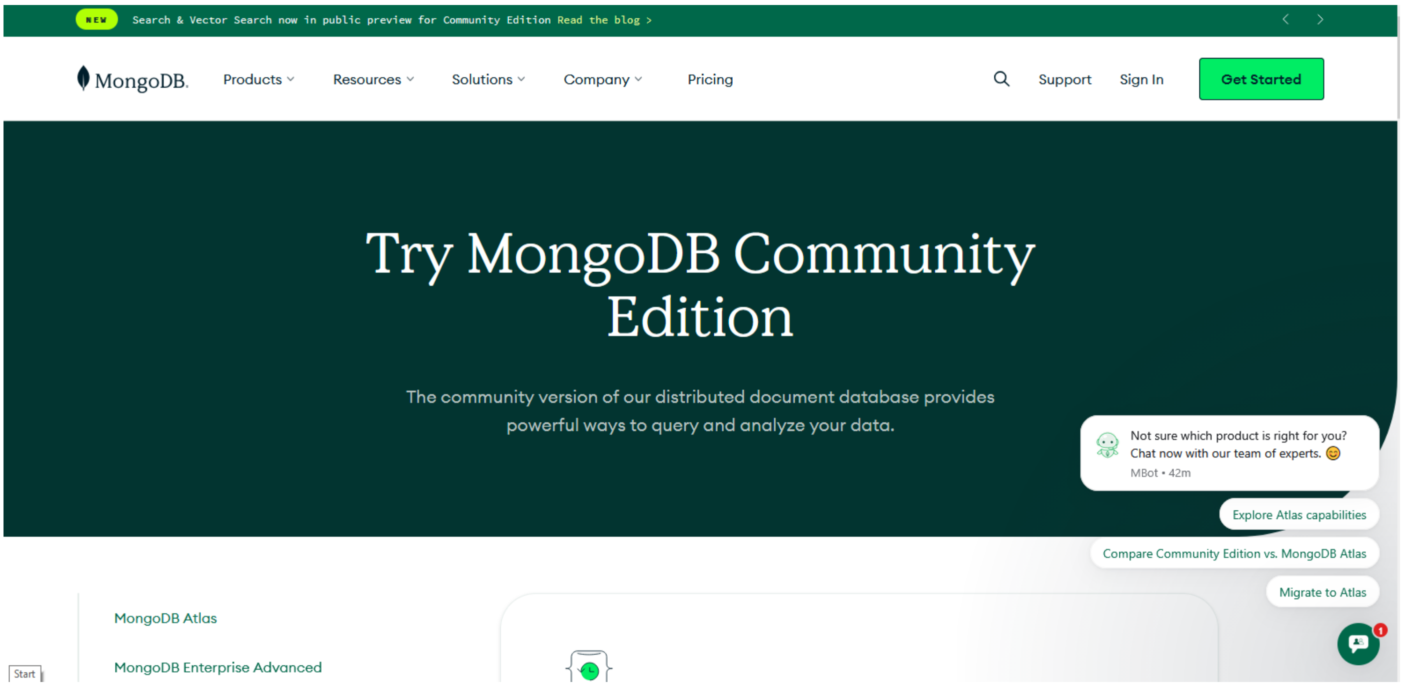
MongoDB Guide

- Emam Saimon

QUICK SETUP:

STEP	ACTION
1	Go to: https://www.mongodb.com/try/download/community
2	Choose **Windows/macOS/Linux** → Download
3	Install (default path is fine)
4	**Compass** is included in the installer (tick it)
5	Open **MongoDB Compass** → It auto-detects local server



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The community version of our distributed document database provides powerful ways to query and analyze your data.

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Explore Atlas capabilities

Compare Community Edition vs. MongoDB Atlas

Migrate to Atlas

MongoDB Atlas

MongoDB Enterprise Advanced

Your local MongoDB is running on mongodb://localhost:27027 (default port)

PART 1: MongoDB CONCEPTS – A to Z (Simple Words)

Letter	Concept	Easy Explanation
A	**Atlas**	MongoDB in the cloud (free tier available)
B	**BSON**	Binary JSON – how MongoDB stores data
C	**Collection**	Like a table in SQL, but **no fixed schema**
D	**Document**	One record = JSON-like object `{name: "Rahim", age: 25}`
E	**Embedded Documents**	Nesting: `{name: "Karim", address: {city: "Dhaka"}}`
F	**Field**	Key in a document (e.g., `age`)
G	**GridFS**	Store big files (>16MB) like videos
H	**_id**	Auto-generated unique ID (`ObjectId`)
I	**Index**	Speeds up queries (like book index)
J	**JSON**	Human-readable format MongoDB uses
K	**Key**	Same as Field
L	**Limit**	Show only N results
M	**MongoDB Shell (`mongosh`)**	Command line to talk to DB
N	**Namespace**	`database.collection`
O	**ObjectId**	12-byte unique ID with timestamp
P	**Projection**	Pick only some fields in result
Q	**Query**	Find data (`db.users.find({age: 25})`)
R	**Replica Set**	Backup copies for high availability
S	**Schema**	Flexible – no strict columns
T	**TTL Index**	Auto-delete docs after time
U	**Update**	Change existing docs
V	**Validation**	Enforce rules on insert/update
W	**Write Concern**	How many nodes must confirm write
X	**Explain**	See query performance
Y	**Aggregation**	Group, sum, filter like SQL `GROUP BY`
Z	**Zones (Sharding)**	Split data across servers

macOS (Homebrew)

```
brew tap mongodb/brew
brew install mongodb-community
```

Ubuntu/Debian

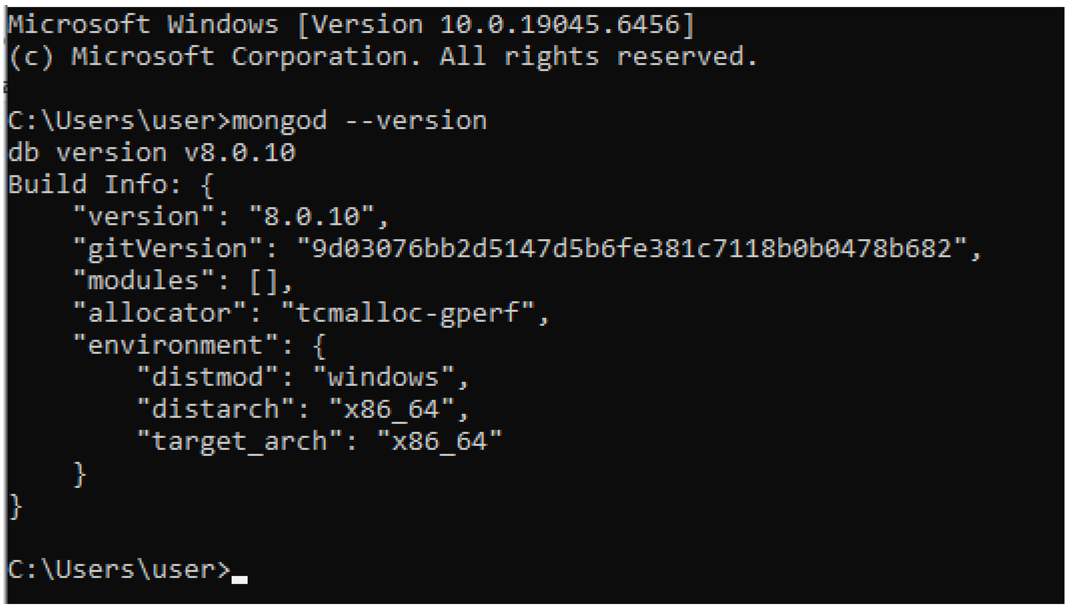
```
sudo apt-get install -y mongodb-org
```

Check Version & Start Server

1. Open Command Prompt

Press:
Win + R → type `cmd` → Enter

```
mongod --version

//or

mongo --version
```

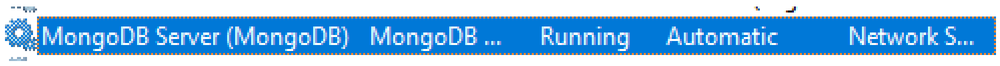


```
Microsoft Windows [Version 10.0.19045.6456]
(c) Microsoft Corporation. All rights reserved.

C:\Users\user>mongod --version
db version v8.0.10
Build Info: {
    "version": "8.0.10",
    "gitVersion": "9d03076bb2d5147d5b6fe381c7118b0b0478b682",
    "modules": [],
    "allocator": "tcmalloc-gperf",
    "environment": {
        "distmod": "windows",
        "distarch": "x86_64",
        "target_arch": "x86_64"
    }
}

C:\Users\user>_
```

Check MongoDB Service (Server running or not)

services.msc

Find **MongoDB Server**
If it exists → MongoDB is installed.



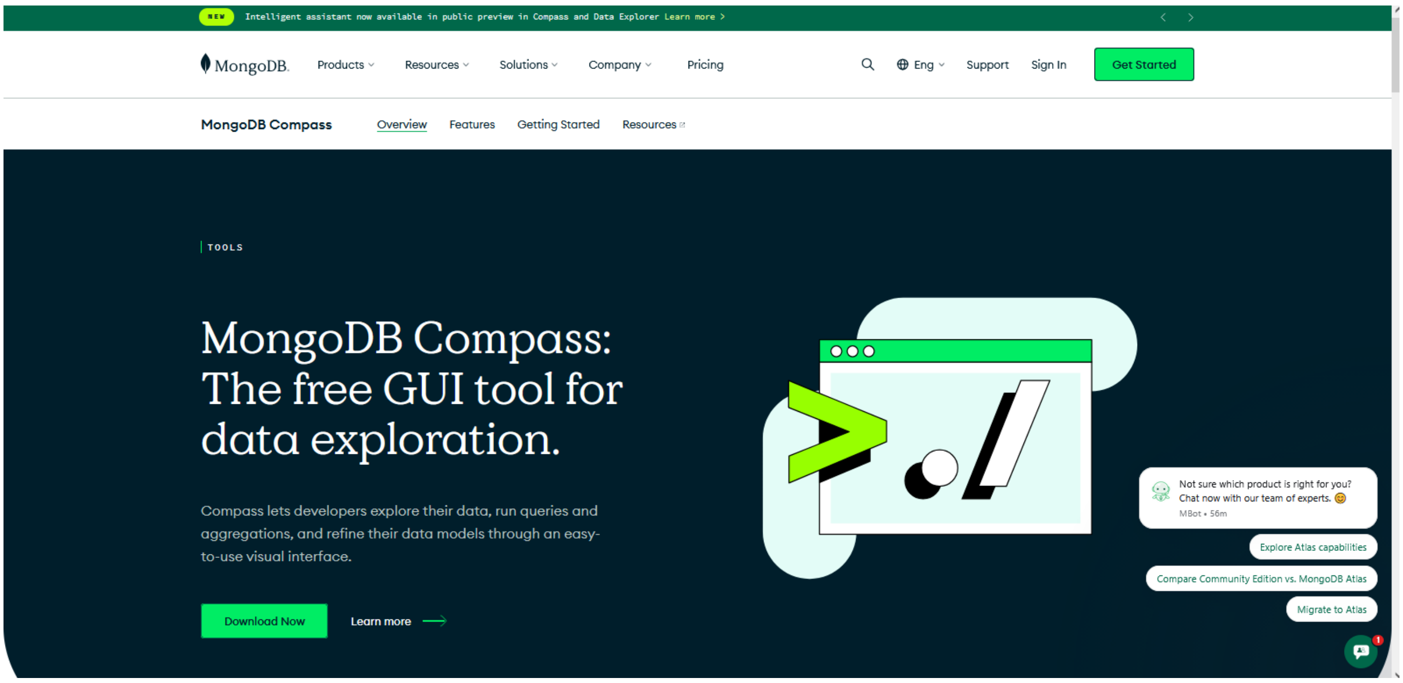
MongoDB Server (MongoDB) MongoDB ... Running Automatic Network S...

MongoDB Compass – The GUI Tool

1. **Open MongoDB Compass** (installed with MongoDB or download separately).
2. Click **"Connect"** to mongodb://localhost:27017.
3. You'll see:
    - List of databases
    - Collections (like tables)
    - Documents (like rows)

Compass CRUD (Easy Way)

Action	How in Compass
Create DB	Click **"Create Database"**
Insert Doc	Click collection → **ADD DATA** → **Insert Document**
Read	Click collection → see list
Update	Click pencil icon
Delete	Click trash icon



Intelligent assistant now available in public preview in Compass and Data Explorer

MongoDB Compass: The free GUI tool for data exploration.

Compass lets developers explore their data, run queries and aggregations, and refine their data models through an easy-to-use visual interface.

Not sure which product is right for you? Chat now with our team of experts. 😊
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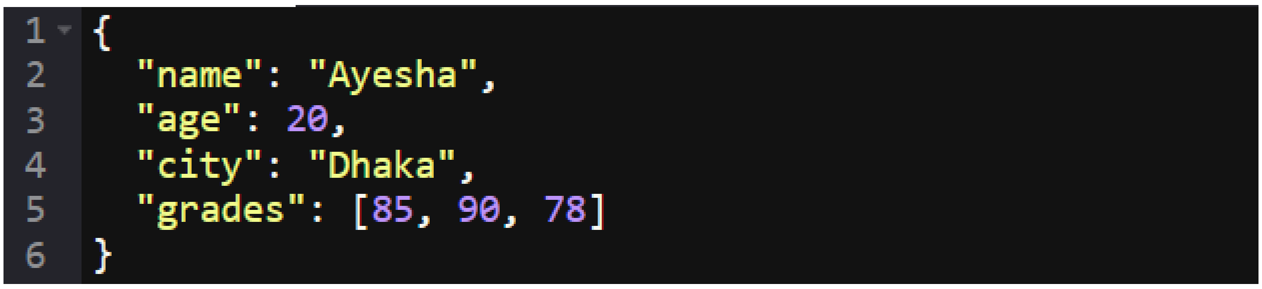
Create Database & Collection

1. Click **+ Create Database**
    - DB Name: school
    - Collection: students
2. Click **Create**

Insert Document (GUI)

- Click students → **INSERT DOCUMENT**



```
{
  "name": "Ayesha",
  "age": 20,
  "city": "Dhaka",
  "grades": [85, 90, 78]
}
```

Query Visually

- Filter box: { "age": { "$gt": 18 } }
- Projection: name, age

5. Aggregation Pipeline (GUI)

1. Click **Aggregations** tab
2. Add stage: $match → { age: { $gte: 20 } }
3. Add stage: $group → _id: "$city", count: { $sum: 1 }

Mongo Shell (mongosh) – ALL COMMANDS (Easy!)

Open terminal → type mongosh

A. Database Commands

Command	Meaning	Example
`use dbname`	Switch/create DB	`use school`
`show dbs`	List databases	`show dbs`
`db`	Current DB	`db → school`
`db.dropDatabase()`	Delete current DB	`db.dropDatabase()`

B. Collection Commands

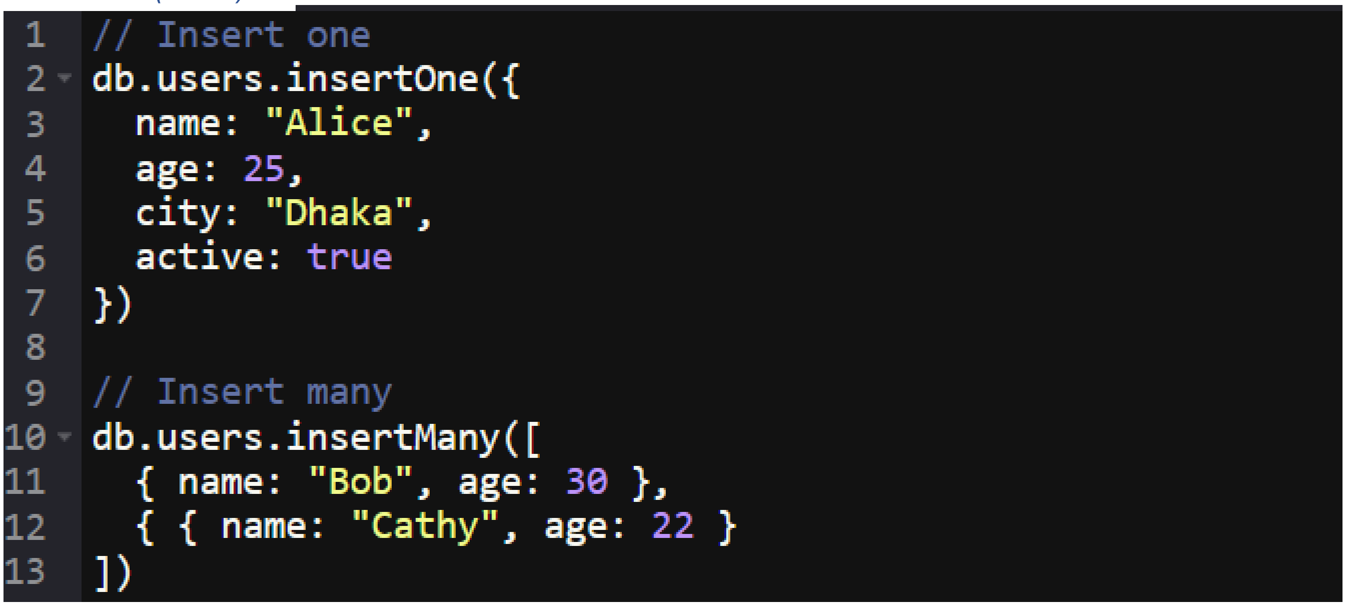
Command	Meaning	Example
`db.createCollection("name")`	Make collection	`db.createCollection("teachers")`
`show collections`	List collections	`show collections`
`db.collectioname.drop()`	Delete collection	`db.students.drop()`

Basic Command:

Command	Meaning
`show dbs`	List databases
`use mydb`	Switch/create DB
`show collections`	List collections
`db`	Current database

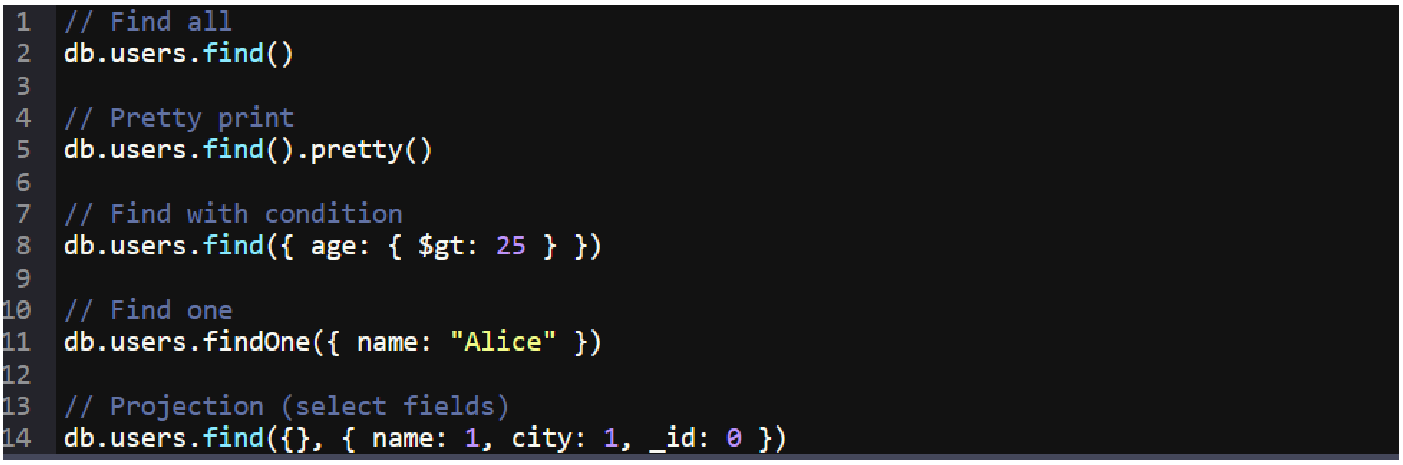
CRUD Operations (Pro Level)

C – Create (Insert)



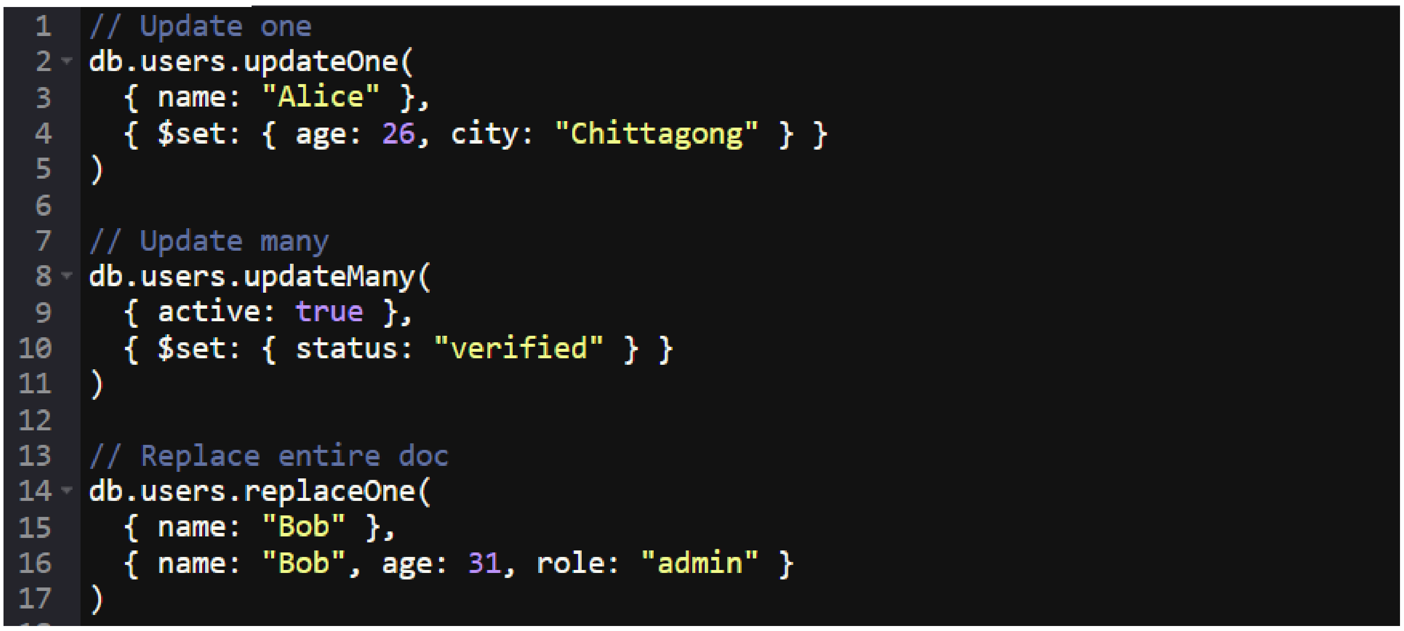
```
// Insert one
db.users.insertOne({
  name: "Alice",
  age: 25,
  city: "Dhaka",
  active: true
})

// Insert many
db.users.insertMany([
  { name: "Bob", age: 30 },
  { { name: "Cathy", age: 22 }
])
```

R – Read (Find)



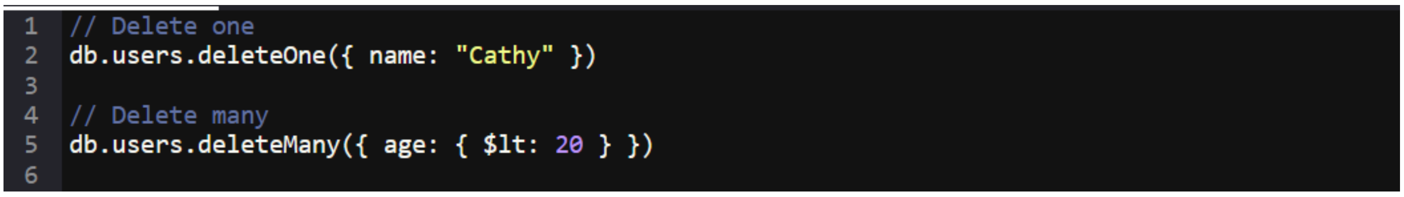
```
// Find all
db.users.find()

// Pretty print
db.users.find().pretty()

// Find with condition
db.users.find({ age: { $gt: 25 } })

// Find one
db.users.findOne({ name: "Alice" })

// Projection (select fields)
db.users.find({}, { name: 1, city: 1, _id: 0 })
```

U – Update



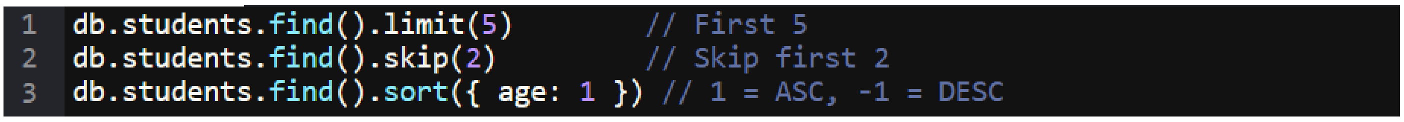
```
// Update one
db.users.updateOne(
  { name: "Alice" },
  { $set: { age: 26, city: "Chittagong" } }
)

// Update many
db.users.updateMany(
  { active: true },
  { $set: { status: "verified" } }
)

// Replace entire doc
db.users.replaceOne(
  { name: "Bob" },
  { name: "Bob", age: 31, role: "admin" }
)
```

D – Delete



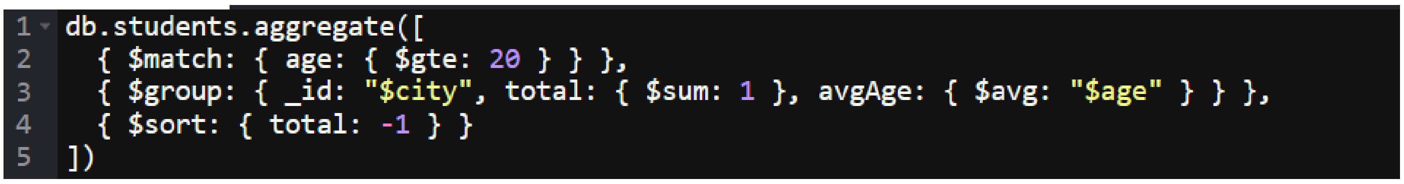
```
// Delete one
db.users.deleteOne({ name: "Cathy" })

// Delete many
db.users.deleteMany({ age: { $lt: 20 } })
```

LIMIT, SKIP, SORT



```
db.students.find().limit(5)        // First 5
db.students.find().skip(2)         // Skip first 2
db.students.find().sort({ age: 1 }) // 1 = ASC, -1 = DESC
```

AGGREGATION (Like SQL GROUP BY)

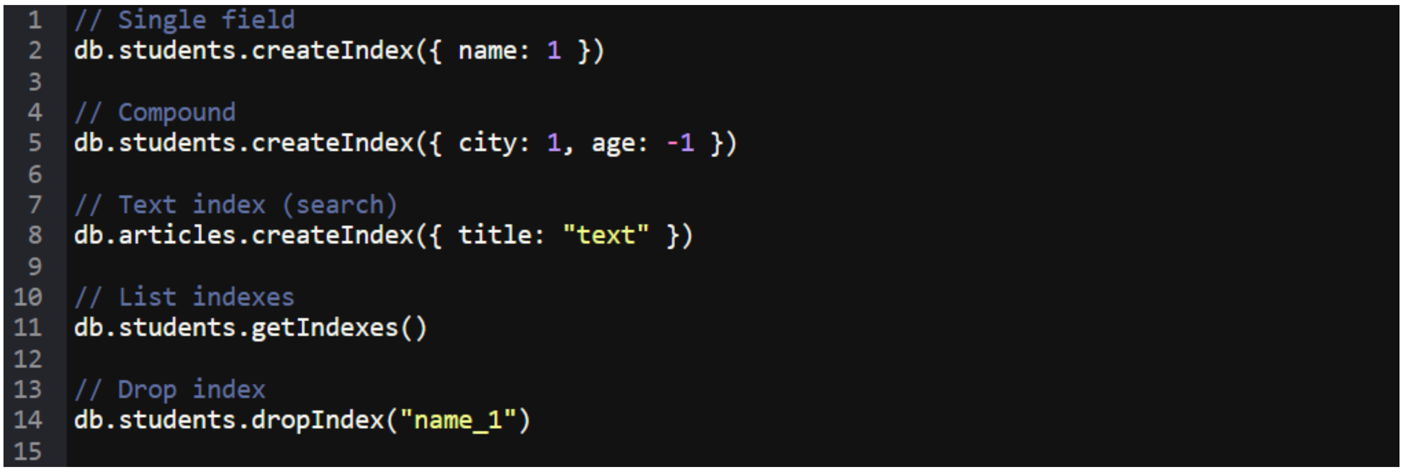


```
db.students.aggregate([
  { $match: { age: { $gte: 20 } } },
  { $group: { _id: "$city", total: { $sum: 1 }, avgAge: { $avg: "$age" } } },
  { $sort: { total: -1 } }
])
```

Aggregation Stages

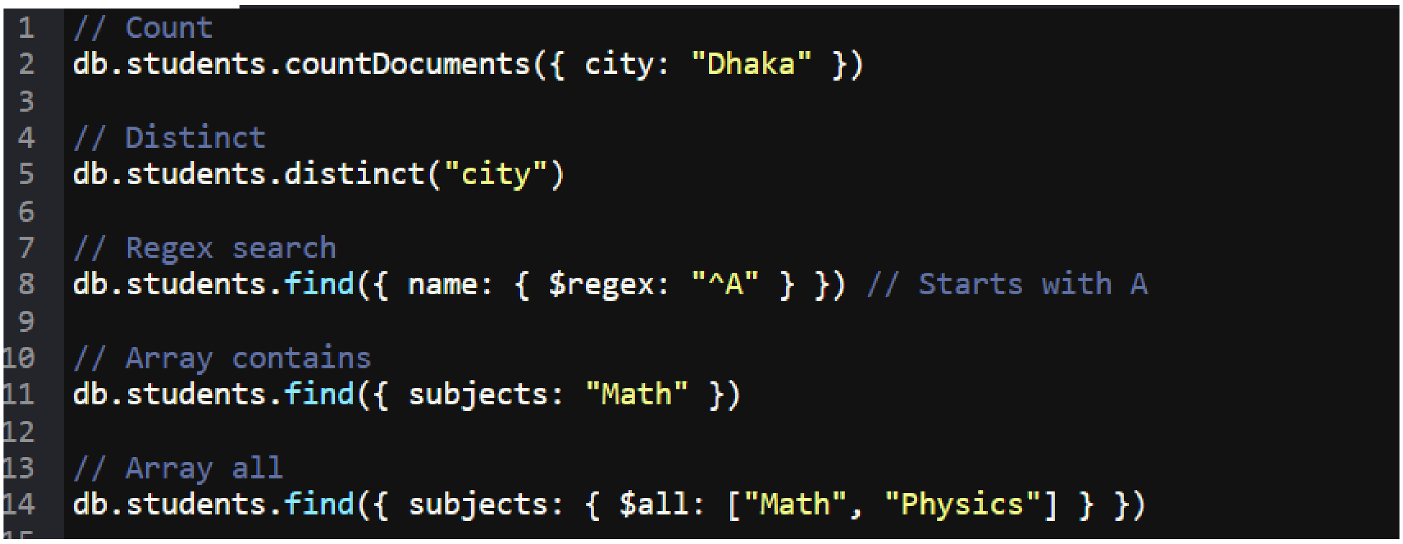
Stage	Meaning
`$match`	Filter
`$group`	Group + calculate
`$project`	Select/reshape
`$sort`	Order
`$limit`	Top N
`$unwind`	Expand array

INDEXES (Speed Up Queries)



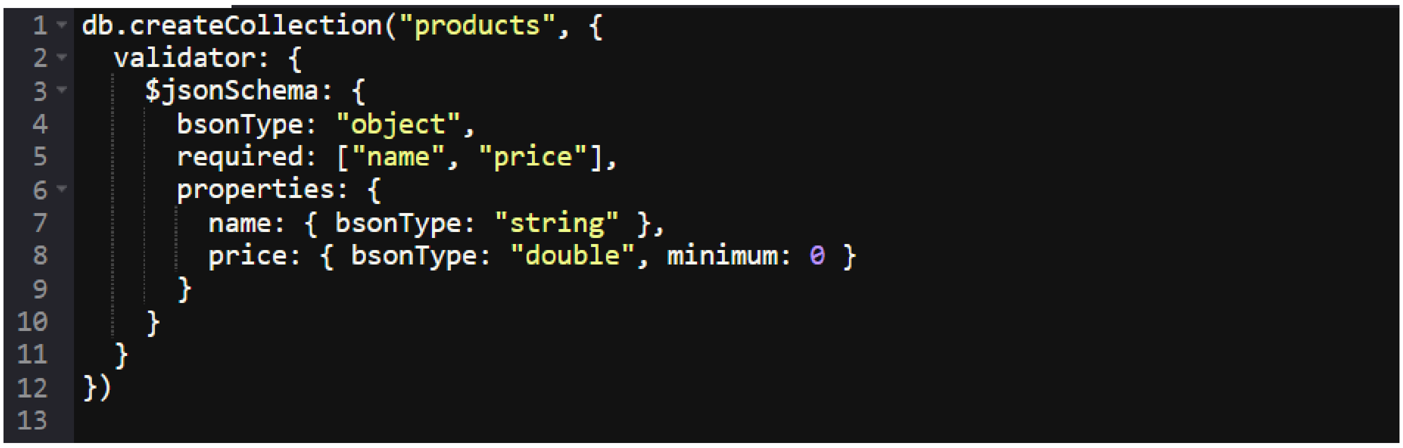
```
// Single field
db.students.createIndex({ name: 1 })

// Compound
db.students.createIndex({ city: 1, age: -1 })

// Text index (search)
db.articles.createIndex({ title: "text" })

// List indexes
db.students.getIndexes()

// Drop index
db.students.dropIndex("name_1")

```

SPECIAL QUERIES



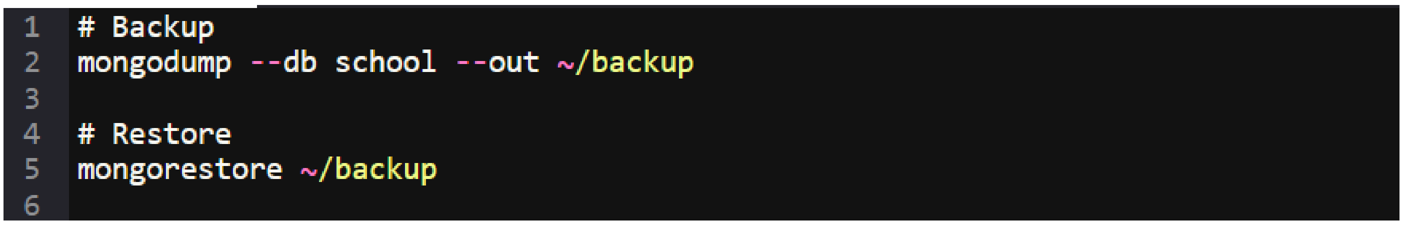
```
// Count
db.students.countDocuments({ city: "Dhaka" })

// Distinct
db.students.distinct("city")

// Regex search
db.students.find({ name: { $regex: "^A" } }) // Starts with A

// Array contains
db.students.find({ subjects: "Math" })

// Array all
db.students.find({ subjects: { $all: ["Math", "Physics"] } })
```

VALIDATION (Enforce Rules)



```
db.createCollection("products", {
  validator: {
    $jsonSchema: {
      bsonType: "object",
      required: ["name", "price"],
      properties: {
        name: { bsonType: "string" },
        price: { bsonType: "double", minimum: 0 }
      }
    }
  }
})
```

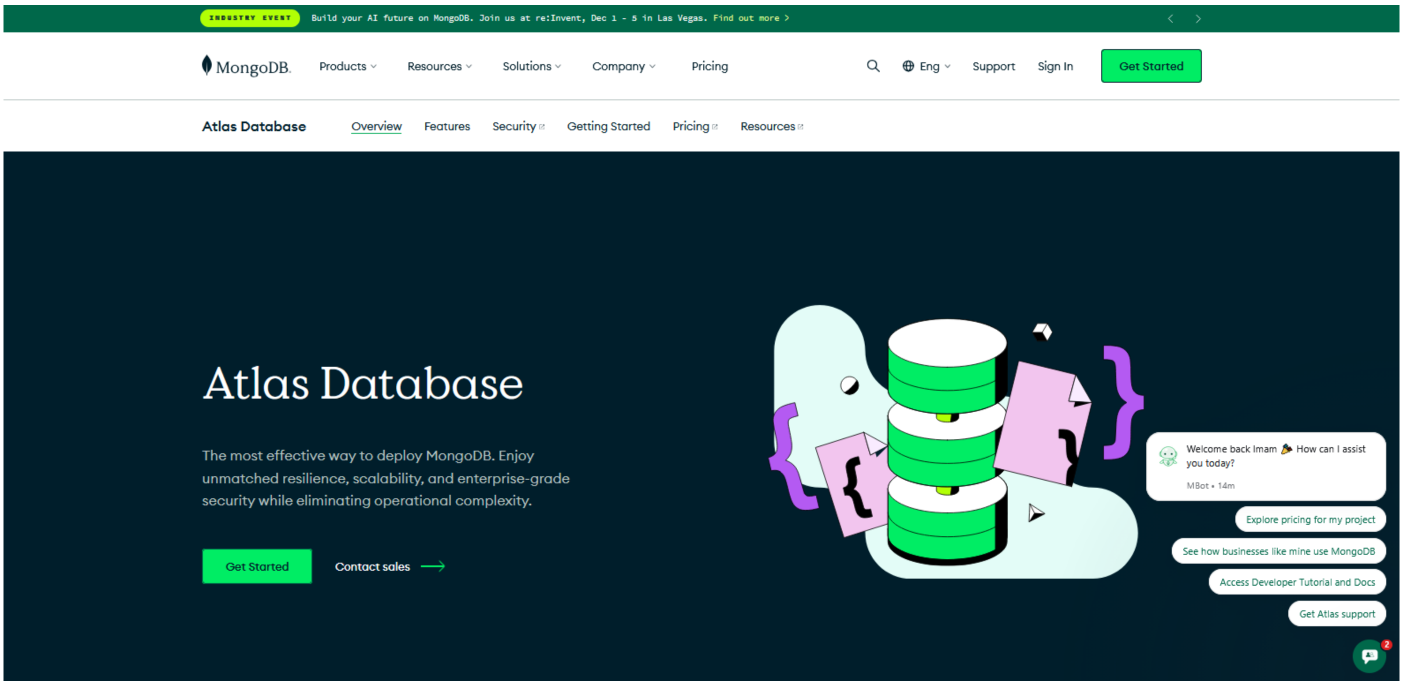
BACKUP & RESTORE (Local)



```
# Backup
mongodump --db school --out ~/backup

# Restore
mongorestore ~/backup
```

Pro Shell Commands (A to Z Cheat Sheet)

Command	Use
`db.collection.aggregate([...])`	Powerful data pipelines
`db.collection.createIndex({ field: 1 })`	Speed up queries
`db.collection.drop()`	Delete collection
`db.dropDatabase()`	Delete entire DB
`db.stats()`	DB size & stats
`db.collection.countDocuments({})`	Count docs
`db.collection.find().limit(5)`	Limit results
`db.collection.find().sort({ age: -1 })`	Sort descending
`db.collection.distinct("city")`	Unique values
`db.runCommand({ collMod: "users", validator: { ... } })`	Schema validation



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Atlas Database

The most effective way to deploy MongoDB. Enjoy unmatched resilience, scalability, and enterprise-grade security while eliminating operational complexity.

Welcome back Imam 🎉 How can I assist you today?

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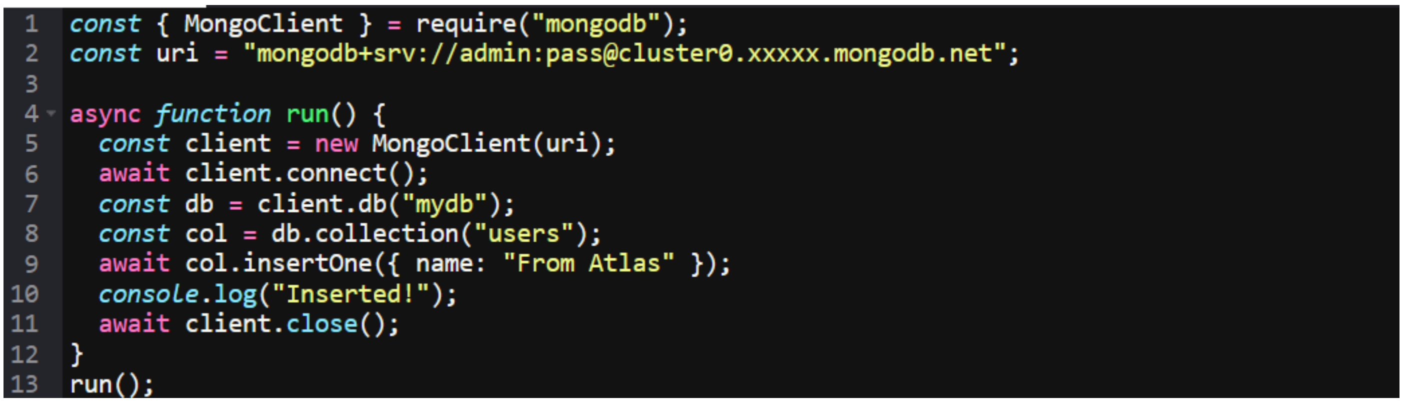
MongoDB Atlas (Cloud) – Free Forever

1. Go to: https://cloud.mongodb.com
2. Sign up (Google/GitHub)
3. Create **Cluster** → **M0 Free**
4. Whitelist IP: 0.0.0.0/0 (for learning)
5. Create user: admin / password123
6. Get connection string:

mongodb+srv://admin:password123@cluster0.xxxxx.mongodb.net/

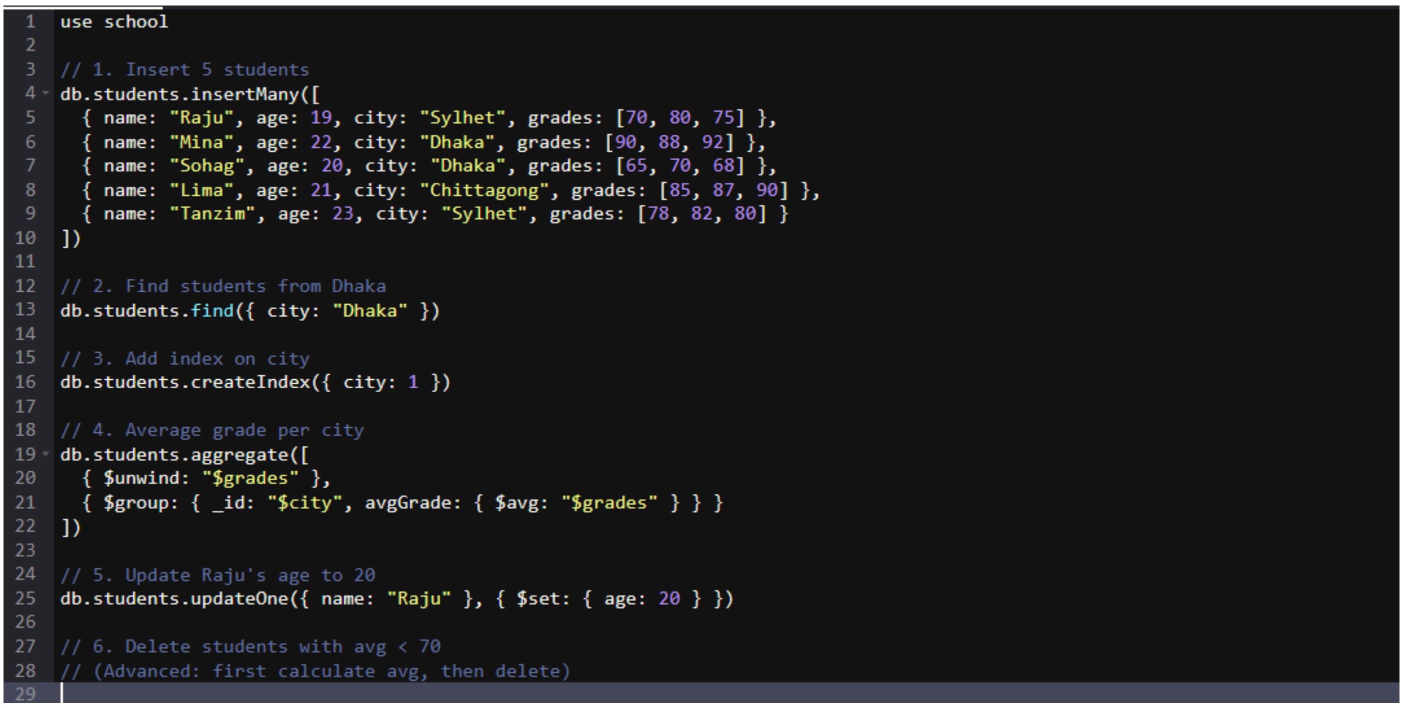
7. Use in Compass or mongosh

Use in Code (Node.js Example)



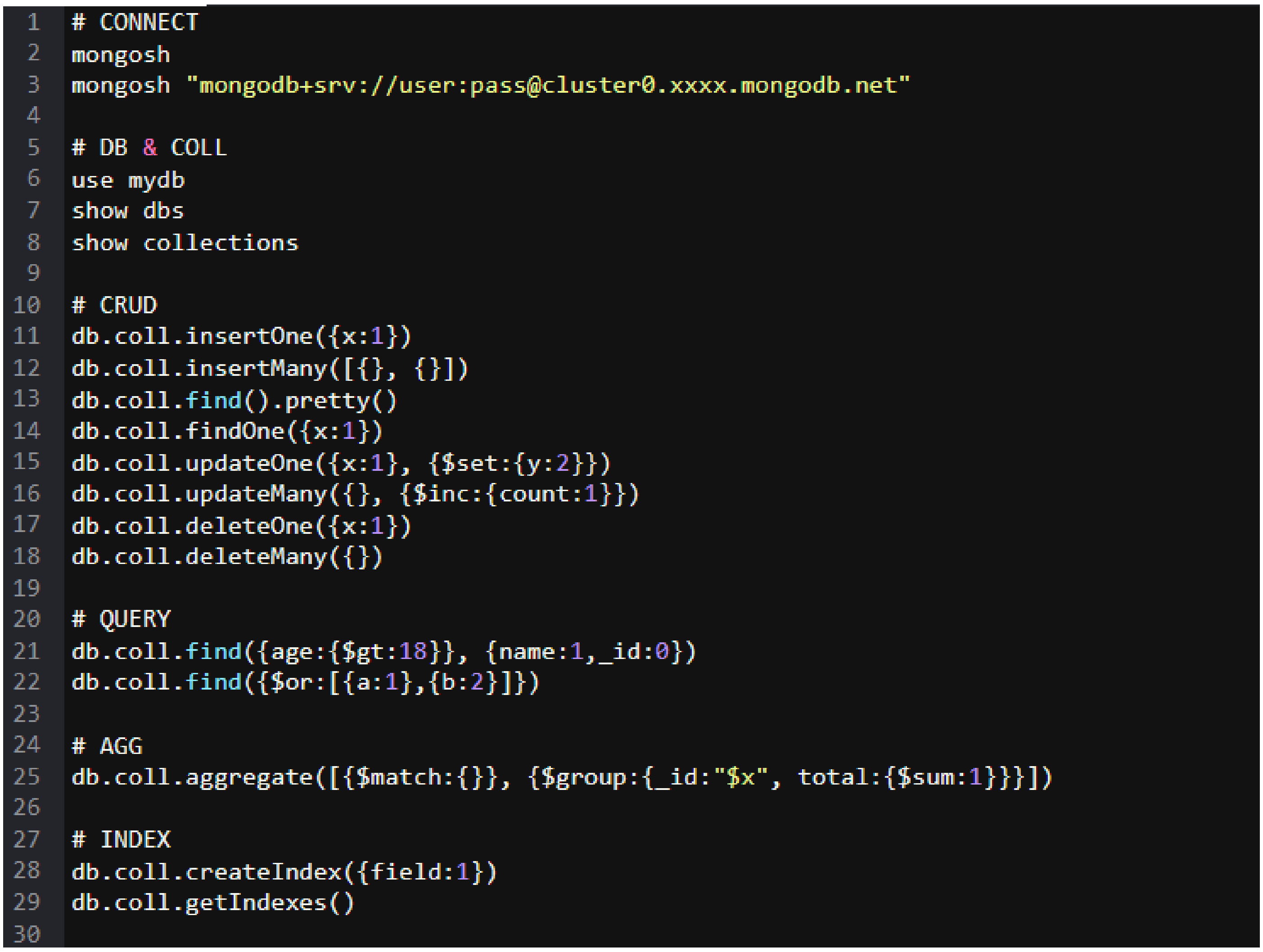
```
const { MongoClient } = require("mongodb");
const uri = "mongodb+srv://admin:pass@cluster0.xxxxx.mongodb.net";

async function run() {
  const client = new MongoClient(uri);
  await client.connect();
  const db = client.db("mydb");
  const col = db.collection("users");
  await col.insertOne({ name: "From Atlas" });
  console.log("Inserted!");
  await client.close();
}
run();
```

Mini Project (Practice!)



```
use school

// 1. Insert 5 students
db.students.insertMany([
  { name: "Raju", age: 19, city: "Sylhet", grades: [70, 80, 75] },
  { name: "Mina", age: 22, city: "Dhaka", grades: [90, 88, 92] },
  { name: "Sohag", age: 20, city: "Dhaka", grades: [65, 70, 68] },
  { name: "Lima", age: 21, city: "Chittagong", grades: [85, 87, 90] },
  { name: "Tanzim", age: 23, city: "Sylhet", grades: [78, 82, 80] }
])

// 2. Find students from Dhaka
db.students.find({ city: "Dhaka" })

// 3. Add index on city
db.students.createIndex({ city: 1 })

// 4. Average grade per city
db.students.aggregate([
  { $unwind: "$grades" },
  { $group: { _id: "$city", avgGrade: { $avg: "$grades" } } }
])

// 5. Update Raju's age to 20
db.students.updateOne({ name: "Raju" }, { $set: { age: 20 } })

// 6. Delete students with avg < 70
// (Advanced: first calculate avg, then delete)
```

Cheat Sheet (Print & Stick!)



```
# CONNECT
mongosh
mongosh "mongodb+srv://user:pass@cluster0.xxxx.mongodb.net"

# DB & COLL
use mydb
show dbs
show collections

# CRUD
db.coll.insertOne({x:1})
db.coll.insertMany([{}, {}])
db.coll.find().pretty()
db.coll.findOne({x:1})
db.coll.updateOne({x:1}, {$set:{y:2}})
db.coll.updateMany({}, {$inc:{count:1}})
db.coll.deleteOne({x:1})
db.coll.deleteMany({})

# QUERY
db.coll.find({age:{$gt:18}}, {name:1,_id:0})
db.coll.find({$or:[{a:1},{b:2}]})

# AGG
db.coll.aggregate([{$match:{}}, {$group:{_id:"$x", total:{$sum:1}}}])

# INDEX
db.coll.createIndex({field:1})
db.coll.getIndexes()
```