
University Management System

We'll track **students**, **courses**, and **enrollments**.

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1. Database & Collections Setup

```
use universityDB

// Students Collection
db.students.insertMany([
  { _id: 1, name: "Rahul Sharma", age: 21, email: "rahul@example.com", city:
"Bangalore" },
  { _id: 2, name: "Priya Singh", age: 22, email: "priya@example.com", city: "Delhi" },
  { _id: 3, name: "Aman Kumar", age: 20, email: "aman@example.com", city: "Hyderabad"
},
  { _id: 4, name: "Sneha Reddy", age: 23, email: "sneha@example.com", city: "Chennai"
}
]);

// Courses Collection
db.courses.insertMany([
  { _id: 101, title: "Database Systems", department: "CS", credits: 4 },
  { _id: 102, title: "Data Structures", department: "CS", credits: 3 },
  { _id: 103, title: "Economics 101", department: "Economics", credits: 2 },
  { _id: 104, title: "Operating Systems", department: "CS", credits: 4 }
]);

// Enrollments Collection (student_id references students, course_id references
courses)
db.enrollments.insertMany([
  { student_id: 1, course_id: 101, grade: "A" },
  { student_id: 1, course_id: 103, grade: "B" },
  { student_id: 2, course_id: 101, grade: "A" },
  { student_id: 3, course_id: 102, grade: "C" },
  { student_id: 4, course_id: 104, grade: "B" }
]);
```

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2. Exercises

CRUD Basics

1. Insert a new student into the `students` collection.
2. Find all students from Delhi.
3. Update Aman Kumar's email.
4. Delete the student "Sneha Reddy".

Indexing

5. Create a unique index on student `email`.

6. Create a compound index on `department` and `credits` in `courses`.
7. Verify indexes using `getIndexes()`.
8. Write a query on `courses` that benefits from the compound index.
9. Write a query that causes a **COLLSCAN** instead of using the index.

Aggregation Framework

10. Find the number of students enrolled in each course (`$group`).
11. Find the average age of students per city.
12. Find the highest credit course in the `CS` department.
13. Show all enrollments with student names (using `$lookup`).
14. Show all students with the list of courses they enrolled in (nested `$lookup`).
15. Count how many students got grade `"A"`.
