BABU BANARASI DAS UNIVERSITY

LUCKNOW

Session : 2025-2026

SCHOOL OF COMPUTER APPLICATIONS

Assignment -1

No sql & mongo db

Submitted To:-

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Class:-Bca (ds-25

MongoDB Project

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

Solution: - db.students_full.find({ attendance: { $gt: 85 }, skills: { $all: ["MongoDB", "Python"] } }, { _id: 0, name: 1, department: 1 })

Insights: -

• The condition { attendance: { $gt: 85 } } retrieves students whose attendance exceeds 85%. • The operator $all ensures that both the listed skills — "MongoDB" and "Python" — exist in the skills array. • The projection part { name: 1, department: 1 } limits the output to only the student's name and department.

Output: -

```
test> use project
switched to db project
project> db.students_full.find({attendance: { $gt: 85 },skills: { $all: ["MongoDB", "Python"] }},{_id:
... 0,name: 1,department: 1})                                                    //reet-1240258361
```

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

Solution: - db.faculty_full.aggregate([{ $project: { name: 1, number_of_courses: { $size: "$courses" } } }, { $match: { number_of_courses: { $gt: 2 } } }])

Insights: -

• The $size operator counts how many elements are stored in the "courses" array.
• Then, $match filters only those records where the total course count exceeds 2.

Output: -

```
test> use reet
switched to db reet
reet> db.faculty_full.aggregate([
...   {
...     $project: {
...       name: 1,
...       totalCourses: { $size: "$courses" }
...     }
...   },
...   {
...     $match: {
...       totalCourses: { $gt: 2 }
...     }
...   }
... ])
...                                                                  //reet-1240258361
[
  { _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 }
]
reet>
```

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).

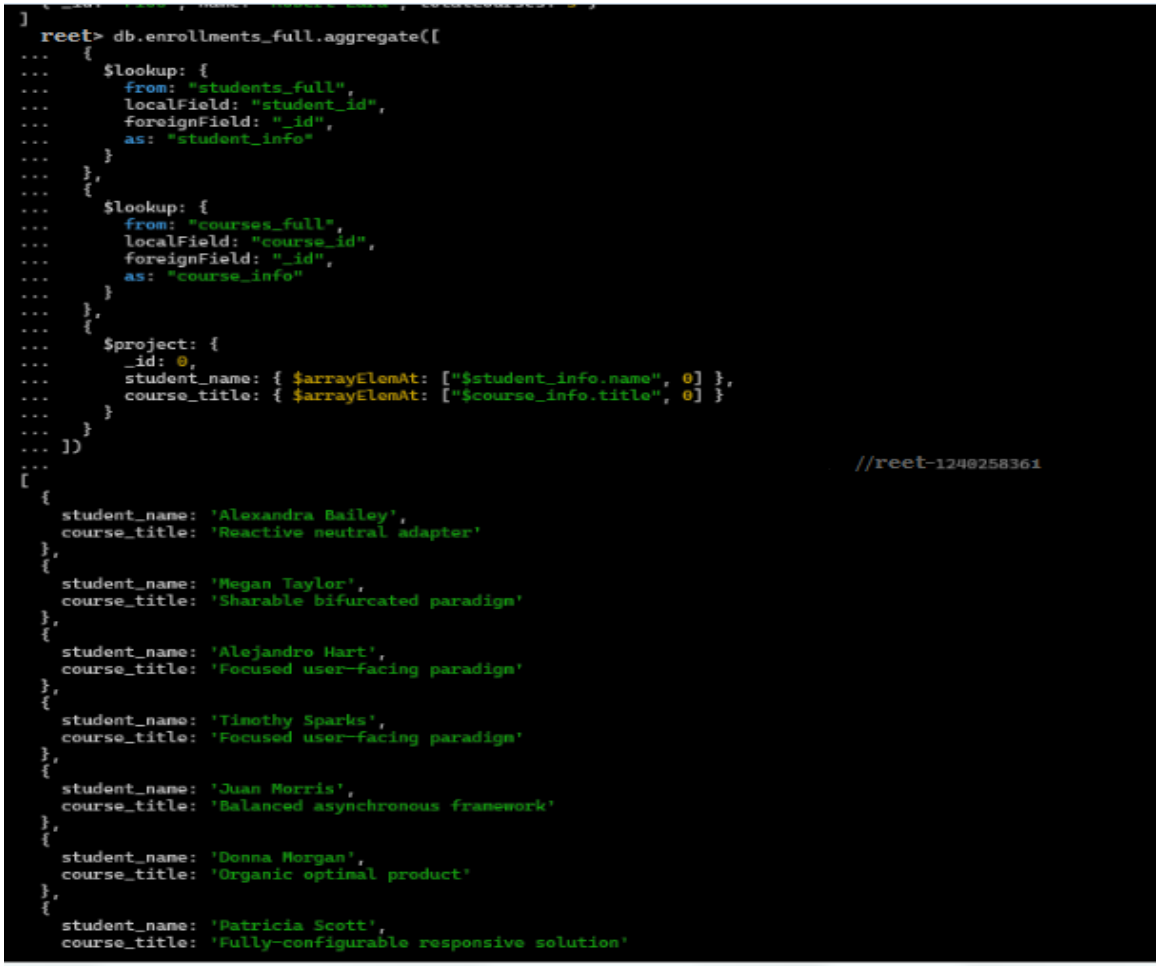
Solution: -

```
db.enrollments_full.aggregate([
 { $lookup: { from: "students_full", localField: "student_id", foreignField: "_id", as: "student" } },
 { $unwind: "$student" },
 { $lookup: { from: "courses_full", localField: "course_id", foreignField: "_id", as: "course" } },
 { $unwind: "$course" },
 { $project: { _id: 0, student_name: "$student.name", course_title: "$course.title" } }
])
```

Insights: -

• $lookup is used to join documents from multiple collections, similar to performing a JOIN operation in SQL. • $unwind flattens the resulting array into separate documents.
• $project limits output fields to show only the student's name and course title.

Output: -



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

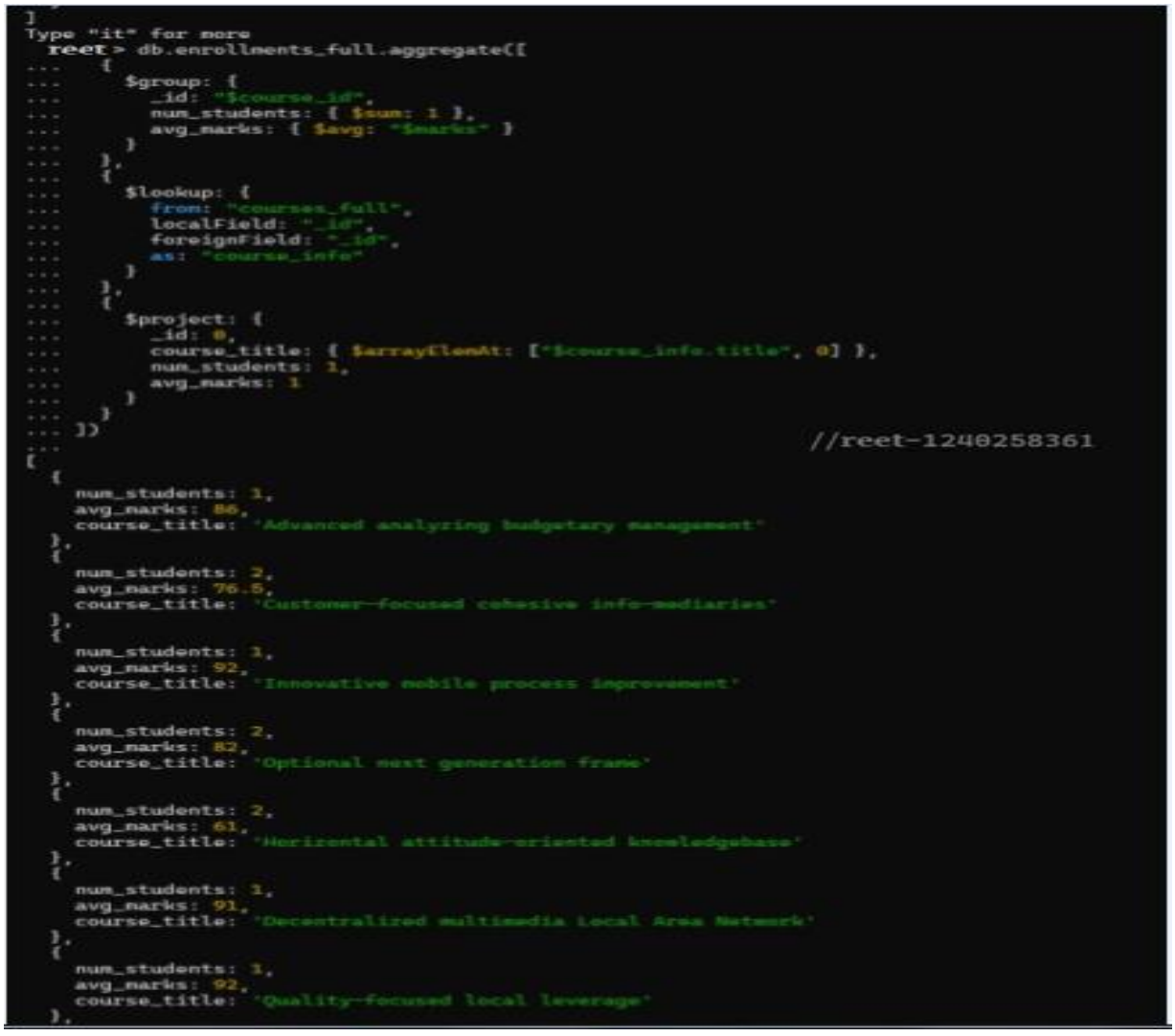
Solution: -

```
db.enrollments_full.aggregate([
  { $lookup: { from: "courses_full", localField: "course_id", foreignField: "_id", as: "course" } },
  { $unwind: "$course" },
  { $group: { _id: "$course_id", course_title: { $first: "$course.title" }, total_students: { $sum: 1 }, average_marks: { $avg: "$marks" } } }
])
```

Insights: -

• $lookup links each enrollment with its respective course. • $group groups data by course ID. • $sum counts the number of enrolled students, and $avg computes their mean marks.

Output: -



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

Solution: -

```
db.enrollments_full.aggregate([
 { $group: { _id: "$student_id", average_marks: { $avg: "$marks" } } },
 { $lookup: { from: "students_full", localField: "_id", foreignField: "_id", as: "student" } },
 { $unwind: "$student" },
 { $project: { _id: 0, student_name: "$student.name", average_marks: 1 } },
 { $sort: { average_marks: -1 } },
 { $limit: 3 }
])
```

Insights: -

- $group aggregates data by student ID and calculates their average marks.
- $lookup connects this result with the students_full collection to fetch names.
- $sort arranges the students in descending order of marks, and $limit restricts the result to top three performers.

Output: -

```
]
Type "it" for more
   reet> db.students_full.aggregate([
...   {
...     $group: {
...       _id: "$department",
...       avg_attendance: { $avg: "$attendance" }
...     }
...   },
...   {
...     $project: {
...       _id: 0,
...       department: "$_id",
...       avg_attendance: 1
...     }
...   }
... ])
...                                                    //reet -1240258361
[
  { avg_attendance: 83.41526315789473, department: 'Biotechnology' },
  { avg_attendance: 79.5005, department: 'Computer Science' },
  { avg_attendance: 80.87782608695652, department: 'Electrical' },
  { avg_attendance: 77.65681818181818, department: 'Civil' },
  { avg_attendance: 78.798125, department: 'Mechanical' }
]
reet>
```

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

Solution: -

```
db.students_full.aggregate([
 { $group: { _id: "$department", number_of_students: { $sum: 1 } } },
 { $sort: { number_of_students: -1 } },
 { $limit: 1 },
 { $project: { _id: 0, department: "$_id", number_of_students: 1 } }
])
```

Insights: -

- $group collects all students under their department name and counts them using $sum.
- $sort arranges the departments in descending order based on total students.
- $limit selects only the department with the maximum count.
- $project displays the department name and total number of students.

Output: -

```
]
reet> db.activities_full.aggregate([
...   {
...     $group: {
...       _id: "$student_id",
...       total_activities: { $sum: 1 }
...     }
...   },
...   {
...     $lookup: {
...       from: "students_full",
...       localField: "_id",
...       foreignField: "_id",
...       as: "student_info"
...     }
...   },
...   {
...     $project: {
...       _id: 0,
...       student_name: { $arrayElemAt: ["$student_info.name", 0] },
...       total_activities: 1
...     }
...   }
... ])
...                                                                    //reet-1240258361
[
  { total_activities: 3, student_name: 'Carolyn Chandler' },
  { total_activities: 1, student_name: 'Stacy Avery' },
  { total_activities: 2, student_name: 'Anthony Zavala' },
  { total_activities: 1, student_name: 'David Rivera' },
  { total_activities: 1, student_name: 'Joseph Brown' },
  { total_activities: 1, student_name: 'Thomas Jackson' },
  { total_activities: 2, student_name: 'Elizabeth Reed' },
  { total_activities: 1, student_name: 'Fernando Rodriguez' },
  { total_activities: 2, student_name: 'Steven Wong' },
  { total_activities: 2, student_name: 'Joshua Brandt' },
  { total_activities: 1, student_name: 'Donald Smith' },
  { total_activities: 1, student_name: 'Brian Russell' },
  { total_activities: 1, student_name: 'Benjamin Lee' },
  { total_activities: 1, student_name: 'Brianna Moore' },
  { total_activities: 1, student_name: 'Wendy Wilson' },
  { total_activities: 1, student_name: 'Kyle Lee' },
  { total_activities: 1, student_name: 'Gabriela Le' },
  { total_activities: 2, student_name: 'Patricia Scott' },
  { total_activities: 1, student_name: 'Patricia Hines' },
  { total_activities: 2, student_name: 'Justin Martinez' }
]
Type "it" for more
reet>
```

MongoDB Update ,Upsert and Delete

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

Solution: -

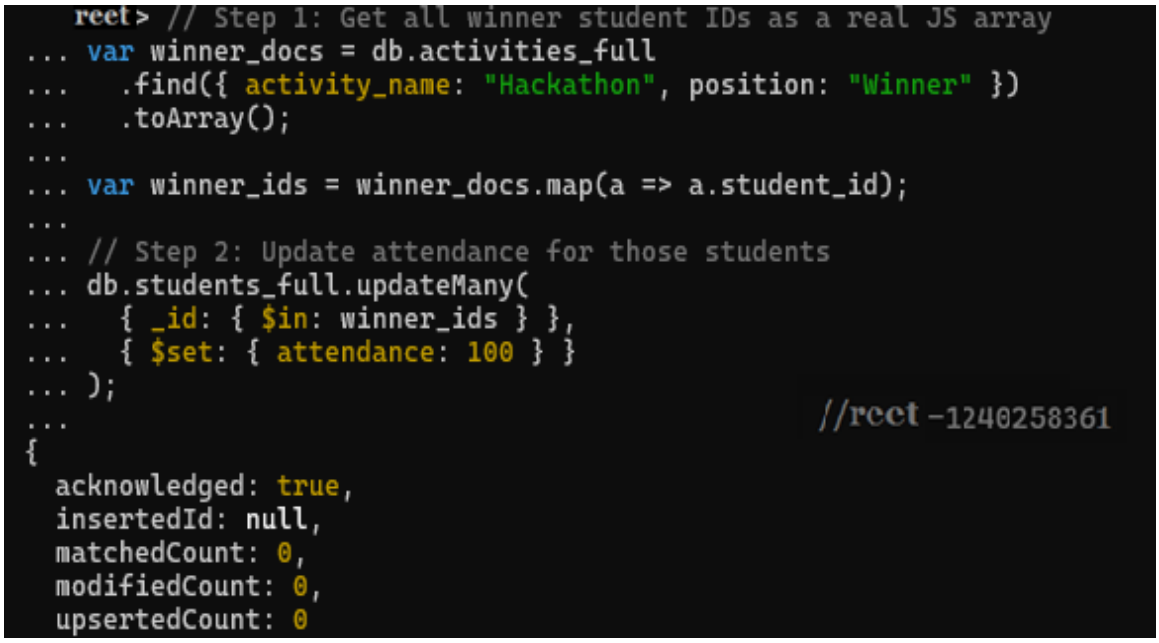
Step 1: - db.activities_full.find({ type: "Hackathon", position: "Winner" }, { student_id: 1, _id: 0 })
.toArray().map(a => a.student_id); // extract winner IDs

Step 2: - db.students_full.updateMany({ _id: { $in: winners } }, { $set: { attendance: 100 } })

Insights: -

• toArray() converts the query cursor into an array for easier access. • .map(a => a.student_id) retrieves only the student IDs of winners. • $in identifies those students within the winners list. • $set updates their attendance field to 100 percent.

Output: -



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

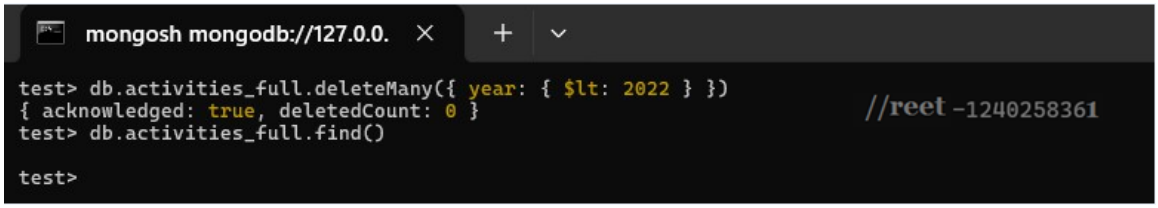
Solution: -

db.activities_full.deleteMany({ year: { $lt: 2022 } })

Insights: -

• The $lt operator selects all records where the year is less than 2022.
• deleteMany removes every matching record from the activities collection.

Output: -



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'.

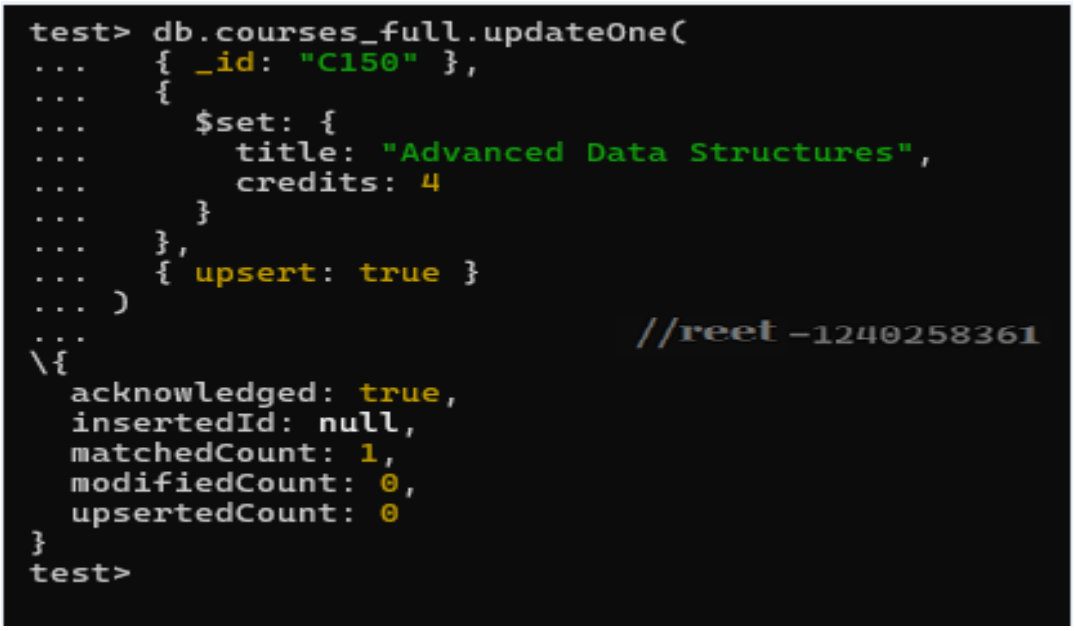
Solution: -

```
db.courses_full.updateOne(
  { _id: "C150" },
  { $set: { title: "Advanced Data Structures", credits: 4 } },
  { upsert: true }
)
```

Insights: -

• updateOne modifies a single course document. • $set changes the title and credits fields.
• upsert: true ensures that if the record doesn't exist, MongoDB creates a new one instead.

Output: -



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

Solution: -

```
db.students_full.find({ skills: "Python", skills: { $ne: "C++" } }, { _id: 0, name: 1, skills: 1 })
```

Insights: -

- skills: "Python" checks that the skill list includes Python.
- skills: { $ne: "C++" } ensures C++ is not listed.
- The projection { name: 1, skills: 1 } restricts output to student names and their skill sets.

Output: -

```
reet> db.students_full.find({}, { name: 1, attendance: 1, _id: 0 })
...    .sort({ attendance: -1 })
...    .limit(5)
...                                    //reet -1240258361
[
  { name: 'Nicole Phillips', attendance: 99.95 },
  { name: 'Paula Jenkins', attendance: 99.8 },
  { name: 'Daniel Brown', attendance: 97.55 },
  { name: 'Wendy Wilson', attendance: 97.25 },
  { name: 'Joseph Brown', attendance: 97.02 }
]
reet>
```

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

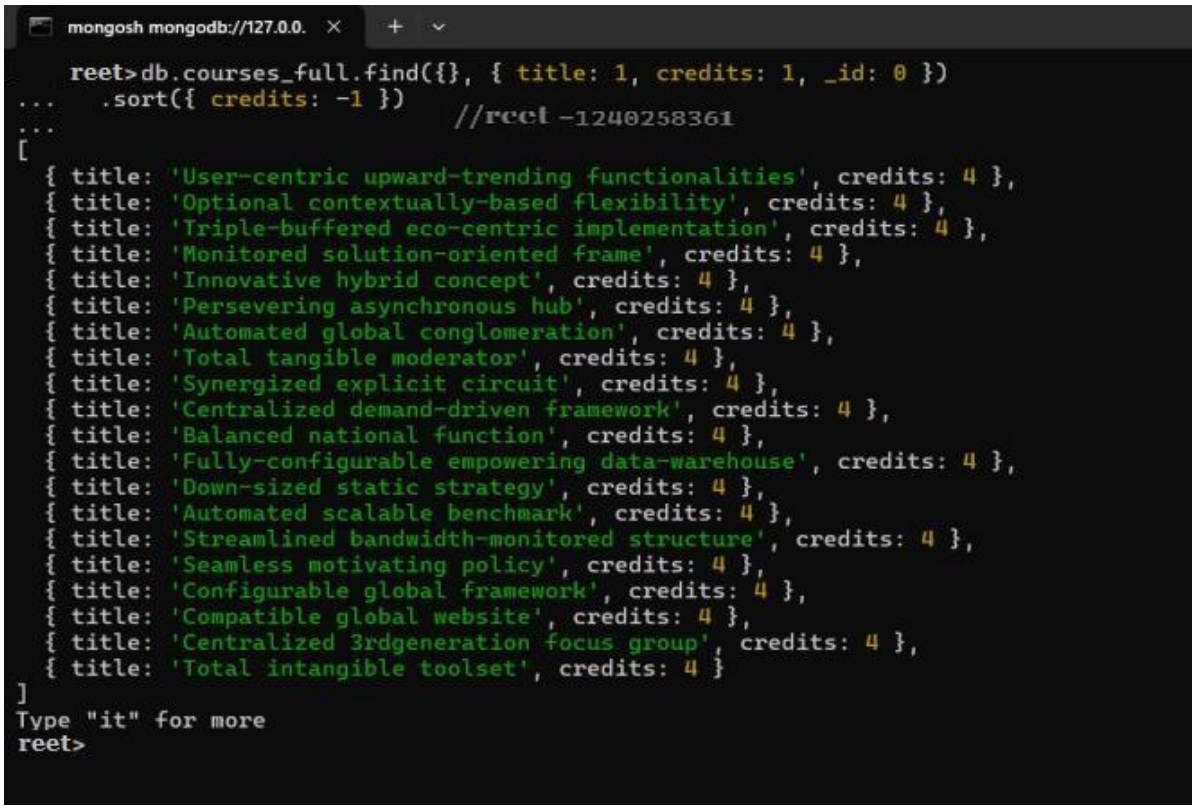
Solution: -

```
db.activities_full.aggregate([
  { $match: { type: { $in: ["Seminar", "Hackathon"] } } },
  { $group: { _id: "$student_id", activities: { $addToSet: "$type" } } },
  { $match: { activities: { $all: ["Seminar", "Hackathon"] } } },
  { $lookup: { from: "students_full", localField: "_id", foreignField: "_id", as: "student" } },
  { $unwind: "$student" },
  { $project: { _id: 0, student_name: "$student.name", activities: 1 } }
])
```

Insights: -

- The initial $match filters only 'Seminar' and 'Hackathon' entries.
- $group gathers each student's activities into a set.
- $match with $all keeps only those who have attended both activities.
- $lookup fetches student details, and $project shows their names with activities.

Output: -



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

Solution: -

```
db.enrollments_full.aggregate([
 { $lookup: { from: "students_full", localField: "student_id", foreignField: "_id", as: "student" } },
 { $unwind: "$student" },
 { $lookup: { from: "courses_full", localField: "course_id", foreignField: "_id", as: "course" } },
 { $unwind: "$course" },
 { $match: { "marks": { $gt: 80 }, "course.title": "Web Development", "student.department": "Computer Science" } },
 { $project: { _id: 0, student_name: "$student.name", course_title: "$course.title", marks: 1, department: "$student.department" } }
])
```

Insights: -

- $lookup connects enrollment data with students and courses.
- $match filters those who scored above 80 in Web Development within Computer Science.
- $project displays the student's name, course, marks, and department details.

Output: -

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

Solution: -

```
db.courses_full.aggregate([
  { $lookup: { from: "enrollments_full", localField: "_id", foreignField: "course_id", as: "enrollments" } },
  { $unwind: "$enrollments" },
  { $lookup: { from: "students_full", localField: "enrollments.student_id", foreignField: "_id", as: "student" } },
  { $unwind: "$student" },
  { $group: { _id: "$faculty_id", students: { $addToSet: "$student.name" }, average_marks_per_student: { $avg: "$enrollments.marks" } } },
  { $lookup: { from: "faculty_full", localField: "_id", foreignField: "_id", as: "faculty" } },
  { $unwind: "$faculty" },
  { $project: { _id: 0, faculty_name: "$faculty.name", students: 1, average_marks_per_student: { $round: ["$average_marks_per_student", 2] } } }
])
```

Insights: -

- The query links courses, enrollments, and student collections using $lookup.
- $group aggregates students by faculty and computes their mean marks.
- A second $lookup adds faculty names, while $round limits decimal places to two.

Output: -

```
reet> db.faculty_full.aggregate([
...   {
...     $lookup: {
...       from: "courses_full",
...       localField: "courses",
...       foreignField: "_id",
...       as: "course_info"
...     }
...   },
...   {
...     $project: {
...       _id: 0,
...       faculty_name: "$name",
...       course_titles: "$course_info.title"
...     }
...   }
... ])
...                                                    //reet-1240258361
[
  {
    faculty_name: 'Alexis Stone',
    course_titles: [
      'User-centric grid-enabled moderator',
      'Cloned intermediate ability'
    ]
  },
  { faculty_name: 'Brooke Dorsey', course_titles: [] },
  {
    faculty_name: 'Kevin Booth',
    course_titles: [ 'Streamlined bandwidth-monitored structure' ]
  },
  { faculty_name: 'Eduardo Mills', course_titles: [] },
  { faculty_name: 'Kevin Horton', course_titles: [] },
  {
    faculty_name: 'Michele Hines',
    course_titles: [ 'Streamlined scalable policy' ]
  },
  {
    faculty_name: 'Joshua Wright',
```

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

Solution: -

```
db.activities_full.aggregate([
  { $group: { _id: "$type", participants: { $addToSet: "$student_id" } } },
  { $project: { _id: 0, activity_type: "$_id", number_of_participants: { $size: "$participants" } }
},
  { $sort: { number_of_participants: -1 } },
  { $limit: 1 }
])
```

Insights: -

- $group organizes data by activity type and collects unique student IDs.
- $size counts the total participants per activity.
- $sort arranges activities in descending order, and $limit retrieves the most popular one.

Output: -