Experiment – 7: MongoDB

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D.O.P.	
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Sign and Grade	

1) **Aim:** To study CRUD operations in MongoDB
2) **Problem Statement:**

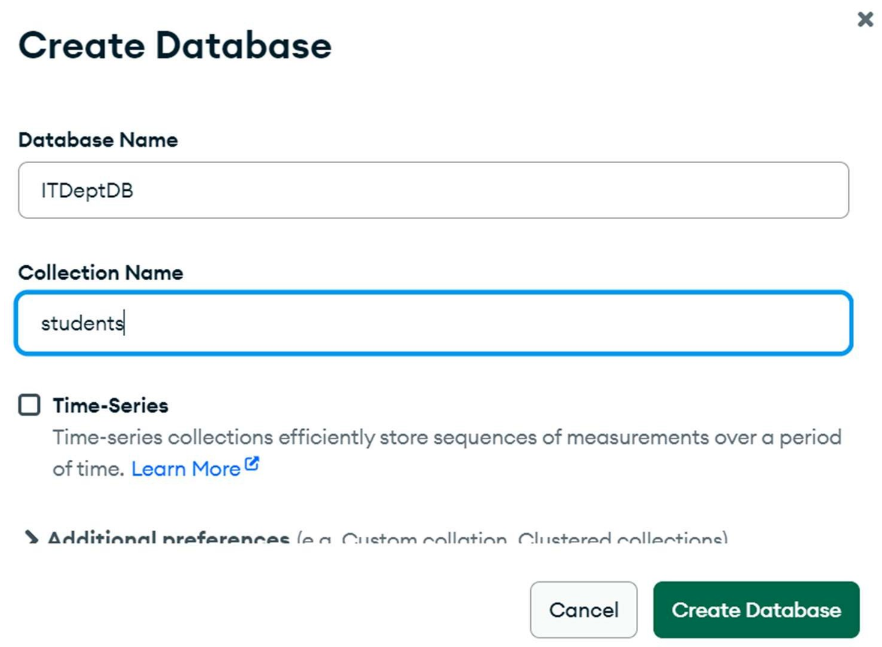
   A) Create a new database to storage student details of IT dept(Name, Roll no, class name) and perform the following on the database
      a) Insert one student details
      b) Insert at once multiple student details
      c) Display student for a particular class
      d) Display students of specific roll no in a class
      e) Change the roll no of a student
      f) Delete entries of particular student

   B) Create a set of RESTful endpoints using Node.js, Express, and Mongoose for handling student data operations.
   The endpoints should support:
   - Retrieve a list of all students.
   - Retrieve details of an individual student by ID.
   - Add a new student to the database.
   - Update details of an existing student by ID.
   - Delete a student from the database by ID.

   Connect the server to MongoDB using Mongoose, and store student data with attributes: name, age, and grade.

OUTPUT:

A) Create a Database ITDeptDB and collection students



Create Database

Database Name

ITDeptDB

Collection Name

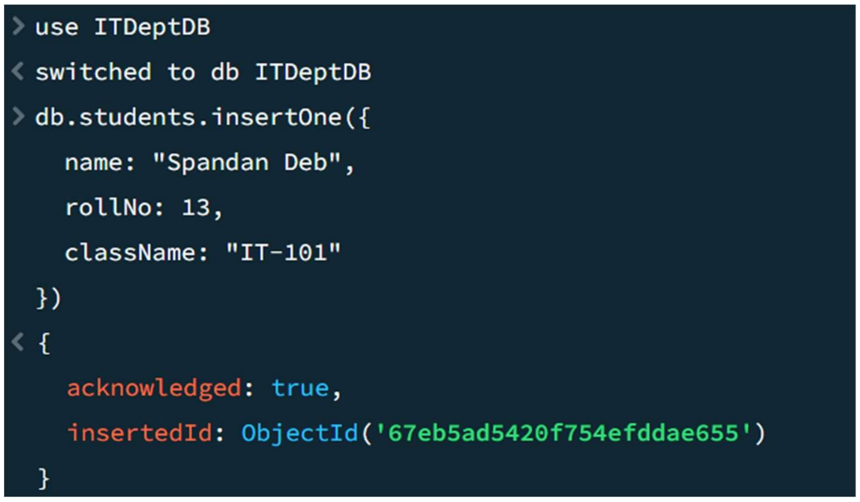
students

☐ Time-Series

Time-series collections efficiently store sequences of measurements over a period of time. Learn More

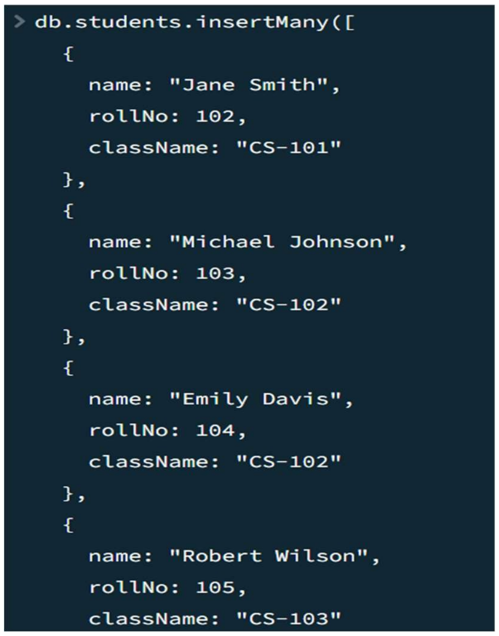
› Additional preferences (e.g. Custom collation, Clustered collections)
Cancel
Create Database

Insert 1 Document



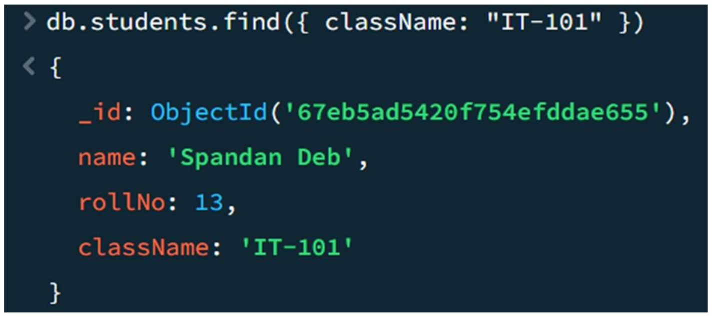
```
> use ITDeptDB
< switched to db ITDeptDB
> db.students.insertOne({
    name: "Spandan Deb",
    rollNo: 13,
    className: "IT-101"
  })
< {
    acknowledged: true,
    insertedId: ObjectId('67eb5ad5420f754efddae655')
  }
```

Insert Multiple student documents



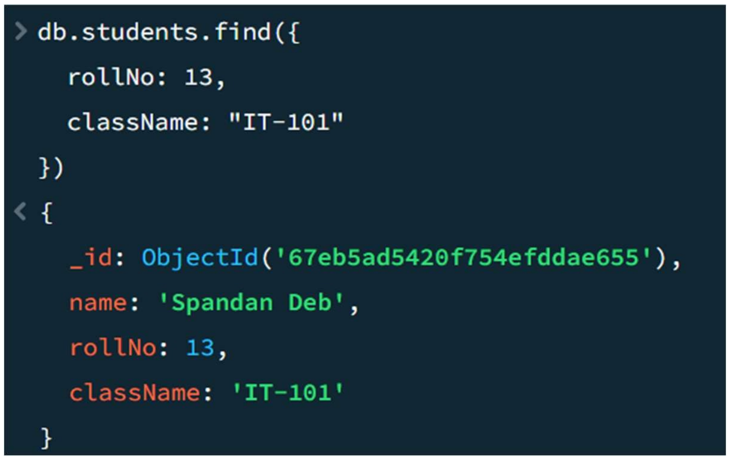
```
> db.students.insertMany([
    {
      name: "Jane Smith",
      rollNo: 102,
      className: "CS-101"
    },
    {
      name: "Michael Johnson",
      rollNo: 103,
      className: "CS-102"
    },
    {
      name: "Emily Davis",
      rollNo: 104,
      className: "CS-102"
    },
    {
      name: "Robert Wilson",
      rollNo: 105,
      className: "CS-103"
```

Display a student record for a particular className



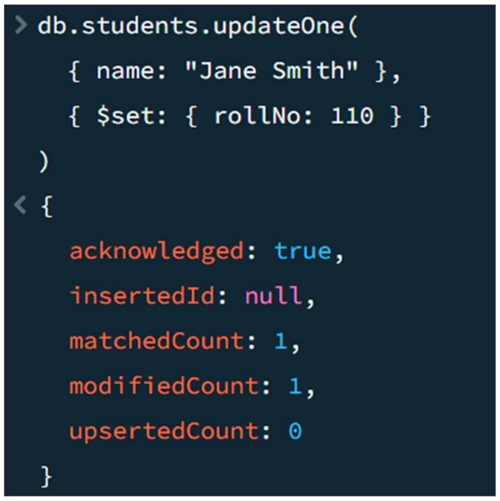
```
> db.students.find({ className: "IT-101" })
< {
    _id: ObjectId('67eb5ad5420f754efddae655'),
    name: 'Spandan Deb',
    rollNo: 13,
    className: 'IT-101'
  }
```

Display a particular student record for a given className and rollNo



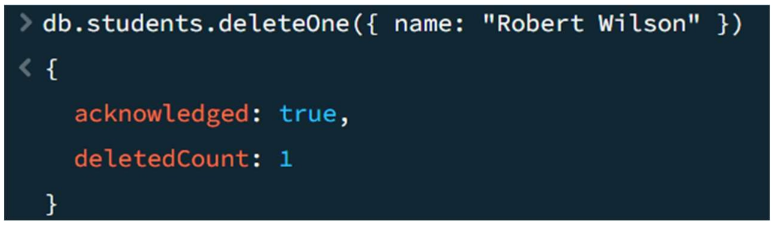
```
> db.students.find({
    rollNo: 13,
    className: "IT-101"
  })
< {
    _id: ObjectId('67eb5ad5420f754efddae655'),
    name: 'Spandan Deb',
    rollNo: 13,
    className: 'IT-101'
  }
```

Update one student record



```
> db.students.updateOne(
    { name: "Jane Smith" },
    { $set: { rollNo: 110 } }
  )
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0
  }
```

Delete one student record



```
> db.students.deleteOne({ name: "Robert Wilson" })
< {
    acknowledged: true,
    deletedCount: 1
  }
```

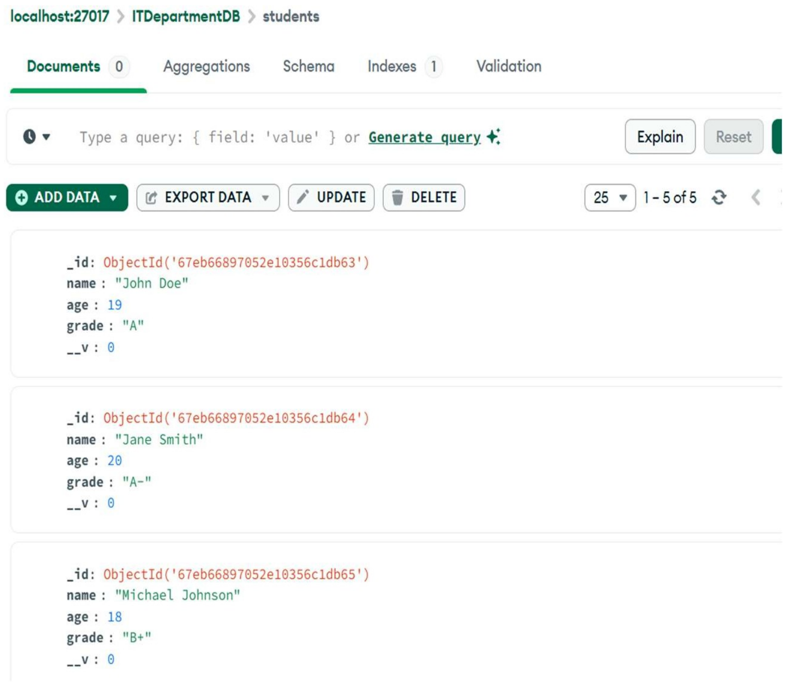
B) Restful API

Server.js

```
// File: server.js
const express = require('express');
const mongoose = require('mongoose');
const app = express();
const PORT = process.env.PORT || 3000;


// Middleware
app.use(express.json());

// Connect to MongoDB
mongoose.connect('mongodb://localhost:27017/ITDepartmentDB')
  .then(() => {
    console.log('MongoDB connected');
    // Seed the database with initial data
    initializeDatabase();
  })
  .catch(err => console.log('MongoDB connection error:', err));


// Student Schema & Model
const Student = mongoose.model('Student',
  { name: String,
  age: Number,
  grade: String
```

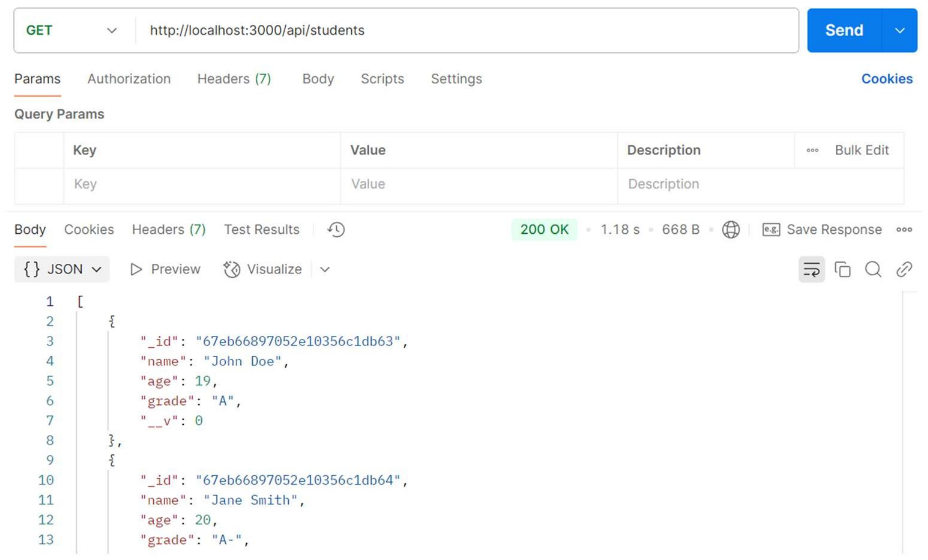
```
});


// Function to initialize the database with sample data
async function initializeDatabase() {
  // Check if the database is empty
  const count = await Student.countDocuments();


  if (count === 0) {
    // Add sample data if the database is empty
    const sampleStudents = [
      { name: "John Doe", age: 19, grade: "A" },
      { name: "Jane Smith", age: 20, grade: "A-" },
      { name: "Michael Johnson", age: 18, grade: "B+" },
      { name: "Emily Davis", age: 21, grade: "A+" },
      { name: "Robert Wilson", age: 19, grade: "B" }
    ];


    try {
      await Student.insertMany(sampleStudents);
      console.log('Database initialized with sample data');
    } catch (err) {
      console.error('Error initializing database:', err);
    }
  } else {
    console.log('Database already contains data, skipping initialization');
  }
}


// Routes - All student operations in a much more concise format
app
  // Get all students
  .get('/api/students', async (req, res) =>
    { try {
      res.json(await Student.find());
    } catch (err) {
      res.status(500).json({ error: err.message });
    }
  })


  // Get student by ID
  .get('/api/students/:id', async (req, res) =>
    { try {
      const student = await Student.findById(req.params.id);
      student ? res.json(student) : res.status(404).json({ error: 'Student not found' });
    } catch (err) {
      res.status(500).json({ error: err.message });
    }
  })


  // Add new student
```

```
.post('/api/students', async (req, res) =>
  { try {
    const newStudent = await new Student(req.body).save();
    res.status(201).json(newStudent);
  } catch (err) {
    res.status(400).json({ error: err.message });
  }
})


// Update student by ID
.put('/api/students/:id', async (req, res) =>
  { try {
    const student = await
      Student.findByIdAndUpdate( req.params.id,
      req.body,
      { new: true }
    );
    student ? res.json(student) : res.status(404).json({ error: 'Student not found' });
  } catch (err) {
    res.status(400).json({ error: err.message });
  }
})


// Delete student by ID
.delete('/api/students/:id', async (req, res) => {
    try {
      const result = await Student.findByIdAndDelete(req.params.id);
      result ? res.json({ message: 'Student deleted' }) : res.status(404).json({ error: 'Student not found' });
    } catch (err) {
      res.status(500).json({ error: err.message });
    }
  });


// Start server
app.listen(PORT, () => console.log(`Server running on port ${PORT}`));
```



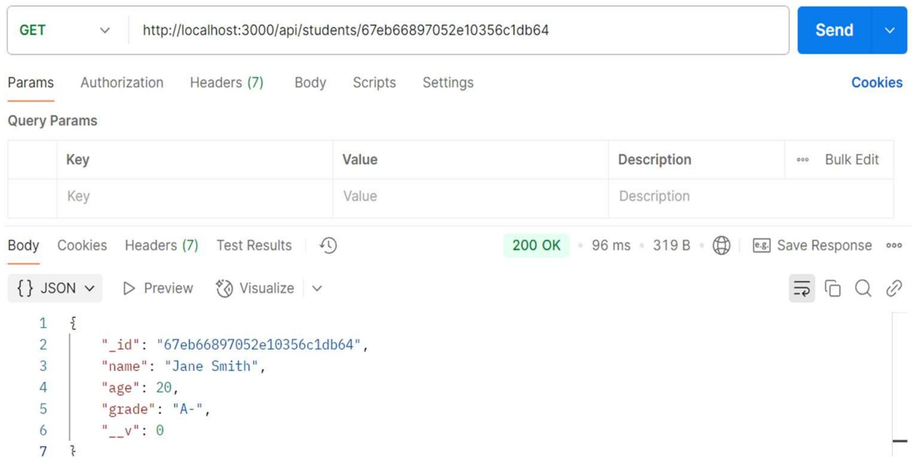
```
_id: ObjectId('67eb66897052e10356c1db63')
name : "John Doe"
age : 19
grade : "A"
__v : 0

_id: ObjectId('67eb66897052e10356c1db64')
name : "Jane Smith"
age : 20
grade : "A-"
__v : 0

_id: ObjectId('67eb66897052e10356c1db65')
name : "Michael Johnson"
age : 18
grade : "B+"
__v : 0
```

Retrieve a list of students


GET http://localhost:3000/api/students

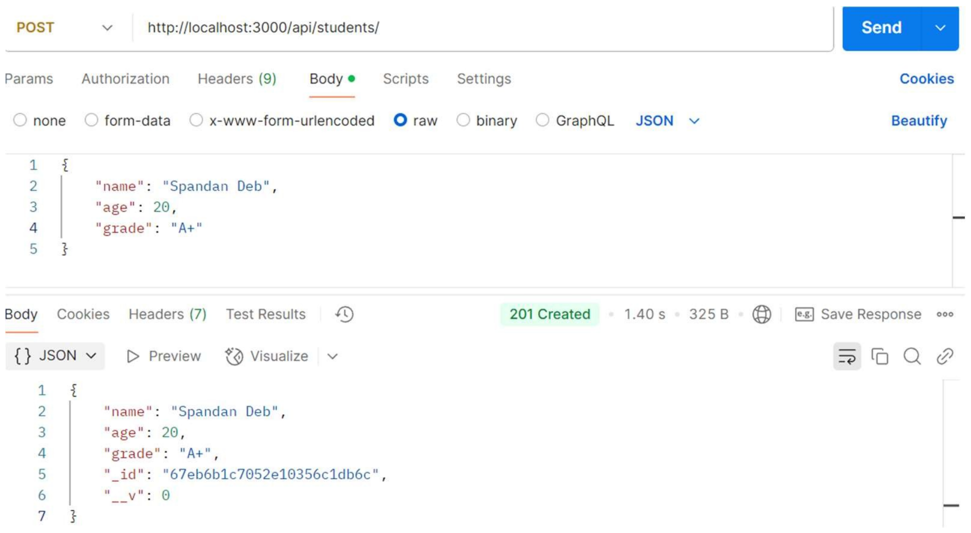
```
[
    {
        "_id": "67eb66897052e10356c1db63",
        "name": "John Doe",
        "age": 19,
        "grade": "A",
        "__v": 0
    },
    {
        "_id": "67eb66897052e10356c1db64",
        "name": "Jane Smith",
        "age": 20,
        "grade": "A-",
```

Retrieve a student by id


GET http://localhost:3000/api/students/67eb66897052e10356c1db64

```
{
    "_id": "67eb66897052e10356c1db64",
    "name": "Jane Smith",
    "age": 20,
    "grade": "A-",
    "__v": 0
}
```

Adding a student to the database



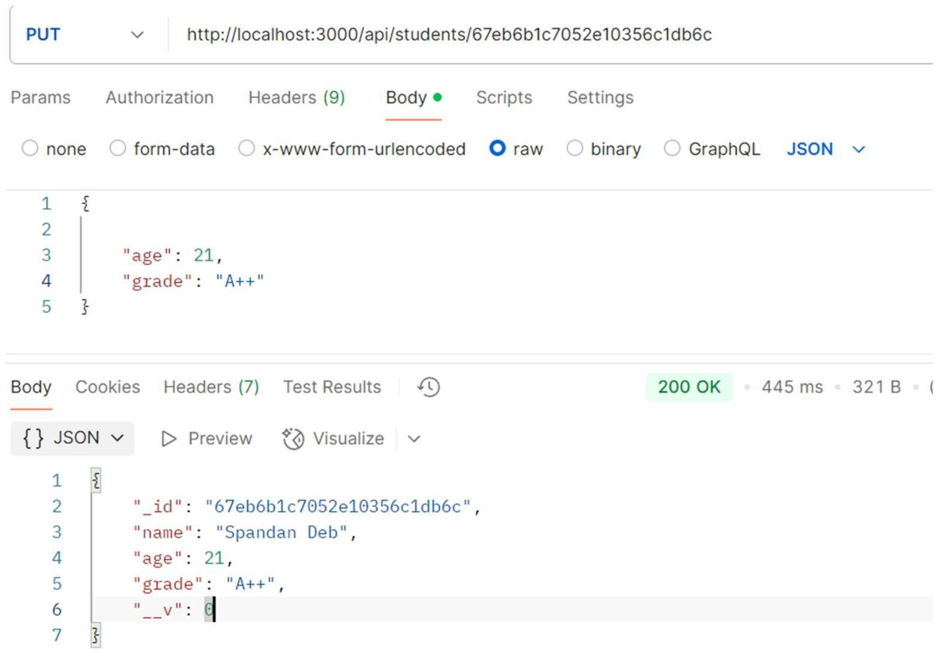
http://localhost:3000/api/students/

```
{
    "name": "Spandan Deb",
    "age": 20,
    "grade": "A+"
}
```

201 Created • 1.40 s • 325 B

```
{
    "name": "Spandan Deb",
    "age": 20,
    "grade": "A+",
    "_id": "67eb6b1c7052e10356c1db6c",
    "__v": 0
}
```

Update a student record here changed the age and grade



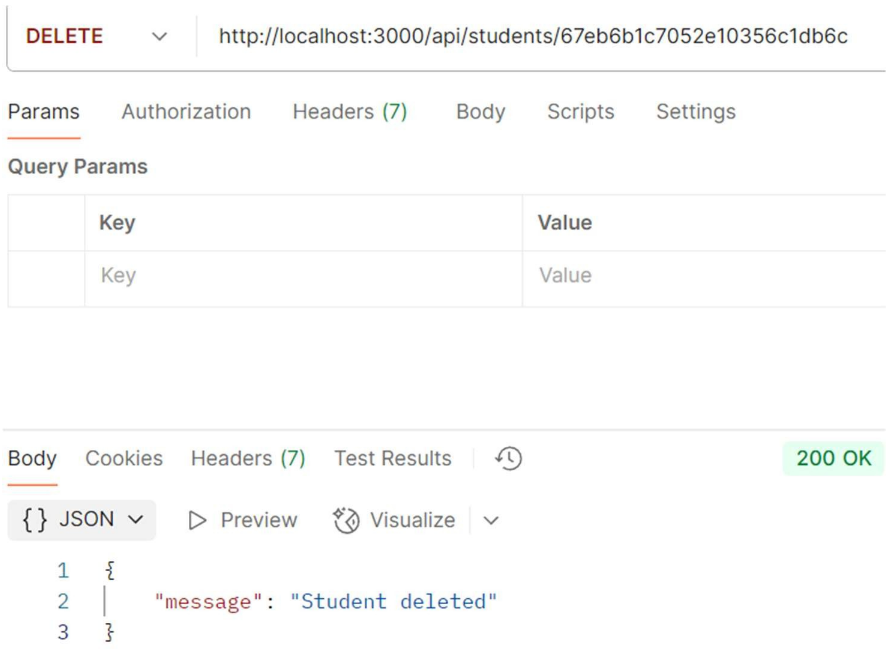
http://localhost:3000/api/students/67eb6b1c7052e10356c1db6c

```
{

    "age": 21,
    "grade": "A++"
}
```

200 OK • 445 ms • 321 B

```
{
    "_id": "67eb6b1c7052e10356c1db6c",
    "name": "Spandan Deb",
    "age": 21,
    "grade": "A++",
    "__v": 0
}
```

Delete a student from database



DELETE http://localhost:3000/api/students/67eb6b1c7052e10356c1db6c

Key	Value
Key	Value

200 OK

```
{
    "message": "Student deleted"
}
```

CONCLUSION:

Implemented CRUD Operations in MongoDB and implemented a Restful API using Node.js, express and mongoose .We learned about create,read,update and delete student records both via MongoDB shell commands and API endpoints.