What Is MongoDB?

MongoDB is a **NoSQL database** that stores data in a flexible, JSON-like format called **documents**.

Instead of tables and rows (like SQL), MongoDB uses:

- **Collections** → like tables
- **Documents** → like rows (but more flexible)

Each document is a set of key-value pairs, like:

```
{
  name: "Aarav",
  age: 21,
  course: "Math"
}
```

MongoDB is great for:

- Storing unstructured or semi-structured data
- Handling large-scale applications
- Fast development and flexible schema

What Are CRUD Operations?

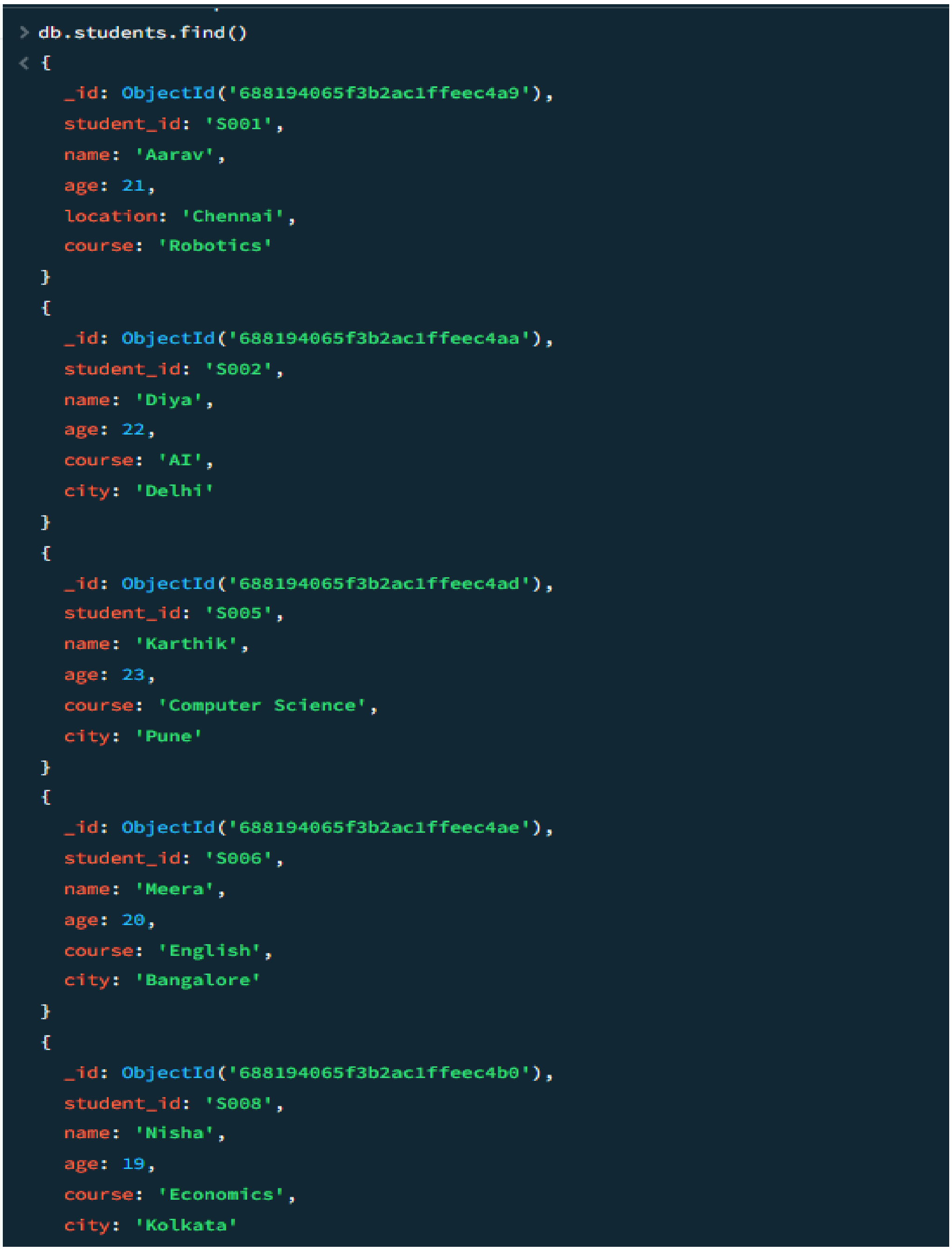
CRUD stands for:

- **C** → Create (add new data)
- **R** → Read (get data)
- **U** → Update (change data)
- **D** → Delete (remove data)

These are the basic operations you perform on any database.

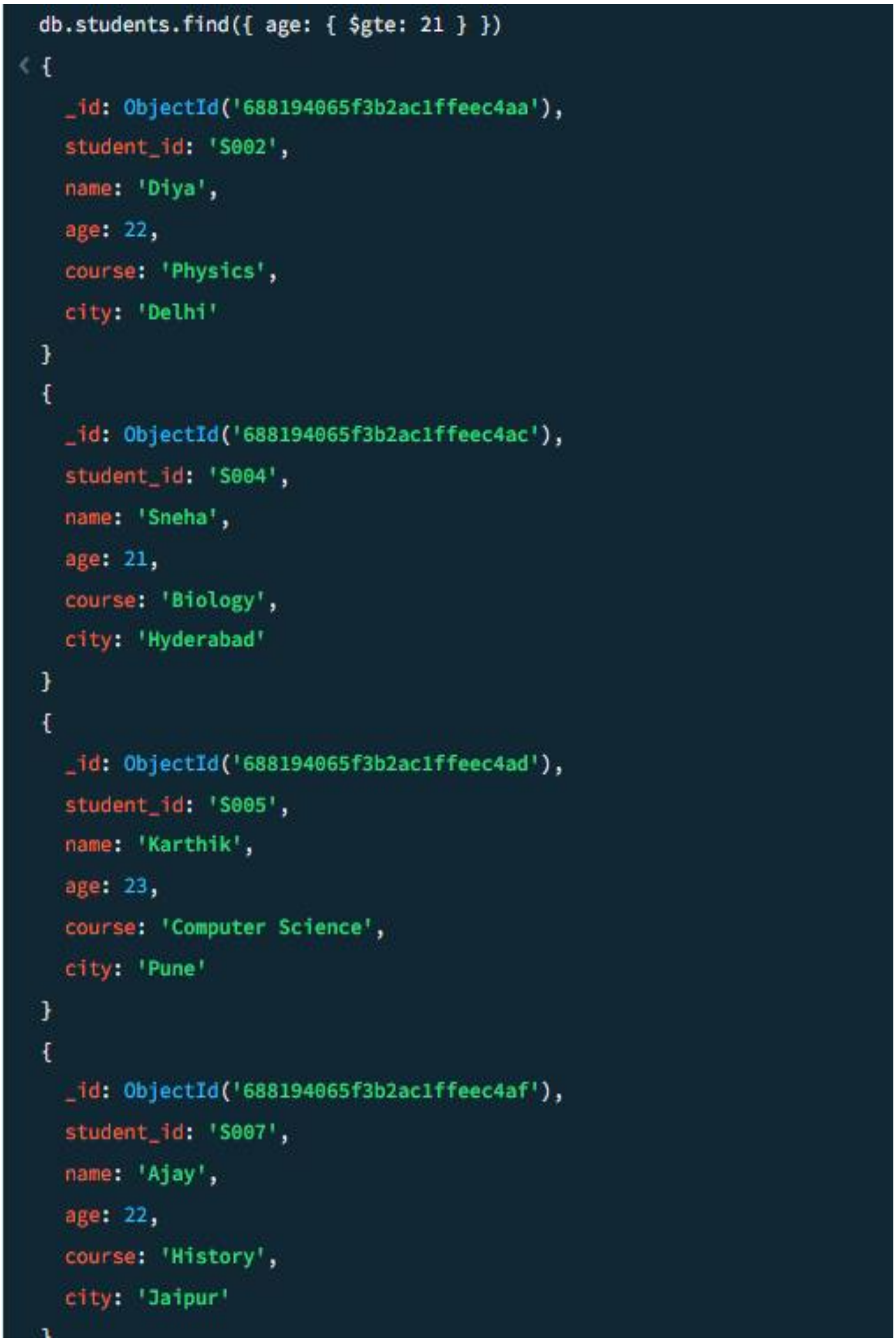
READ OPERATIONS:

1.



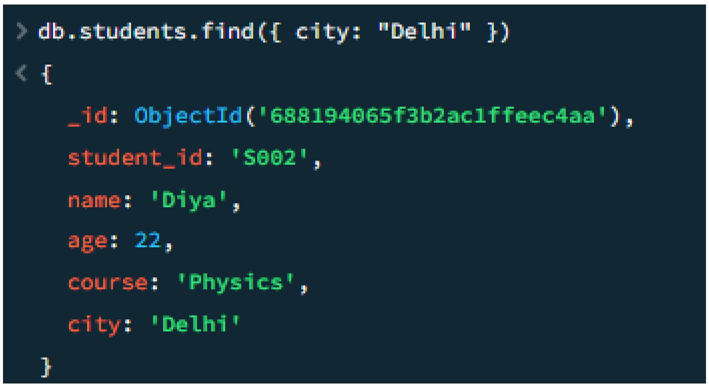
```
> db.students.find()
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    student_id: 'S001',
    name: 'Aarav',
    age: 21,
    location: 'Chennai',
    course: 'Robotics'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'AI',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ae'),
    student_id: 'S006',
    name: 'Meera',
    age: 20,
    course: 'English',
    city: 'Bangalore'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4b0'),
    student_id: 'S008',
    name: 'Nisha',
    age: 19,
    course: 'Economics',
    city: 'Kolkata'
```

2.



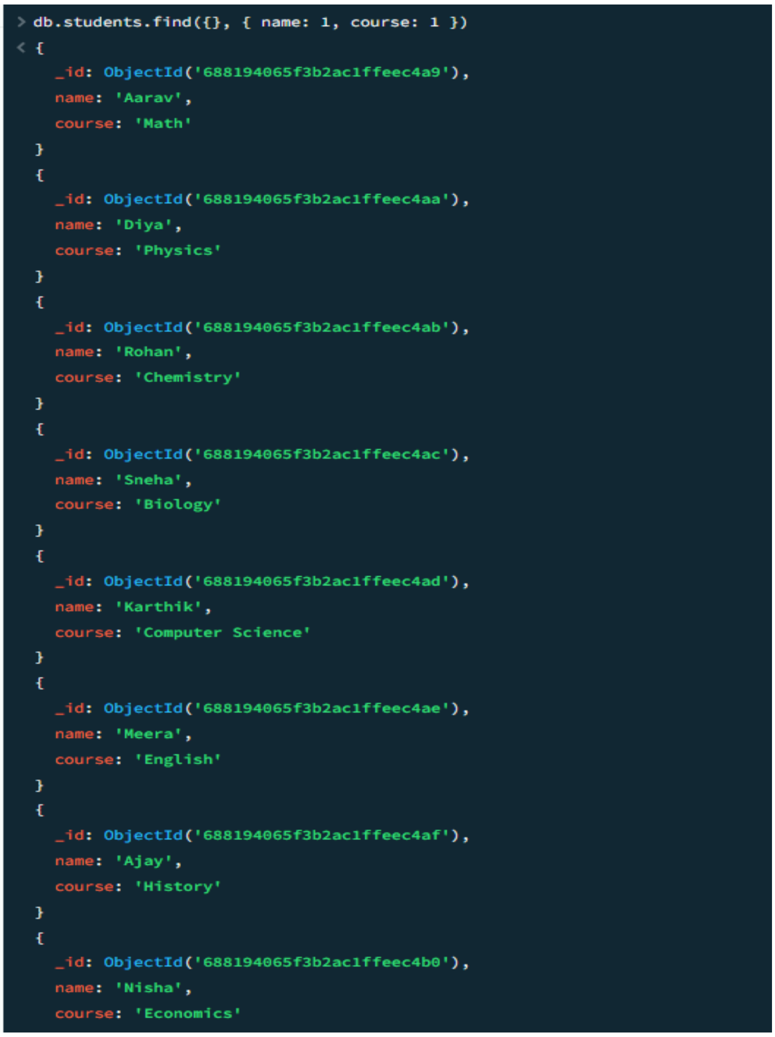
```
  db.students.find({ age: { $gte: 21 } })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    student_id: 'S004',
    name: 'Sneha',
    age: 21,
    course: 'Biology',
    city: 'Hyderabad'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4af'),
    student_id: 'S007',
    name: 'Ajay',
    age: 22,
    course: 'History',
    city: 'Jaipur'
  }
```

3.



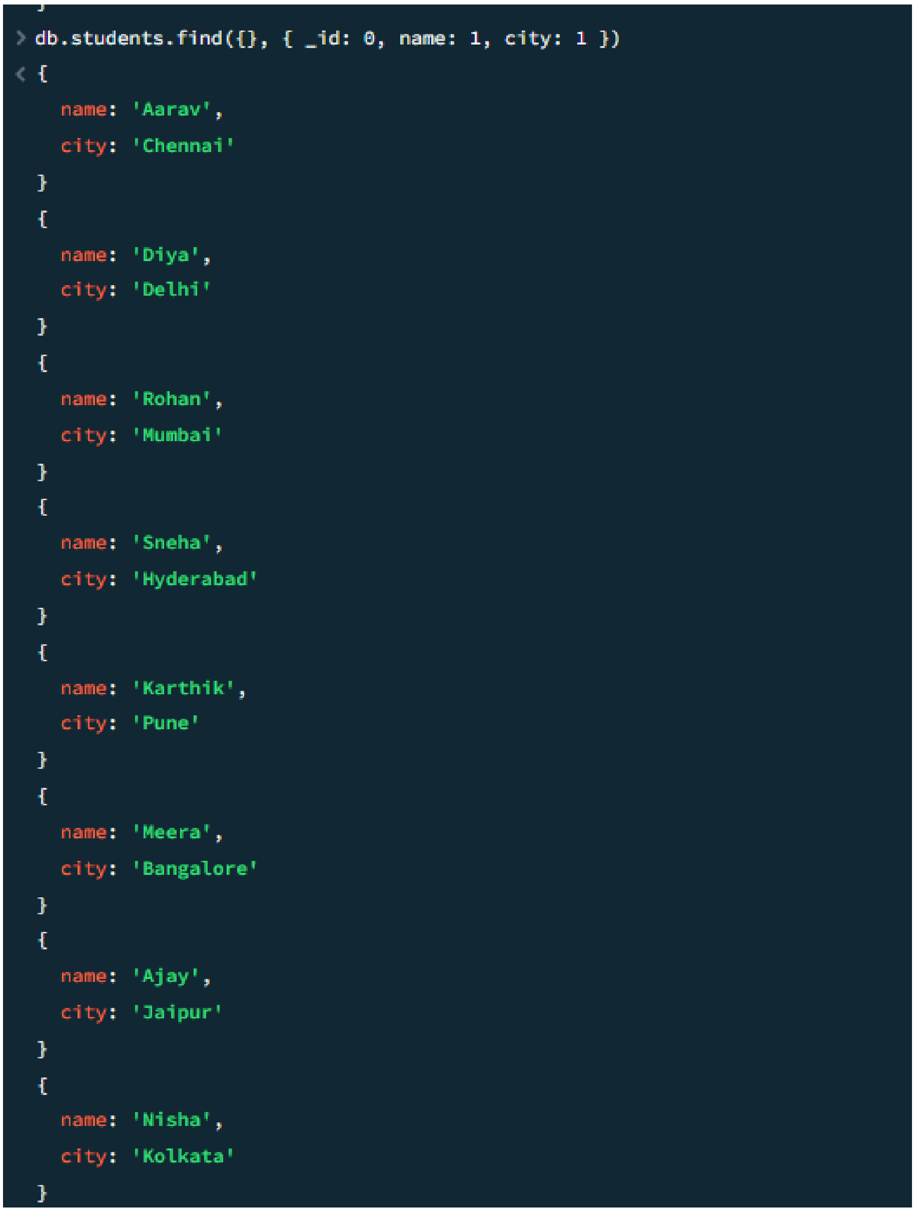
```
> db.students.find({ city: "Delhi" })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
```

4.



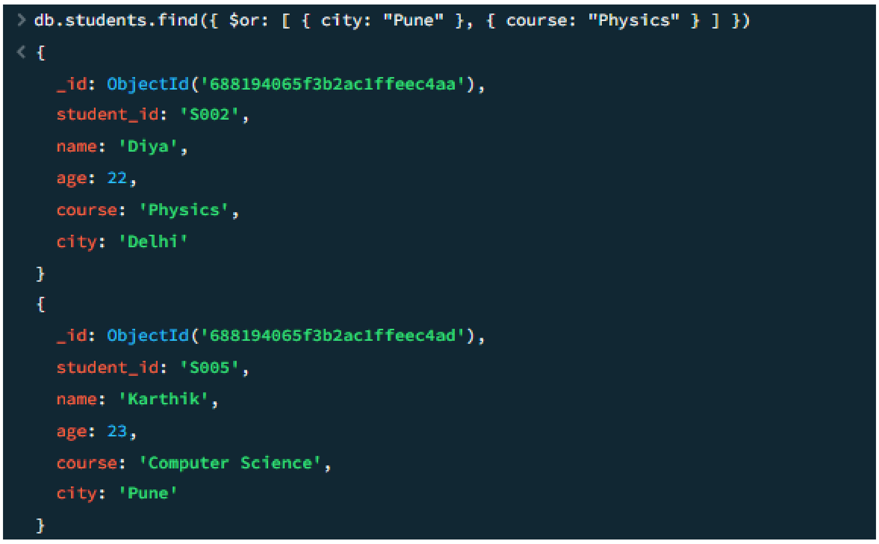
```
> db.students.find({}, { name: 1, course: 1 })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    name: 'Aarav',
    course: 'Math'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    name: 'Diya',
    course: 'Physics'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ab'),
    name: 'Rohan',
    course: 'Chemistry'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    name: 'Sneha',
    course: 'Biology'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    name: 'Karthik',
    course: 'Computer Science'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ae'),
    name: 'Meera',
    course: 'English'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4af'),
    name: 'Ajay',
    course: 'History'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4b0'),
    name: 'Nisha',
    course: 'Economics'
```

5.



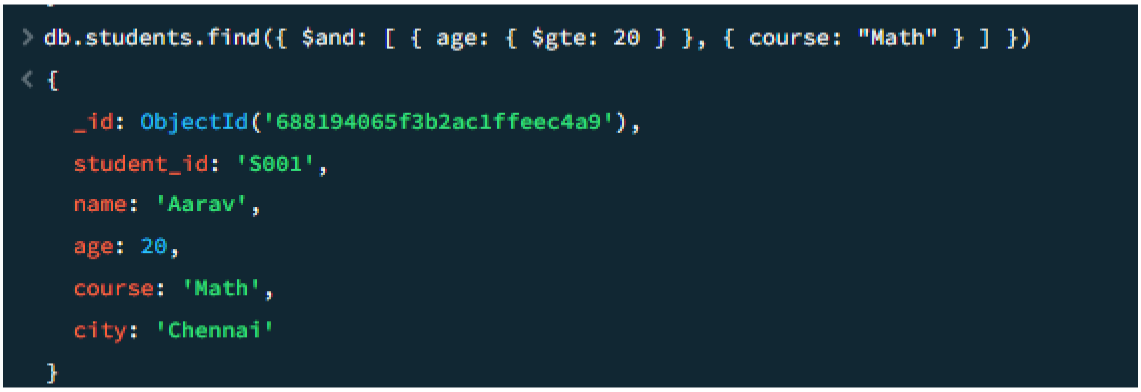
```
  }
> db.students.find({}, { _id: 0, name: 1, city: 1 })
< {
    name: 'Aarav',
    city: 'Chennai'
  }
  {
    name: 'Diya',
    city: 'Delhi'
  }
  {
    name: 'Rohan',
    city: 'Mumbai'
  }
  {
    name: 'Sneha',
    city: 'Hyderabad'
  }
  {
    name: 'Karthik',
    city: 'Pune'
  }
  {
    name: 'Meera',
    city: 'Bangalore'
  }
  {
    name: 'Ajay',
    city: 'Jaipur'
  }
  {
    name: 'Nisha',
    city: 'Kolkata'
  }
```

6.



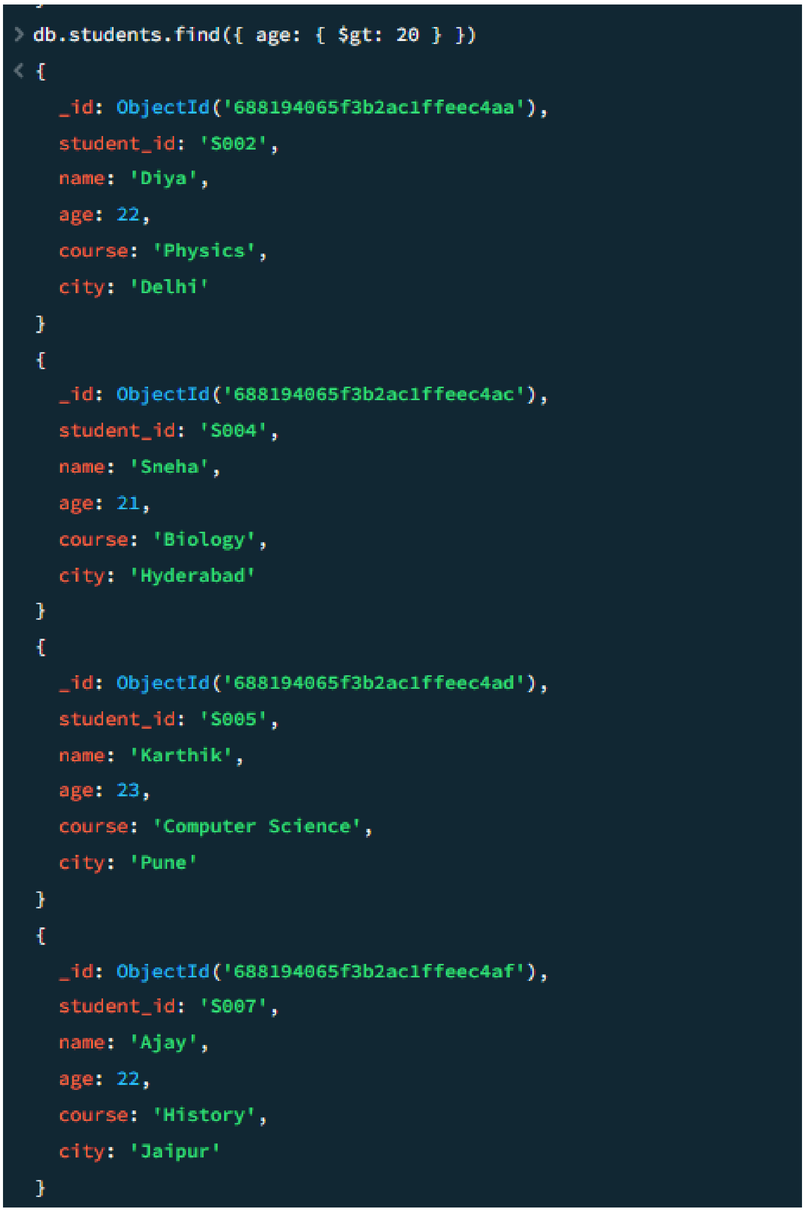
```
> db.students.find({ $or: [ { city: "Pune" }, { course: "Physics" } ] })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
```

7.



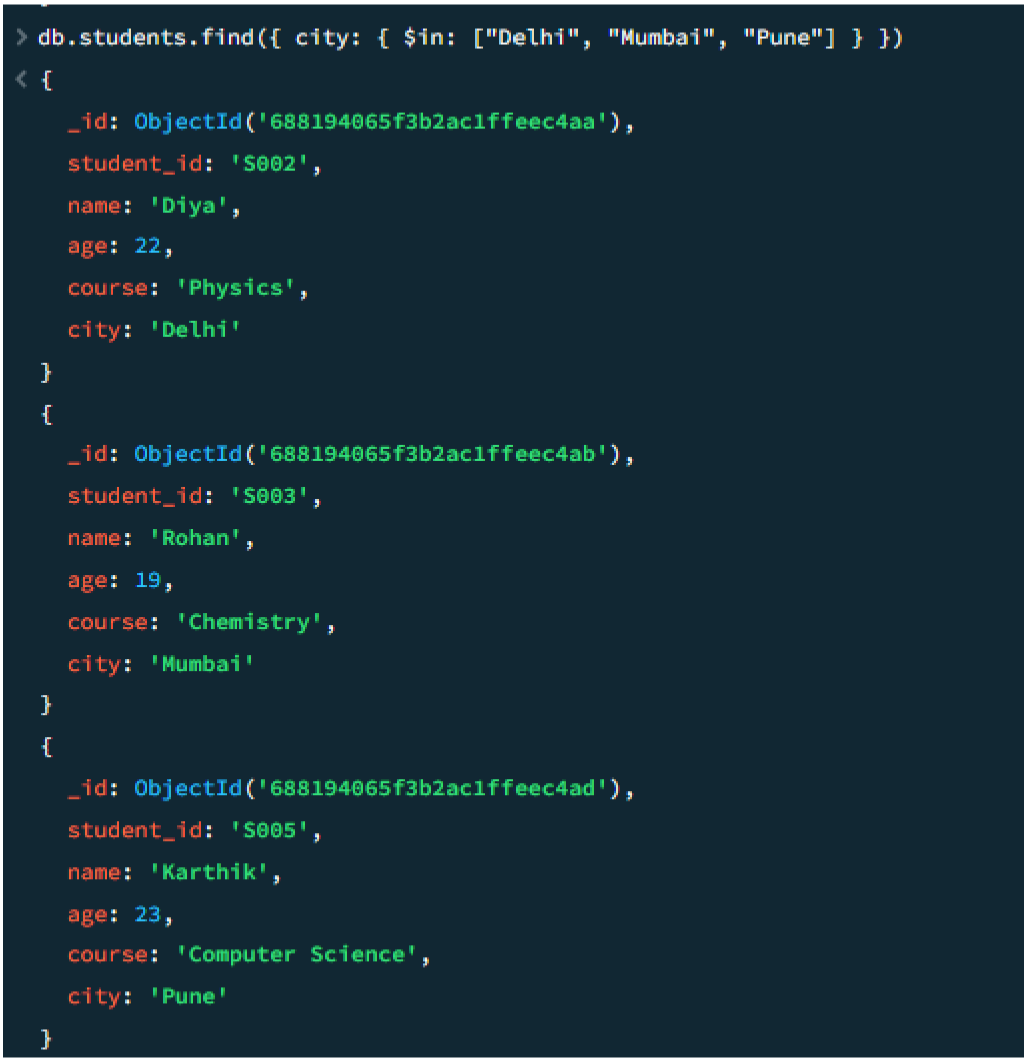
```
> db.students.find({ $and: [ { age: { $gte: 20 } }, { course: "Math" } ] })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    student_id: 'S001',
    name: 'Aarav',
    age: 20,
    course: 'Math',
    city: 'Chennai'
  }
```

8.



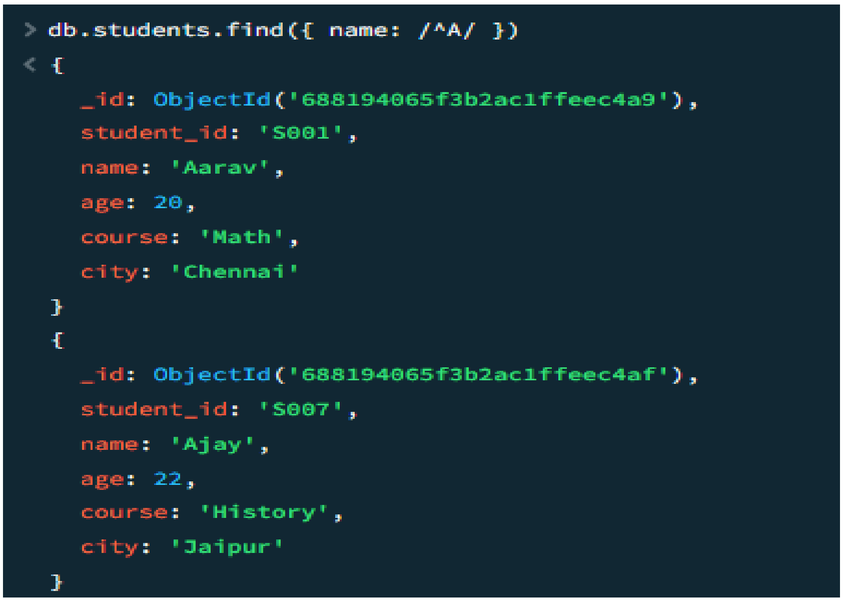
```
> db.students.find({ age: { $gt: 20 } })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    student_id: 'S004',
    name: 'Sneha',
    age: 21,
    course: 'Biology',
    city: 'Hyderabad'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4af'),
    student_id: 'S007',
    name: 'Ajay',
    age: 22,
    course: 'History',
    city: 'Jaipur'
  }
```

9.



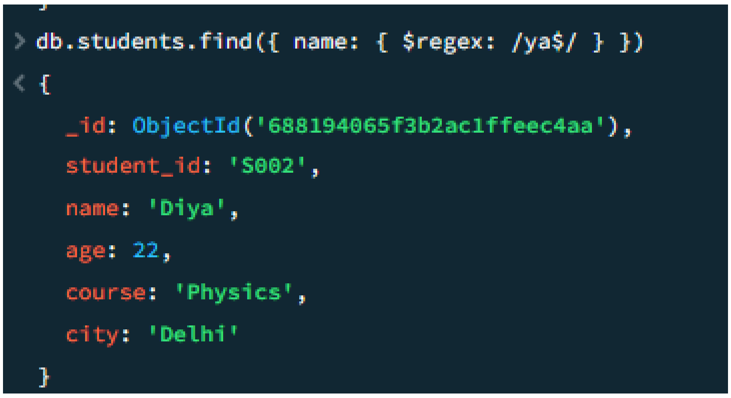
```
> db.students.find({ city: { $in: ["Delhi", "Mumbai", "Pune"] } })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ab'),
    student_id: 'S003',
    name: 'Rohan',
    age: 19,
    course: 'Chemistry',
    city: 'Mumbai'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
```

10.



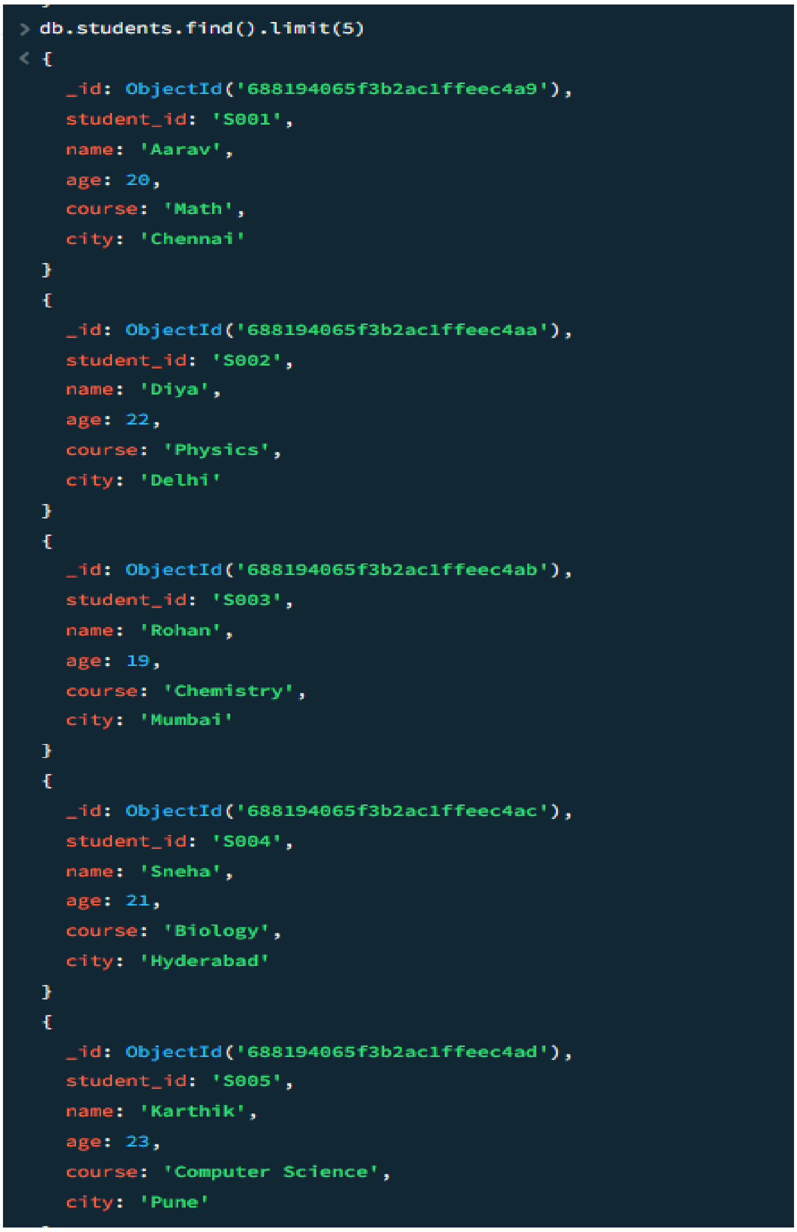
```
> db.students.find({ name: /^A/ })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    student_id: 'S001',
    name: 'Aarav',
    age: 20,
    course: 'Math',
    city: 'Chennai'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4af'),
    student_id: 'S007',
    name: 'Ajay',
    age: 22,
    course: 'History',
    city: 'Jaipur'
  }
```

11.



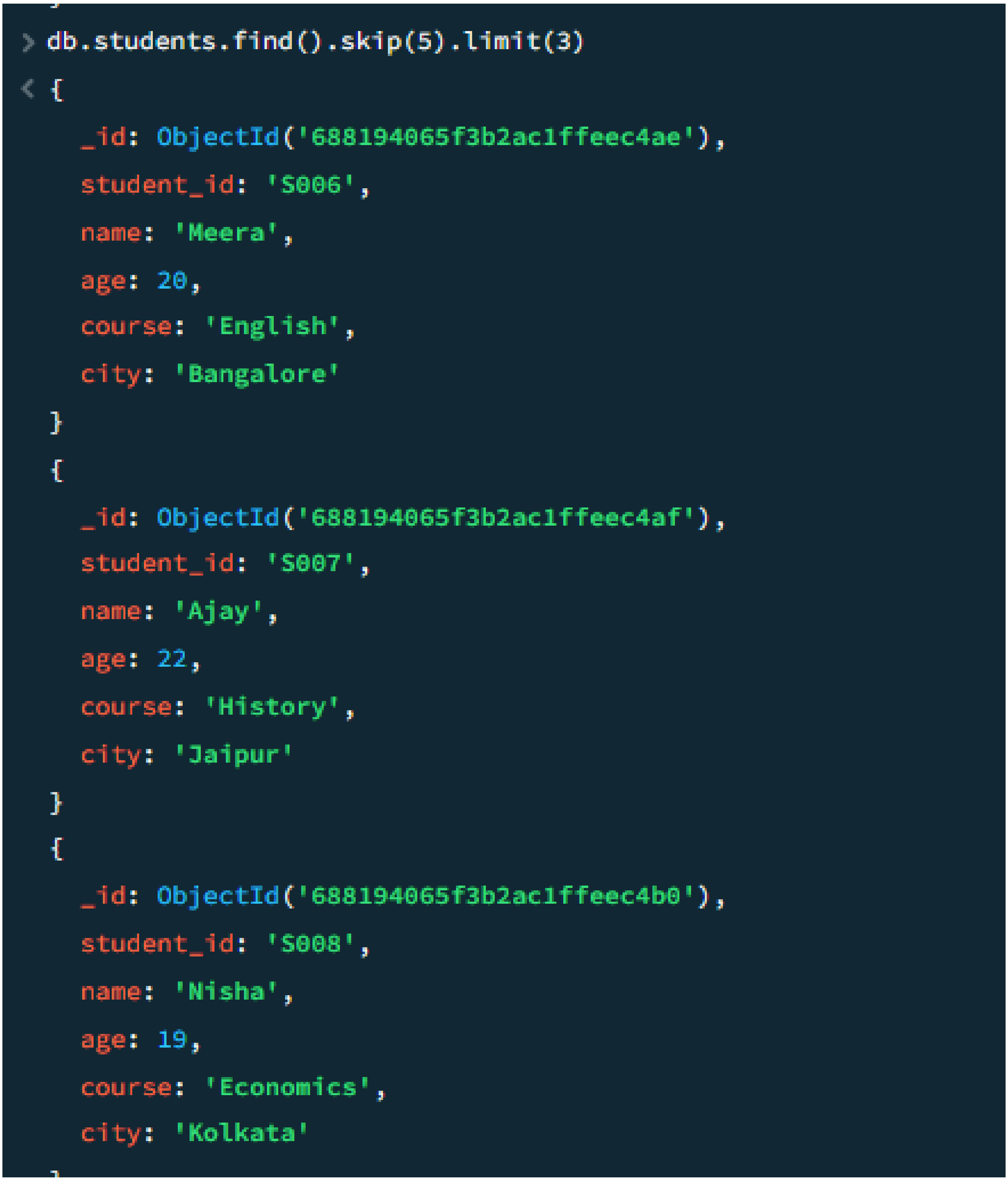
```
> db.students.find({ name: { $regex: /ya$/ } })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
```

12.



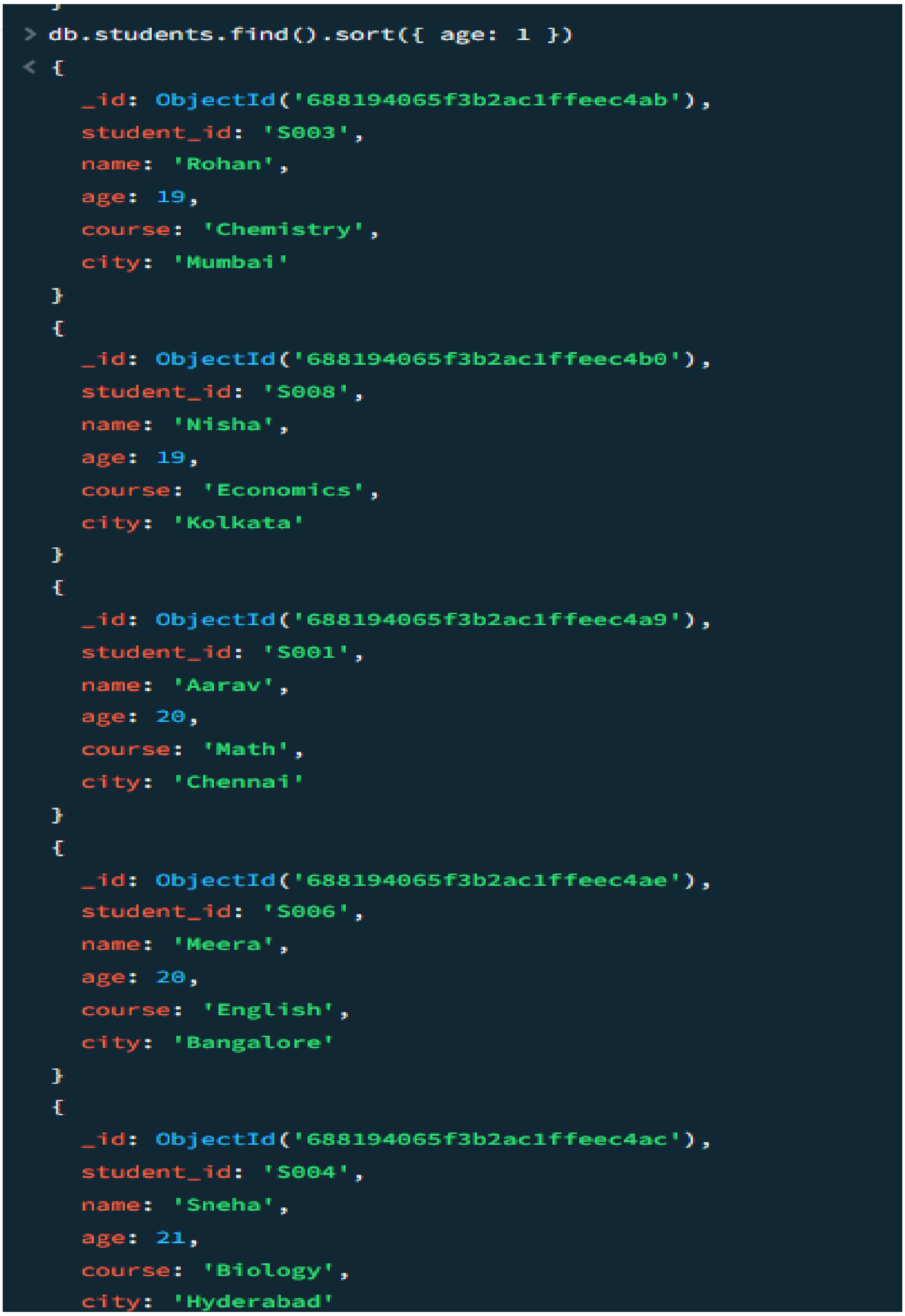
```
> db.students.find().limit(5)
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    student_id: 'S001',
    name: 'Aarav',
    age: 20,
    course: 'Math',
    city: 'Chennai'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ab'),
    student_id: 'S003',
    name: 'Rohan',
    age: 19,
    course: 'Chemistry',
    city: 'Mumbai'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    student_id: 'S004',
    name: 'Sneha',
    age: 21,
    course: 'Biology',
    city: 'Hyderabad'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
```

13.



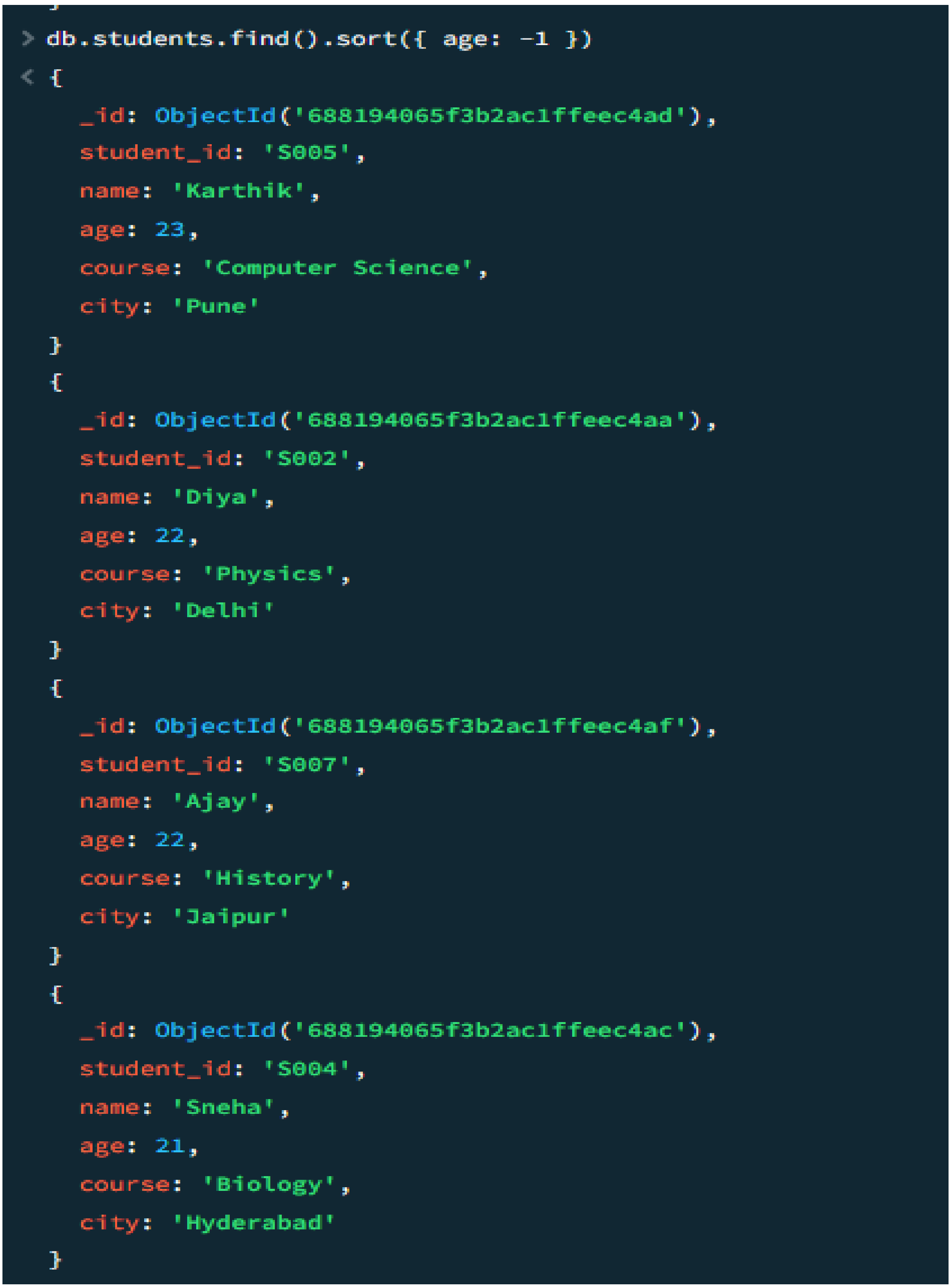
```
> db.students.find().skip(5).limit(3)
< {
    _id: ObjectId('688194065f3b2ac1ffeec4ae'),
    student_id: 'S006',
    name: 'Meera',
    age: 20,
    course: 'English',
    city: 'Bangalore'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4af'),
    student_id: 'S007',
    name: 'Ajay',
    age: 22,
    course: 'History',
    city: 'Jaipur'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4b0'),
    student_id: 'S008',
    name: 'Nisha',
    age: 19,
    course: 'Economics',
    city: 'Kolkata'
```

14.



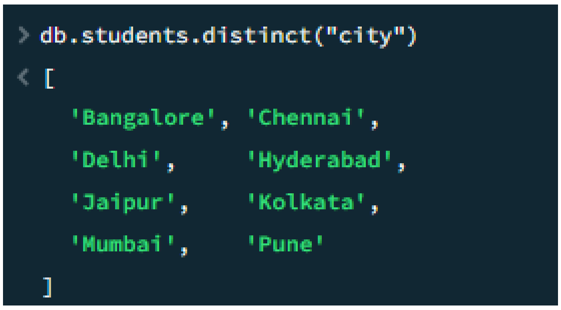
```
> db.students.find().sort({ age: 1 })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4ab'),
    student_id: 'S003',
    name: 'Rohan',
    age: 19,
    course: 'Chemistry',
    city: 'Mumbai'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4b0'),
    student_id: 'S008',
    name: 'Nisha',
    age: 19,
    course: 'Economics',
    city: 'Kolkata'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    student_id: 'S001',
    name: 'Aarav',
    age: 20,
    course: 'Math',
    city: 'Chennai'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ae'),
    student_id: 'S006',
    name: 'Meera',
    age: 20,
    course: 'English',
    city: 'Bangalore'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    student_id: 'S004',
    name: 'Sneha',
    age: 21,
    course: 'Biology',
    city: 'Hyderabad'
```

15.



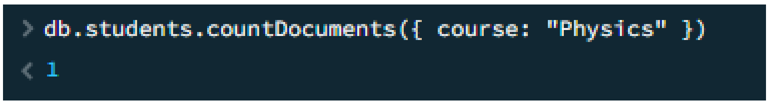
```
  }
> db.students.find().sort({ age: -1 })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'Physics',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4af'),
    student_id: 'S007',
    name: 'Ajay',
    age: 22,
    course: 'History',
    city: 'Jaipur'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    student_id: 'S004',
    name: 'Sneha',
    age: 21,
    course: 'Biology',
    city: 'Hyderabad'
  }
```

16.



```
> db.students.distinct("city")
< [
    'Bangalore', 'Chennai',
    'Delhi',     'Hyderabad',
    'Jaipur',    'Kolkata',
    'Mumbai',    'Pune'
  ]
```

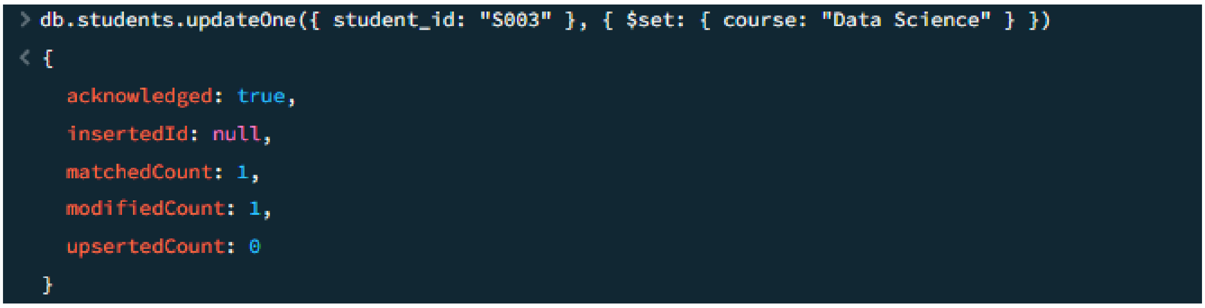
17.



```
> db.students.countDocuments({ course: "Physics" })
< 1
```

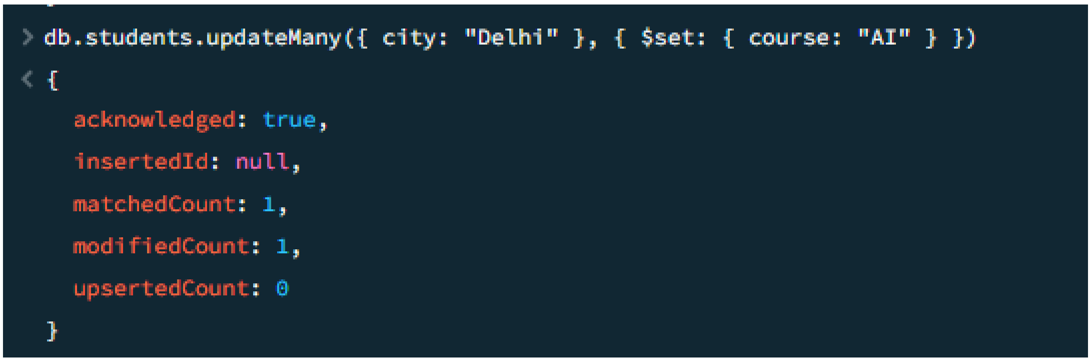
UPDATE OPERATIONS:

18.



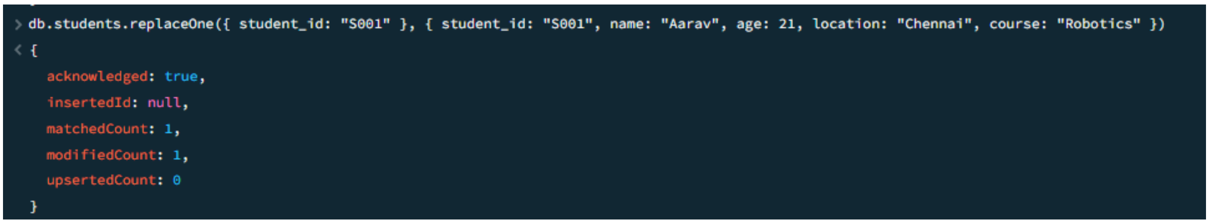
```
> db.students.updateOne({ student_id: "S003" }, { $set: { course: "Data Science" } })
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0
  }
```

19.



```
> db.students.updateMany({ city: "Delhi" }, { $set: { course: "AI" } })
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0
  }
```

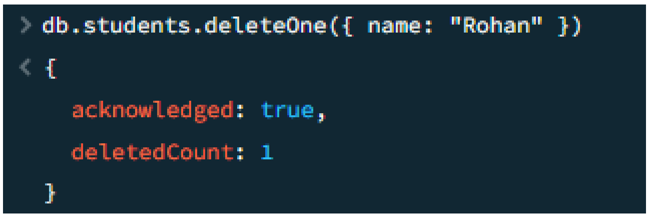
20.



```
> db.students.replaceOne({ student_id: "S001" }, { student_id: "S001", name: "Aarav", age: 21, location: "Chennai", course: "Robotics" })
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0
  }
```

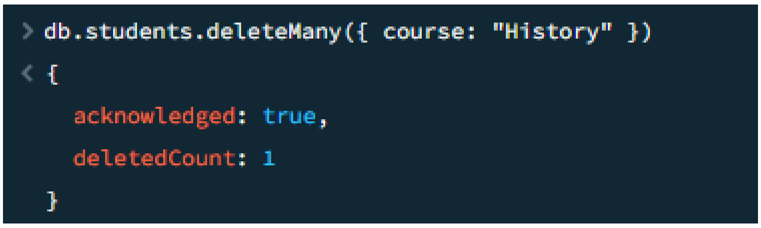
DELETE OPERATIONS:

21.



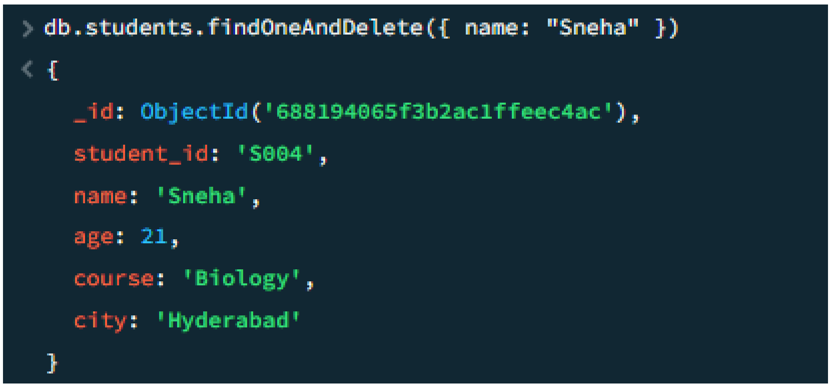
```
> db.students.deleteOne({ name: "Rohan" })
< {
    acknowledged: true,
    deletedCount: 1
  }
```

22.



```
> db.students.deleteMany({ course: "History" })
< {
    acknowledged: true,
    deletedCount: 1
  }
```

23.



```
> db.students.findOneAndDelete({ name: "Sneha" })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4ac'),
    student_id: 'S004',
    name: 'Sneha',
    age: 21,
    course: 'Biology',
    city: 'Hyderabad'
  }
```

MONGO DB PROJECTION:

What Is MongoDB Projection?

Projection in MongoDB means selecting only the fields you want to see from a document. Instead of retrieving the entire document, you choose specific fields to include or exclude. This helps improve performance and keeps your query results focused.

Why Use Projection?

- Reduces the amount of data transferred
- Improves query speed
- Makes results easier to read
- Saves memory when working with large documents

Syntax of Projection

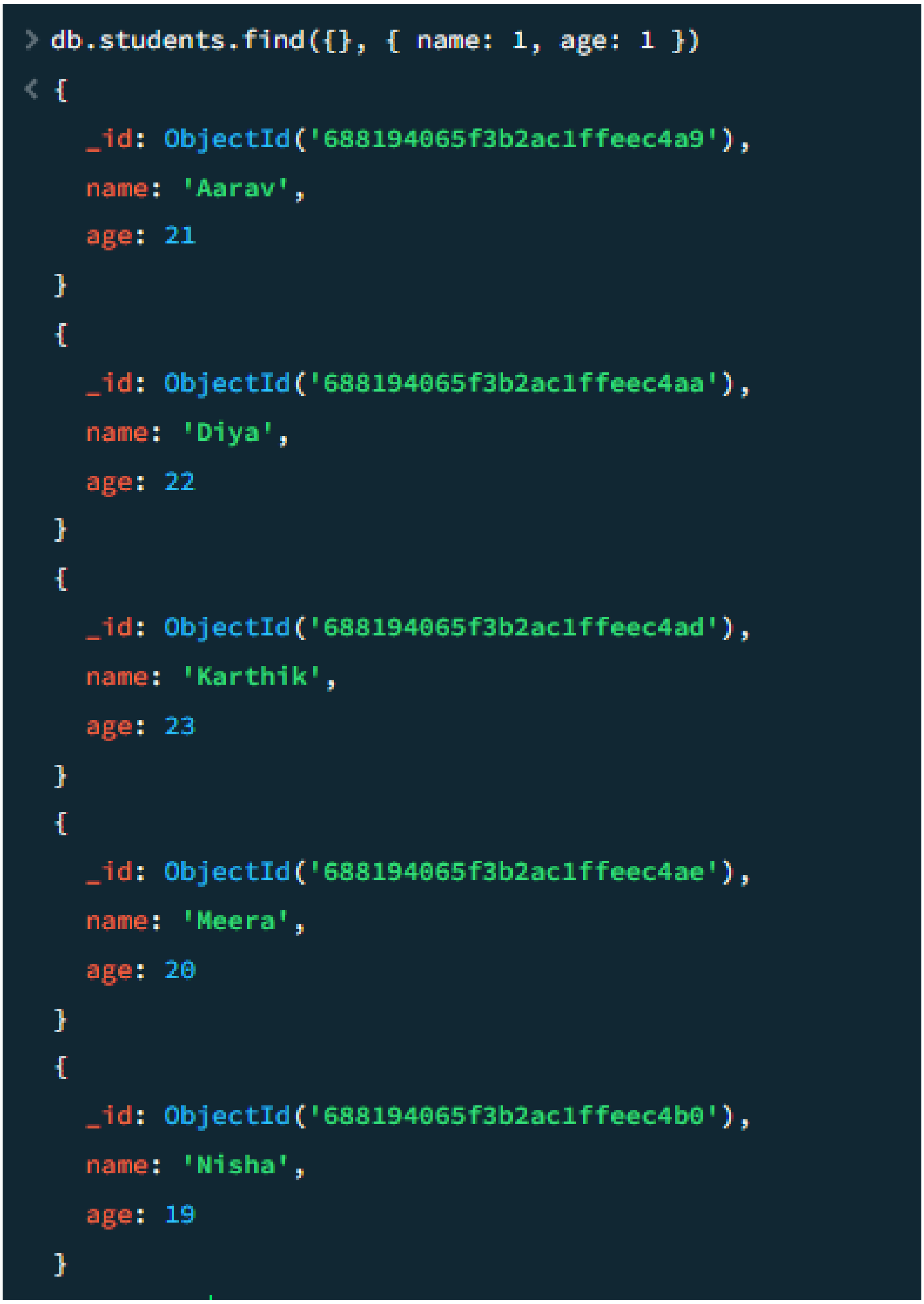
```
db.collection.find(query, projection)
```

- `query`: filters which documents to retrieve
- `projection`: defines which fields to include or exclude

MongoDB Projection Functions Explained

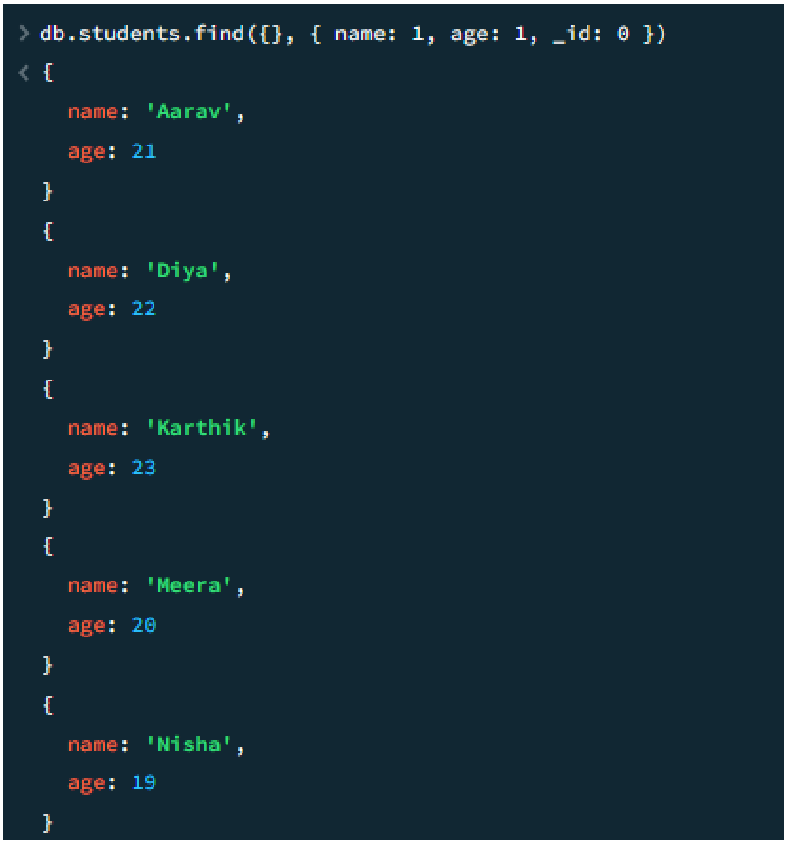
Syntax	Description	Example
`{ field: 1 }`	Includes the field in the result	`{ name: 1 }` → shows only the name field
`{ field: 0 }`	Excludes the field from the result	`{ salary: 0 }` → hides the `salary` field
`{ _id: 0 }`	Excludes the `_id` field (included by default)	`{ name: 1, _id: 0}`
`$slice`	Returns a portion of an array field	`{ skills: { $slice: 2 } }` → returns first 2 items in `skills`
`$elemMatch`	Returns the first matching element from an array of embedded documents	`{ skills: { $elemMatch: { level: { $gt: 3 } } } }`
`pretty()`	Formats the output for readability in the shell	`db.students.find().pretty()`

1.



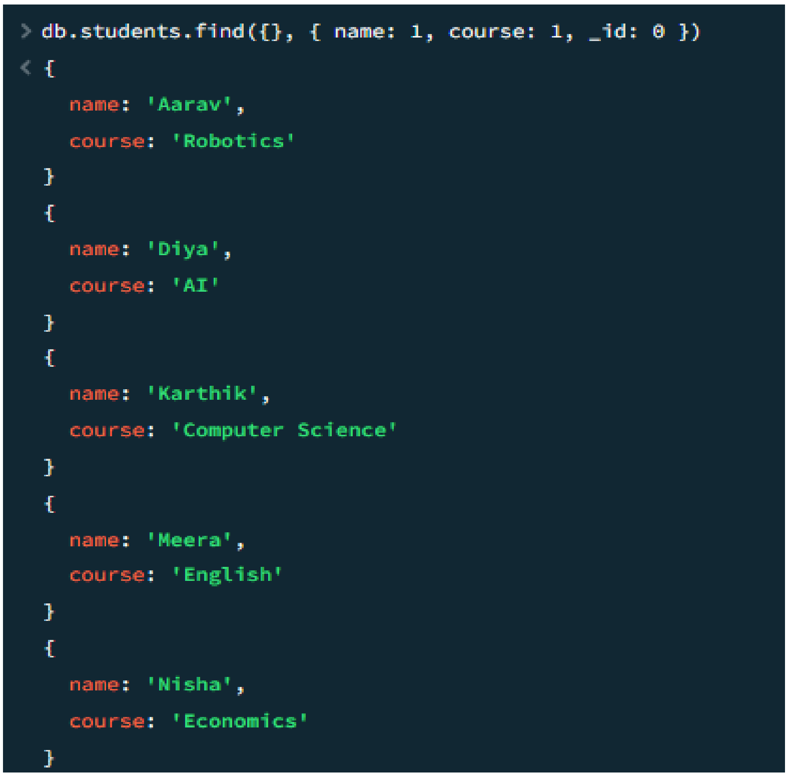
```
> db.students.find({}, { name: 1, age: 1 })
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    name: 'Aarav',
    age: 21
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    name: 'Diya',
    age: 22
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    name: 'Karthik',
    age: 23
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ae'),
    name: 'Meera',
    age: 20
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4b0'),
    name: 'Nisha',
    age: 19
  }
```

2.



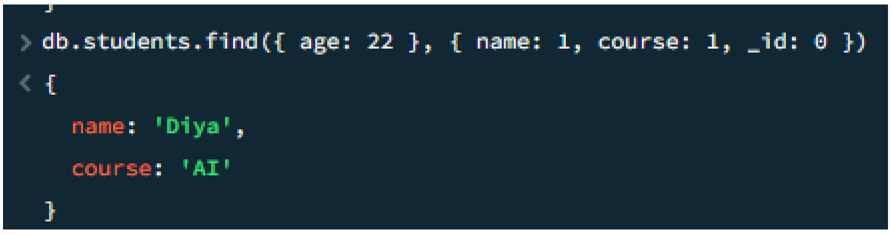
```
> db.students.find({}, { name: 1, age: 1, _id: 0 })
< {
    name: 'Aarav',
    age: 21
  }
  {
    name: 'Diya',
    age: 22
  }
  {
    name: 'Karthik',
    age: 23
  }
  {
    name: 'Meera',
    age: 20
  }
  {
    name: 'Nisha',
    age: 19
  }
```

3.



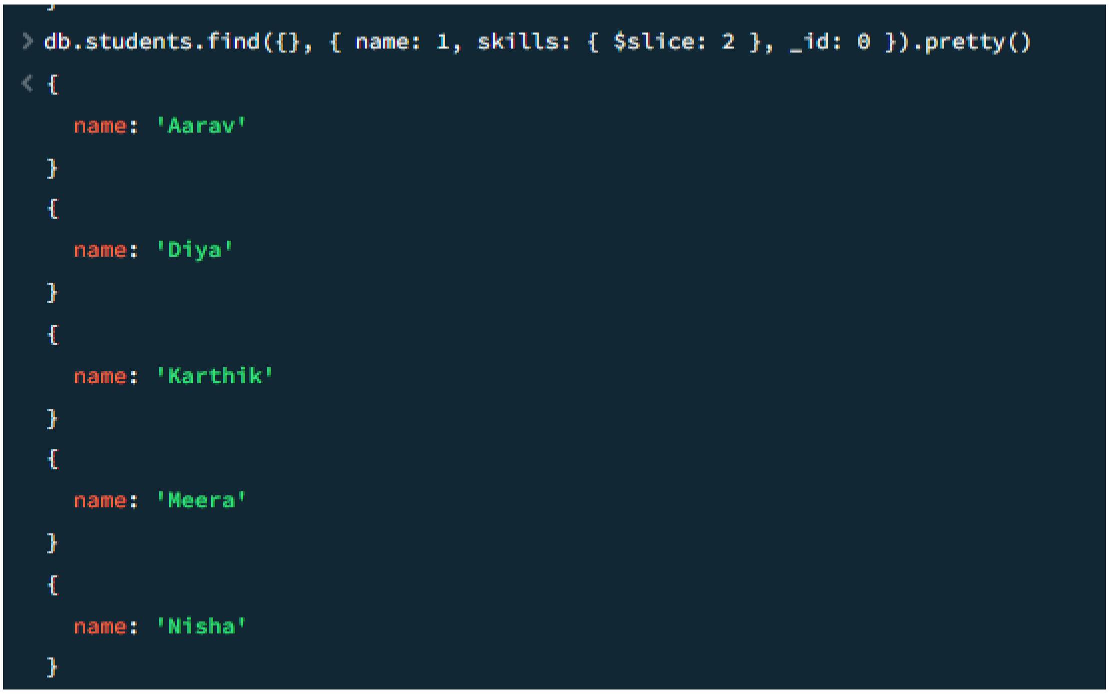
```
> db.students.find({}, { name: 1, course: 1, _id: 0 })
< {
    name: 'Aarav',
    course: 'Robotics'
  }
  {
    name: 'Diya',
    course: 'AI'
  }
  {
    name: 'Karthik',
    course: 'Computer Science'
  }
  {
    name: 'Meera',
    course: 'English'
  }
  {
    name: 'Nisha',
    course: 'Economics'
  }
```

4.



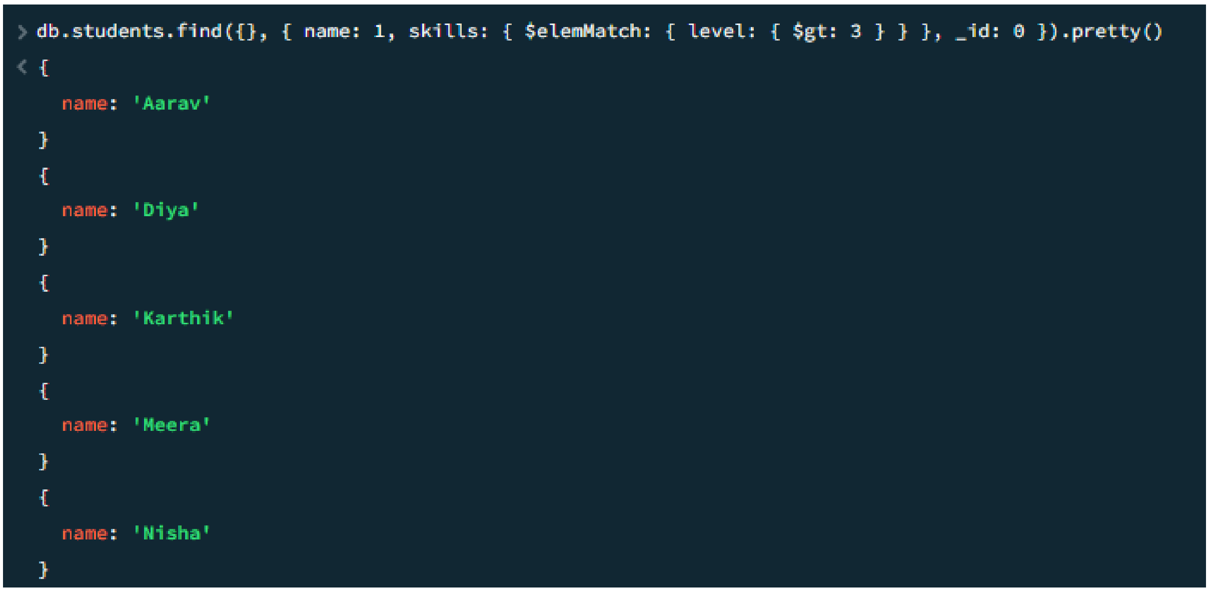
```
> db.students.find({ age: 22 }, { name: 1, course: 1, _id: 0 })
< {
    name: 'Diya',
    course: 'AI'
  }
```

5.



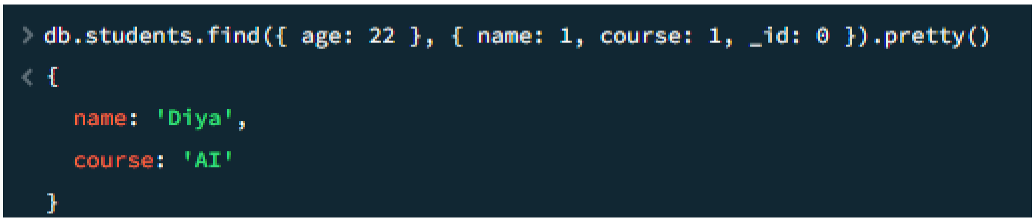
```
> db.students.find({}, { name: 1, skills: { $slice: 2 }, _id: 0 }).pretty()
< {
    name: 'Aarav'
  }
  {
    name: 'Diya'
  }
  {
    name: 'Karthik'
  }
  {
    name: 'Meera'
  }
  {
    name: 'Nisha'
  }
```

6.



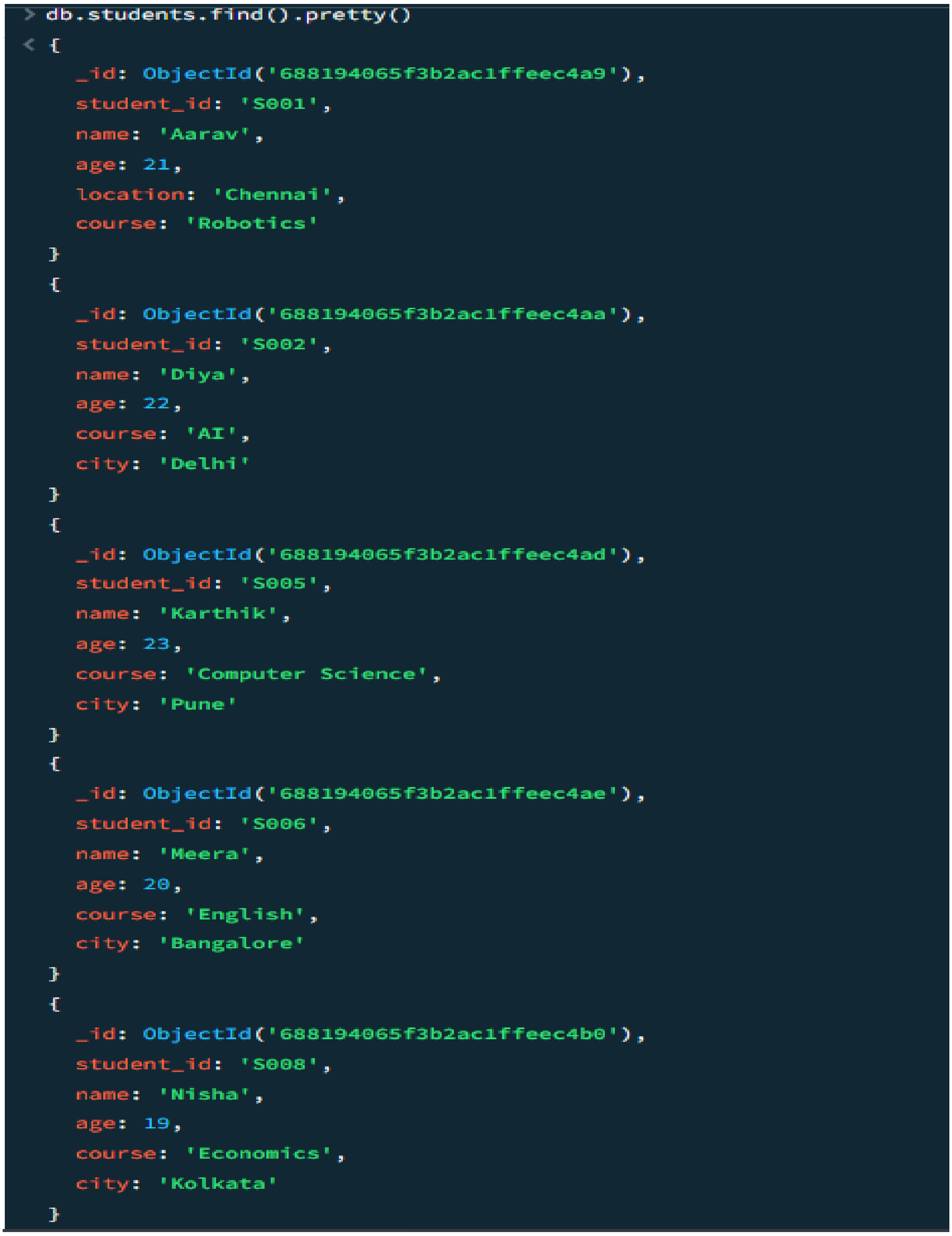
```
> db.students.find({}, { name: 1, skills: { $elemMatch: { level: { $gt: 3 } } }, _id: 0 }).pretty()
< {
    name: 'Aarav'
  }
  {
    name: 'Diya'
  }
  {
    name: 'Karthik'
  }
  {
    name: 'Meera'
  }
  {
    name: 'Nisha'
  }
```

7.



```
> db.students.find({ age: 22 }, { name: 1, course: 1, _id: 0 }).pretty()
< {
    name: 'Diya',
    course: 'AI'
  }
```

8.



```
> db.students.find().pretty()
< {
    _id: ObjectId('688194065f3b2ac1ffeec4a9'),
    student_id: 'S001',
    name: 'Aarav',
    age: 21,
    location: 'Chennai',
    course: 'Robotics'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4aa'),
    student_id: 'S002',
    name: 'Diya',
    age: 22,
    course: 'AI',
    city: 'Delhi'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ad'),
    student_id: 'S005',
    name: 'Karthik',
    age: 23,
    course: 'Computer Science',
    city: 'Pune'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4ae'),
    student_id: 'S006',
    name: 'Meera',
    age: 20,
    course: 'English',
    city: 'Bangalore'
  }
  {
    _id: ObjectId('688194065f3b2ac1ffeec4b0'),
    student_id: 'S008',
    name: 'Nisha',
    age: 19,
    course: 'Economics',
    city: 'Kolkata'
  }
```