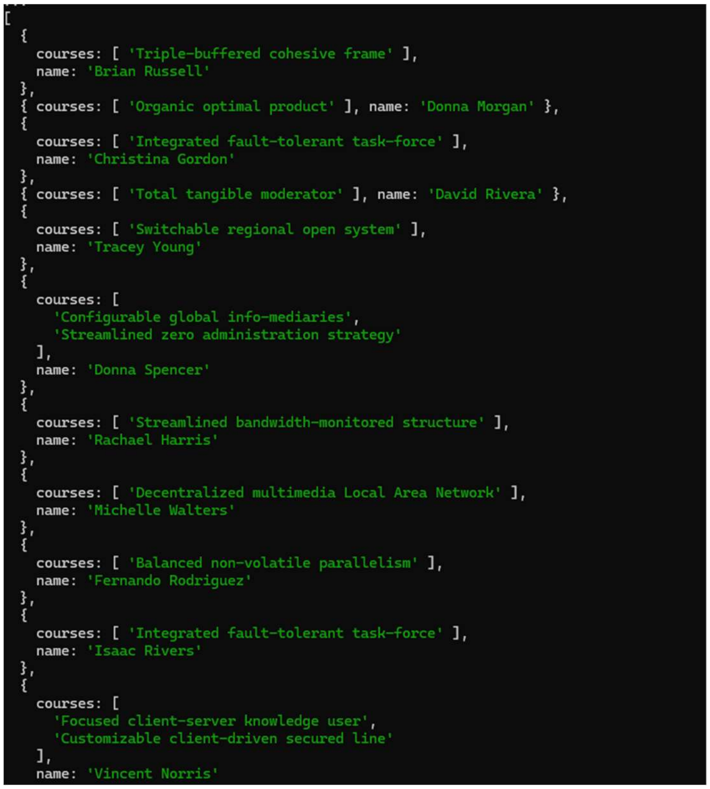
```
[
  { _id: 'F029', name: 'Charles Newton', totalCourses: 3 },
  { _id: 'F032', name: 'Julia Cole', totalCourses: 3 },
  { _id: 'F040', name: 'Darrell Velasquez', totalCourses: 3 },
  { _id: 'F048', name: 'Michael Poole', totalCourses: 3 },
  { _id: 'F051', name: 'John Duran', totalCourses: 3 },
  { _id: 'F061', name: 'Daniel Allen', totalCourses: 3 },
  { _id: 'F083', name: 'Matthew Hanna', totalCourses: 3 },
  { _id: 'F084', name: 'Michael Johnson', totalCourses: 3 },
  { _id: 'F100', name: 'Robert Lara', totalCourses: 3 }
]
```

2. Joins ($lookup) and Aggregations

Q3. Write a query to show each student's name along with the course titles they are enrolled in (use $lookup between enrollments, students, and courses).

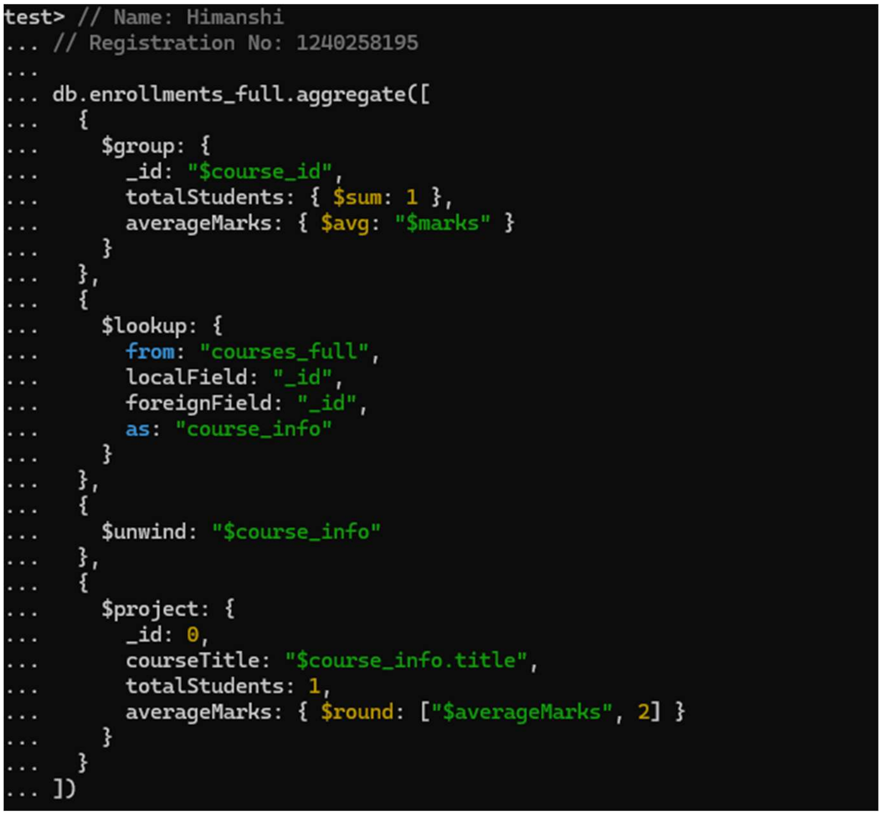


```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.aggregate([
...   {
...     $lookup: {
...       from: "enrollments_full",
...       localField: "_id",
...       foreignField: "student_id",
...       as: "enrollments"
...     }
...   },
...   {
...     $unwind: "$enrollments"
...   },
...   {
...     $lookup: {
...       from: "courses_full",
...       localField: "enrollments.course_id",
...       foreignField: "_id",
...       as: "course_info"
...     }
...   },
...   {
...     $unwind: "$course_info"
...   },
...   {
...     $group: {
...       _id: "$name",
...       courses: { $addToSet: "$course_info.title" }
...     }
...   },
...   {
...     $project: {
...       _id: 0,
...       name: "$_id",
...       courses: 1
...     }
...   }
... ])
```

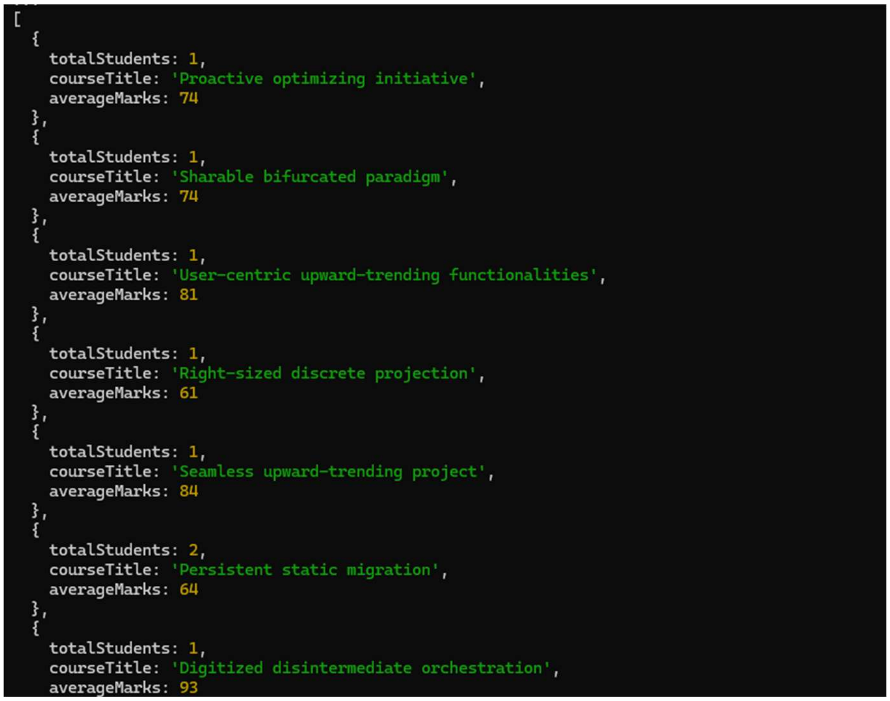


```
...
[
  {
    courses: [ 'Triple-buffered cohesive frame' ],
    name: 'Brian Russell'
  },
  { courses: [ 'Organic optimal product' ], name: 'Donna Morgan' },
  {
    courses: [ 'Integrated fault-tolerant task-force' ],
    name: 'Christina Gordon'
  },
  { courses: [ 'Total tangible moderator' ], name: 'David Rivera' },
  {
    courses: [ 'Switchable regional open system' ],
    name: 'Tracey Young'
  },
  {
    courses: [
      'Configurable global info-mediaries',
      'Streamlined zero administration strategy'
    ],
    name: 'Donna Spencer'
  },
  {
    courses: [ 'Streamlined bandwidth-monitored structure' ],
    name: 'Rachael Harris'
  },
  {
    courses: [ 'Decentralized multimedia Local Area Network' ],
    name: 'Michelle Walters'
  },
  {
    courses: [ 'Balanced non-volatile parallelism' ],
    name: 'Fernando Rodriguez'
  },
  {
    courses: [ 'Integrated fault-tolerant task-force' ],
    name: 'Isaac Rivers'
  },
  {
    courses: [
      'Focused client-server knowledge user',
      'Customizable client-driven secured line'
    ],
    name: 'Vincent Norris'
```

Q4. For each course, display the course title, number of students enrolled, and average marks (use $group).



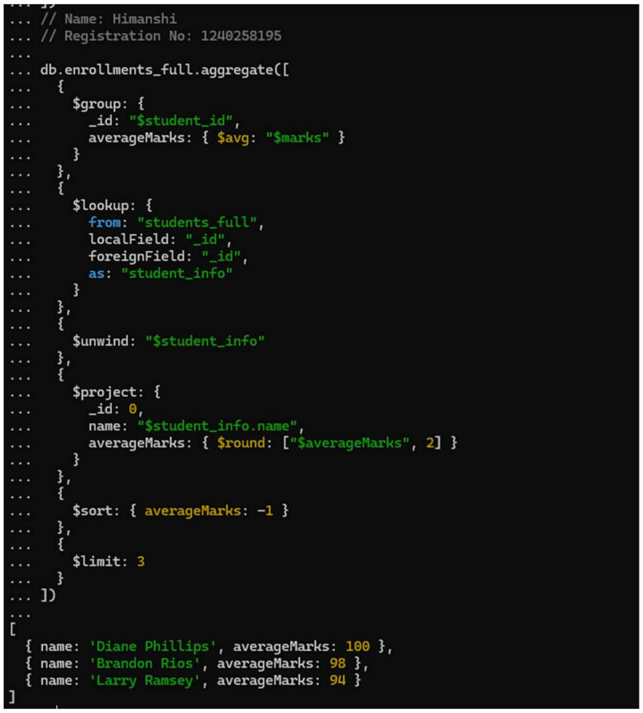
```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.enrollments_full.aggregate([
...   {
...     $group: {
...       _id: "$course_id",
...       totalStudents: { $sum: 1 },
...       averageMarks: { $avg: "$marks" }
...     }
...   },
...   {
...     $lookup: {
...       from: "courses_full",
...       localField: "_id",
...       foreignField: "_id",
...       as: "course_info"
...     }
...   },
...   {
...     $unwind: "$course_info"
...   },
...   {
...     $project: {
...       _id: 0,
...       courseTitle: "$course_info.title",
...       totalStudents: 1,
...       averageMarks: { $round: ["$averageMarks", 2] }
...     }
...   }
... ])
```



```
[
  {
    totalStudents: 1,
    courseTitle: 'Proactive optimizing initiative',
    averageMarks: 74
  },
  {
    totalStudents: 1,
    courseTitle: 'Sharable bifurcated paradigm',
    averageMarks: 74
  },
  {
    totalStudents: 1,
    courseTitle: 'User-centric upward-trending functionalities',
    averageMarks: 81
  },
  {
    totalStudents: 1,
    courseTitle: 'Right-sized discrete projection',
    averageMarks: 61
  },
  {
    totalStudents: 1,
    courseTitle: 'Seamless upward-trending project',
    averageMarks: 84
  },
  {
    totalStudents: 2,
    courseTitle: 'Persistent static migration',
    averageMarks: 64
  },
  {
    totalStudents: 1,
    courseTitle: 'Digitized disintermediate orchestration',
    averageMarks: 93
```

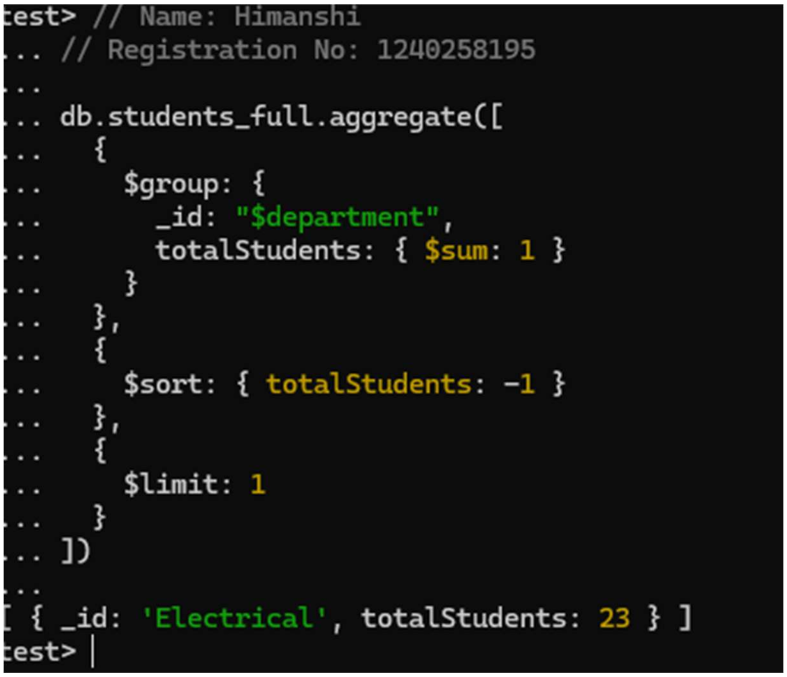
3. Grouping, Sorting, and Limiting

Q5. Find the top 3 students with the highest average marks across all enrolled courses.



```
... // Name: Himanshi
... // Registration No: 1240258195
...
... db.enrollments_full.aggregate([
...   {
...     $group: {
...       _id: "$student_id",
...       averageMarks: { $avg: "$marks" }
...     }
...   },
...   {
...     $lookup: {
...       from: "students_full",
...       localField: "_id",
...       foreignField: "_id",
...       as: "student_info"
...     }
...   },
...   {
...     $unwind: "$student_info"
...   },
...   {
...     $project: {
...       _id: 0,
...       name: "$student_info.name",
...       averageMarks: { $round: ["$averageMarks", 2] }
...     }
...   },
...   {
...     $sort: { averageMarks: -1 }
...   },
...   {
...     $limit: 3
...   }
... ])
...
[
  { name: 'Diane Phillips', averageMarks: 100 },
  { name: 'Brandon Rios', averageMarks: 98 },
  { name: 'Larry Ramsey', averageMarks: 94 }
]
```

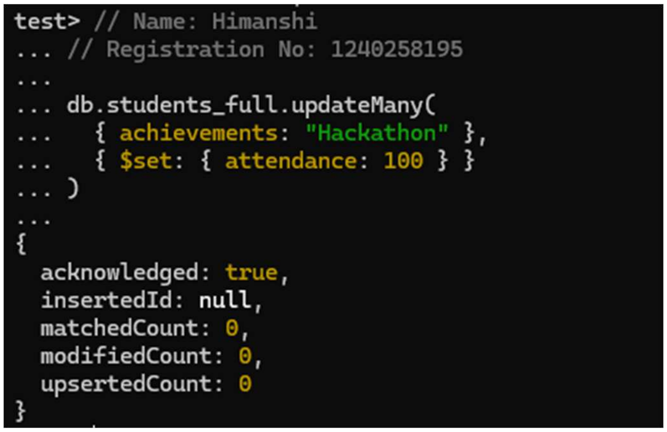
Q6. Count how many students are in each department. Display the department with the highest number of students.



```
est> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.aggregate([
...   {
...     $group: {
...       _id: "$department",
...       totalStudents: { $sum: 1 }
...     }
...   },
...   {
...     $sort: { totalStudents: -1 }
...   },
...   {
...     $limit: 1
...   }
... ])
...
[ { _id: 'Electrical', totalStudents: 23 } ]
est> |
```

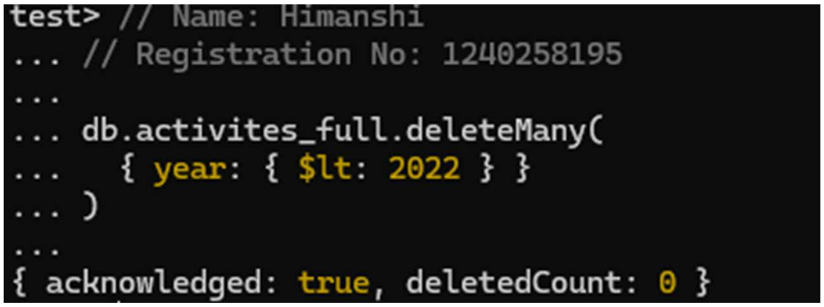
4. Update, Upsert, and Delete

Q7. Update attendance to 100% for all students who won any " Hackathon ".



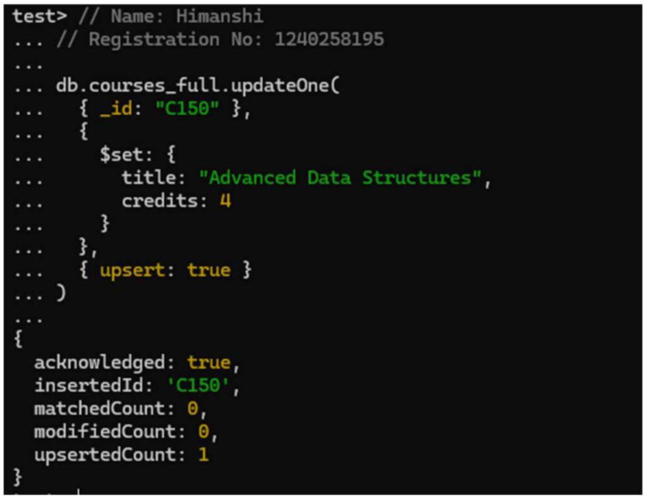
```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.updateMany(
...   { achievements: "Hackathon" },
...   { $set: { attendance: 100 } }
... )
...
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 0,
  modifiedCount: 0,
  upsertedCount: 0
}
```

Q8. Delete all student activity records where the activity year is before 2022.



```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.activites_full.deleteMany(
...   { year: { $lt: 2022 } }
... )
...
{ acknowledged: true, deletedCount: 0 }
```

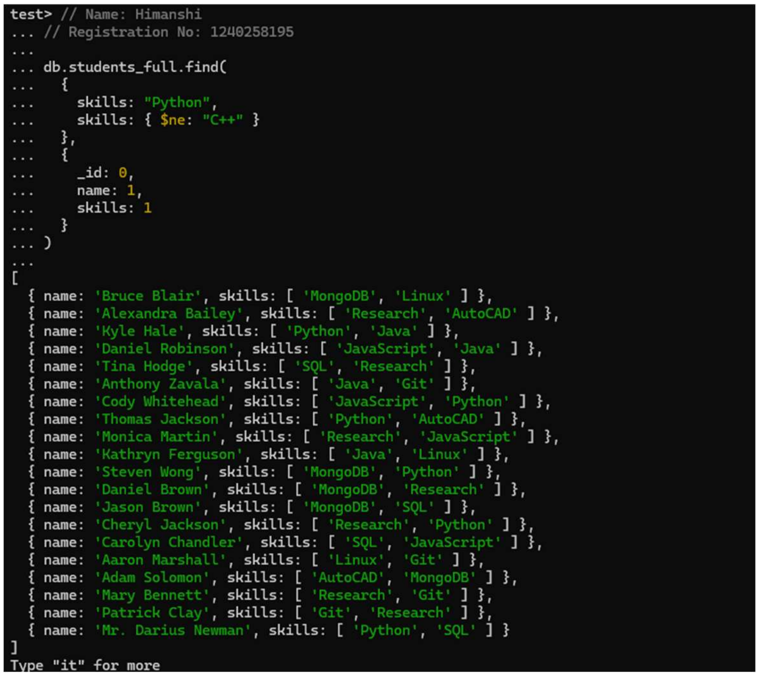
Q9. Upsert a course record for " Data Structures " with ID " C150" and credits 4—if it doesn't exist, insert it; otherwise update its title to " Advanced Data Structures



```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.courses_full.updateOne(
...   { _id: "C150" },
...   {
...     $set: {
...       title: "Advanced Data Structures",
...       credits: 4
...     }
...   },
...   { upsert: true }
... )
...
{
  acknowledged: true,
  insertedId: 'C150',
  matchedCount: 0,
  modifiedCount: 0,
  upsertedCount: 1
}
```

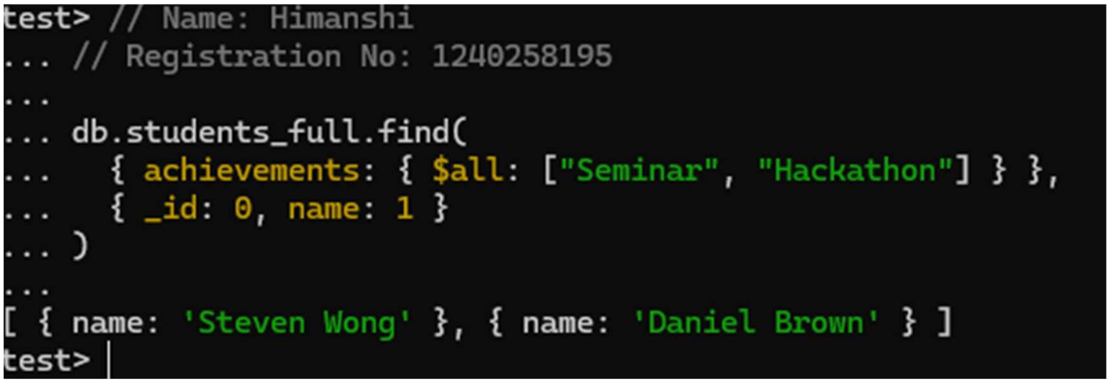
5. Array & Operator Usage

Q10. Find all students who have " Python " as a skill but not " C++".



```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.find(
...   {
...     skills: "Python",
...     skills: { $ne: "C++" }
...   },
...   {
...     _id: 0,
...     name: 1,
...     skills: 1
...   }
... )
...
[
  { name: 'Bruce Blair', skills: [ 'MongoDB', 'Linux' ] },
  { name: 'Alexandra Bailey', skills: [ 'Research', 'AutoCAD' ] },
  { name: 'Kyle Hale', skills: [ 'Python', 'Java' ] },
  { name: 'Daniel Robinson', skills: [ 'JavaScript', 'Java' ] },
  { name: 'Tina Hodge', skills: [ 'SQL', 'Research' ] },
  { name: 'Anthony Zavala', skills: [ 'Java', 'Git' ] },
  { name: 'Cody Whitehead', skills: [ 'JavaScript', 'Python' ] },
  { name: 'Thomas Jackson', skills: [ 'Python', 'AutoCAD' ] },
  { name: 'Monica Martin', skills: [ 'Research', 'JavaScript' ] },
  { name: 'Kathryn Ferguson', skills: [ 'Java', 'Linux' ] },
  { name: 'Steven Wong', skills: [ 'MongoDB', 'Python' ] },
  { name: 'Daniel Brown', skills: [ 'MongoDB', 'Research' ] },
  { name: 'Jason Brown', skills: [ 'MongoDB', 'SQL' ] },
  { name: 'Cheryl Jackson', skills: [ 'Research', 'Python' ] },
  { name: 'Carolyn Chandler', skills: [ 'SQL', 'JavaScript' ] },
  { name: 'Aaron Marshall', skills: [ 'Linux', 'Git' ] },
  { name: 'Adam Solomon', skills: [ 'AutoCAD', 'MongoDB' ] },
  { name: 'Mary Bennett', skills: [ 'Research', 'Git' ] },
  { name: 'Patrick Clay', skills: [ 'Git', 'Research' ] },
  { name: 'Mr. Darius Newman', skills: [ 'Python', 'SQL' ] }
]
Type "it" for more
```

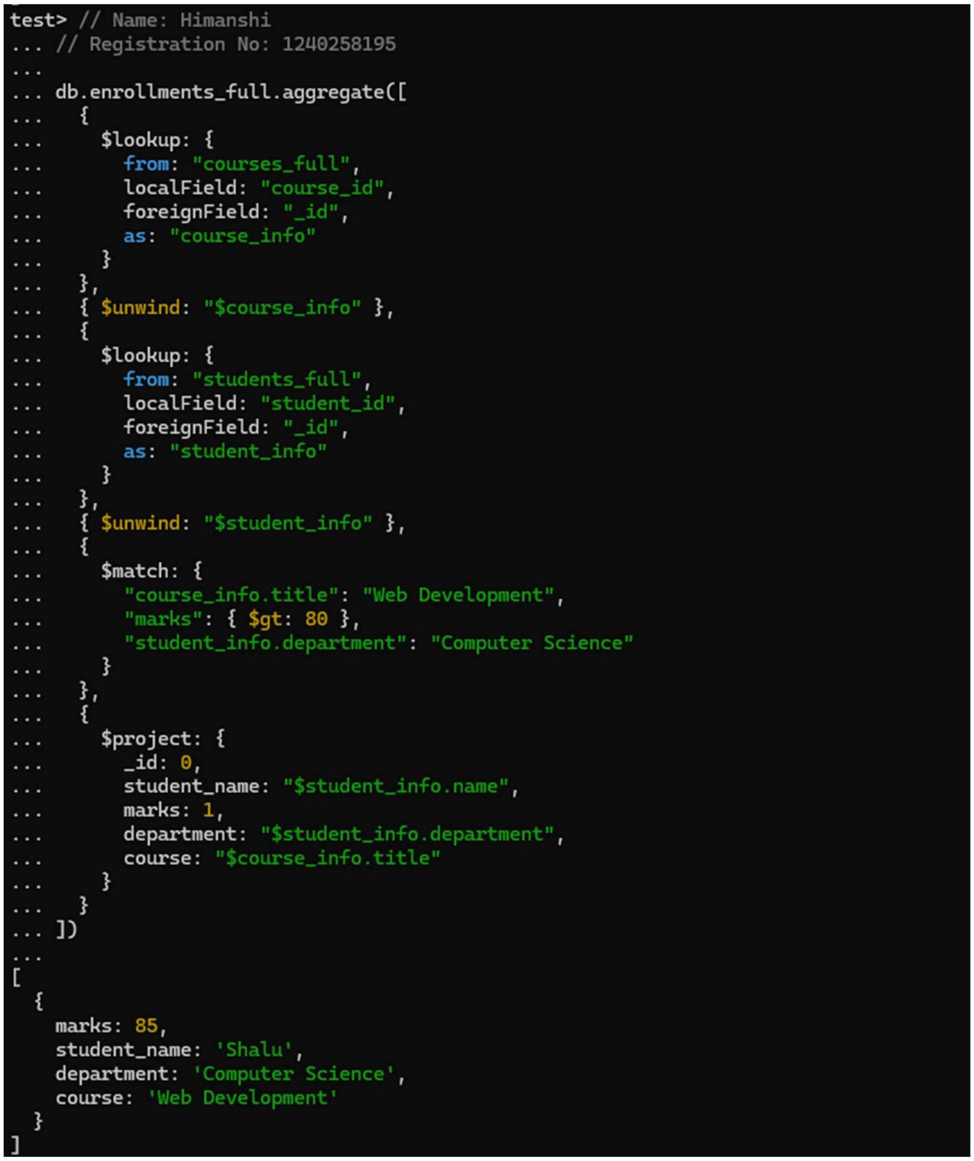
Q11. Return names of students who participated in "Seminar" and "Hackathon" both.



```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.find(
...   { achievements: { $all: ["Seminar", "Hackathon"] } },
...   { _id: 0, name: 1 }
... )
...
[ { name: 'Steven Wong' }, { name: 'Daniel Brown' } ]
test> |
```

6. Subdocuments and Nested Conditions

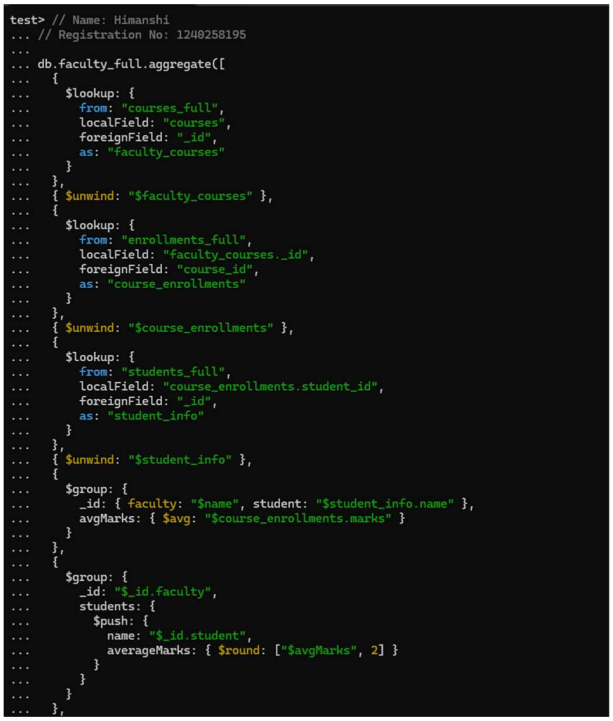
Q12. Find students who scored more than 80 in " Web Development " **only if** they belong to the " Computer Science " department.



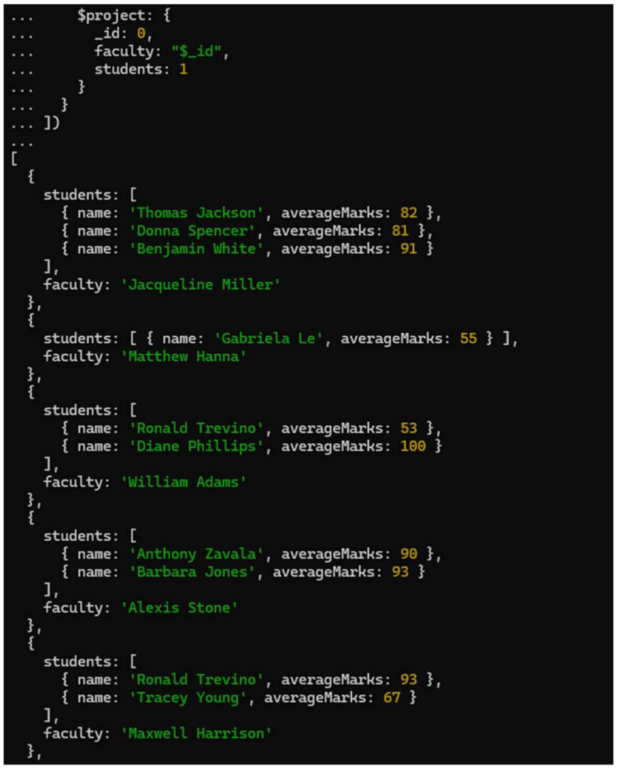
```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.enrollments_full.aggregate([
...   {
...     $lookup: {
...       from: "courses_full",
...       localField: "course_id",
...       foreignField: "_id",
...       as: "course_info"
...     }
...   },
...   { $unwind: "$course_info" },
...   {
...     $lookup: {
...       from: "students_full",
...       localField: "student_id",
...       foreignField: "_id",
...       as: "student_info"
...     }
...   },
...   { $unwind: "$student_info" },
...   {
...     $match: {
...       "course_info.title": "Web Development",
...       "marks": { $gt: 80 },
...       "student_info.department": "Computer Science"
...     }
...   },
...   {
...     $project: {
...       _id: 0,
...       student_name: "$student_info.name",
...       marks: 1,
...       department: "$student_info.department",
...       course: "$course_info.title"
...     }
...   }
... ])
...
[
  {
    marks: 85,
    student_name: 'Shalu',
    department: 'Computer Science',
    course: 'Web Development'
  }
]
```

7. Advanced Aggregation (Challenge Level)

Q13. For each faculty member, list the names of all students enrolled in their courses along with average marks per student per faculty.

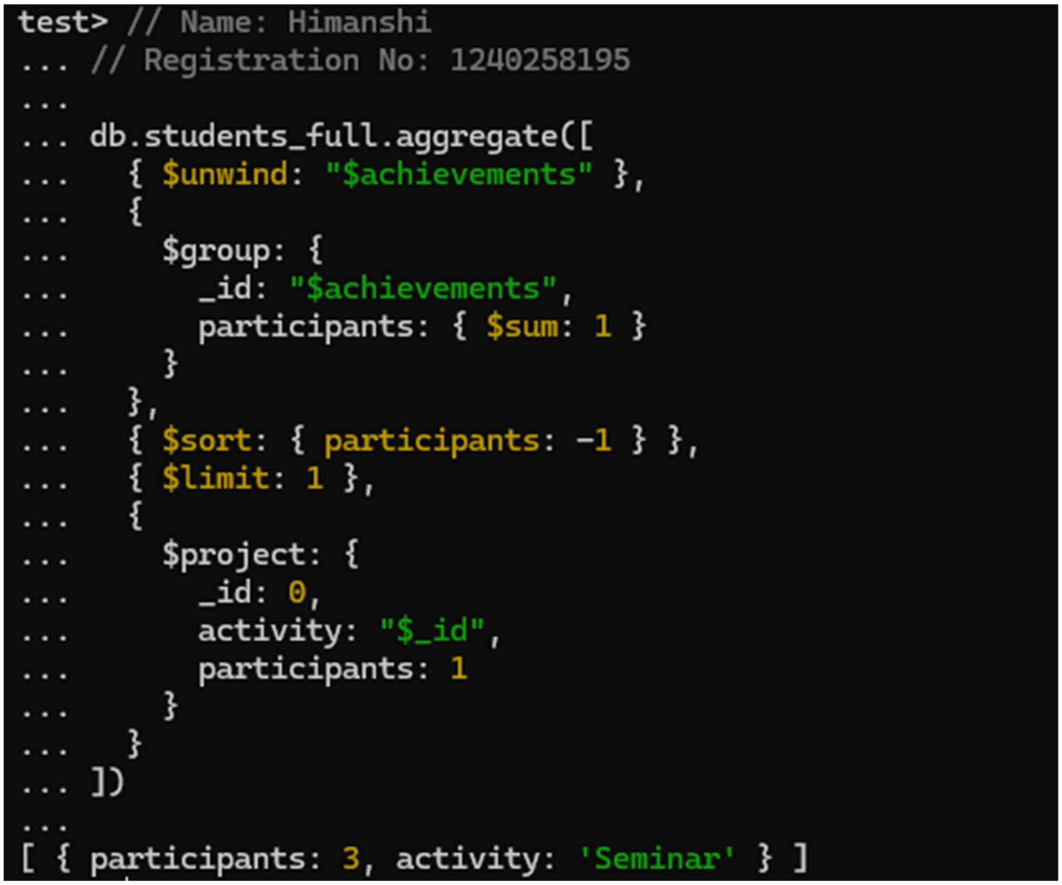


```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.faculty_full.aggregate([
...   {
...     $lookup: {
...       from: "courses_full",
...       localField: "courses",
...       foreignField: "_id",
...       as: "faculty_courses"
...     }
...   },
...   { $unwind: "$faculty_courses" },
...   {
...     $lookup: {
...       from: "enrollments_full",
...       localField: "faculty_courses._id",
...       foreignField: "course_id",
...       as: "course_enrollments"
...     }
...   },
...   { $unwind: "$course_enrollments" },
...   {
...     $lookup: {
...       from: "students_full",
...       localField: "course_enrollments.student_id",
...       foreignField: "_id",
...       as: "student_info"
...     }
...   },
...   { $unwind: "$student_info" },
...   {
...     $group: {
...       _id: { faculty: "$name", student: "$student_info.name" },
...       avgMarks: { $avg: "$course_enrollments.marks" }
...     }
...   },
...   {
...     $group: {
...       _id: "$_id.faculty",
...       students: {
...         $push: {
...           name: "$_id.student",
...           averageMarks: { $round: ["$avgMarks", 2] }
...         }
...       }
...     }
...   },
```



```
...     $project: {
...       _id: 0,
...       faculty: "$_id",
...       students: 1
...     }
...   }
... ])
...
[
  {
    students: [
      { name: 'Thomas Jackson', averageMarks: 82 },
      { name: 'Donna Spencer', averageMarks: 81 },
      { name: 'Benjamin White', averageMarks: 91 }
    ],
    faculty: 'Jacqueline Miller'
  },
  {
    students: [ { name: 'Gabriela Le', averageMarks: 55 } ],
    faculty: 'Matthew Hanna'
  },
  {
    students: [
      { name: 'Ronald Trevino', averageMarks: 53 },
      { name: 'Diane Phillips', averageMarks: 100 }
    ],
    faculty: 'William Adams'
  },
  {
    students: [
      { name: 'Anthony Zavala', averageMarks: 90 },
      { name: 'Barbara Jones', averageMarks: 93 }
    ],
    faculty: 'Alexis Stone'
  },
  {
    students: [
      { name: 'Ronald Trevino', averageMarks: 93 },
      { name: 'Tracey Young', averageMarks: 67 }
    ],
    faculty: 'Maxwell Harrison'
  },
```

Q14. Show the most popular activity type (e.g., Hackathon, Seminar, etc.) by number of student participants.



```
test> // Name: Himanshi
... // Registration No: 1240258195
...
... db.students_full.aggregate([
...   { $unwind: "$achievements" },
...   {
...     $group: {
...       _id: "$achievements",
...       participants: { $sum: 1 }
...     }
...   },
...   { $sort: { participants: -1 } },
...   { $limit: 1 },
...   {
...     $project: {
...       _id: 0,
...       activity: "$_id",
...       participants: 1
...     }
...   }
... ])
...
[ { participants: 3, activity: 'Seminar' } ]
```