Full Stack Engineer

Module 3.1: Intro to MongoDB

Prerequisite

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Install MongoDB Community Edition

Ensure that you have installed MongoDB Community Edition before the classroom started. Follow instructions in the pages below:

- Linux
- MacOS
- Windows

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Before we begin... let's start with a question: what is a database?

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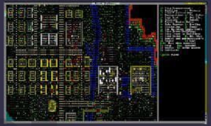
Database Alignment Chart

	Access Purist (must be queryable with a query language)	Access Neutral (must be queryable with a language)	Access Radical (queryable in any way)
Function Purist (must contain digital data)	PostgresSQL is a database	Excel is a database	 Dwarf Fortress is a database
Function Neutral (must contain information)	A library is a database	A senior engineer is a database	A file cabinet is a database
Function Radical (can contain anything)	Battleship is a database	Subway checkout counter is a database	A fridge is a database

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MongoDB

A document-oriented, general purpose database.

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Documents (1)

- A document is the basic unit of data for MongoDB
- An ordered set of keys with associated values
- Representation in programming languages varies: map, hash, dictionary
- In Javascript, documents are represented as objects

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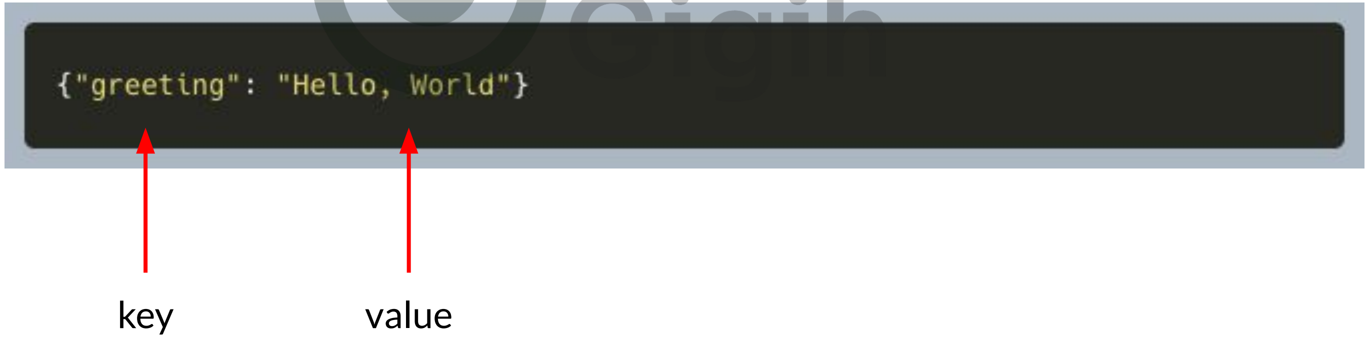
Documents (2)

An example of a simple document:



```
{"greeting": "Hello, World"}
```

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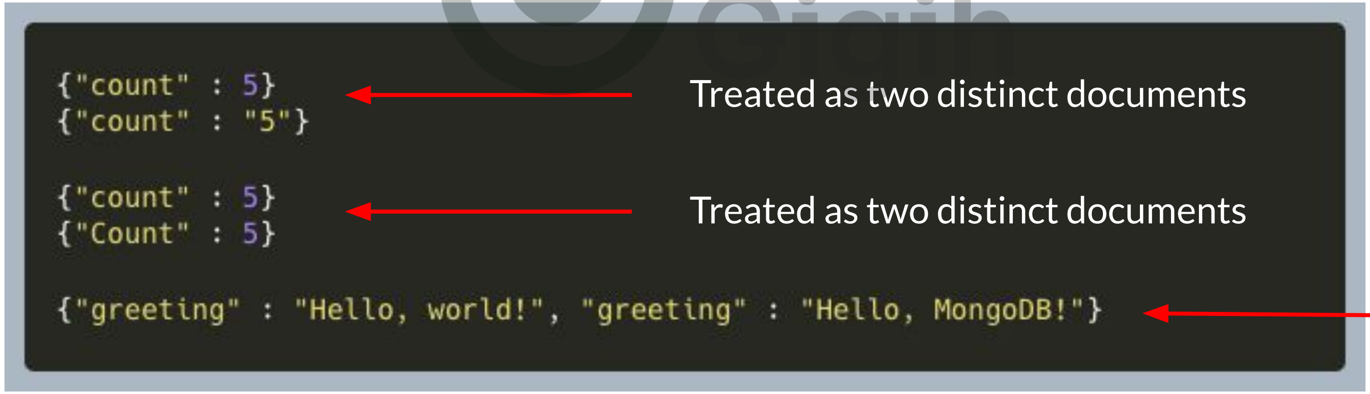
Documents (3)

Type-sensitive, case-sensitive, can't contain duplicate keys



```
{"count" : 5}
{"count" : "5"}

{"count" : 5}
{"Count" : 5}

{"greeting" : "Hello, world!", "greeting" : "Hello, MongoDB!"}
```

Treated as two distinct documents

Treated as two distinct documents

not a legal document

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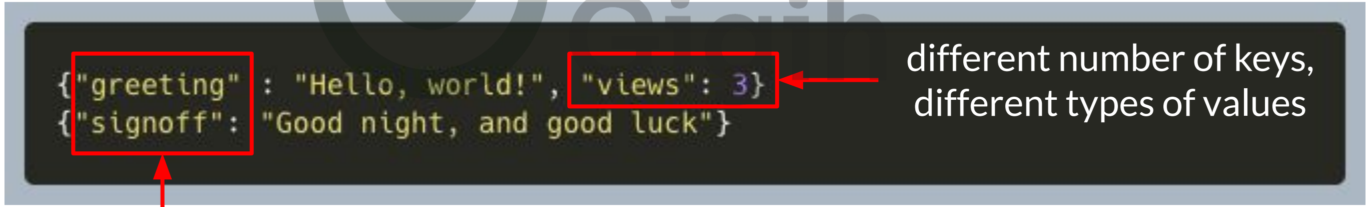
Collections (1)

A group of documents with dynamic schemas:



```
{"greeting" : "Hello, world!", "views": 3}
{"signoff": "Good night, and good luck"}
```

different number of keys, different types of values

different keys

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Collections (2)

Naming:

- Empty string ("") is not a valid collection name
- Collection names may not contain the character \0 (the null character)
- You should not create any collections with names that start with “system.”
- Collections should not contain the reserved character $ in their names

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Subcollections

One convention for organizing collections is to use namespaced subcollections separated by the "." character.

For example, an application containing a blog might have a collection named "blog.posts" and a separate collection named "blog.authors". This is for organizational purposes only—there is no relationship between the blog collection (it doesn't even have to exist) and its subcollections.

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Databases (3)

In addition to grouping documents by collection, MongoDB groups collections into databases.

A single instance of MongoDB can host several databases, each grouping together zero or more collections.

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Databases (3)

Naming:

- The empty string (“”) is not a valid database name.
- A database name cannot contain any of these characters: /, \, ., ", *, <, >, :, |, ?, $, (a single space), or \0 (the null character)
- Database names are case-insensitive
- Database names are limited to a maximum of 64 bytes

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Document-Oriented vs Relational Database

Document-Oriented Database	Relational Database
Document	Row
Collection	Table
Database	Database

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MongoDB Shell

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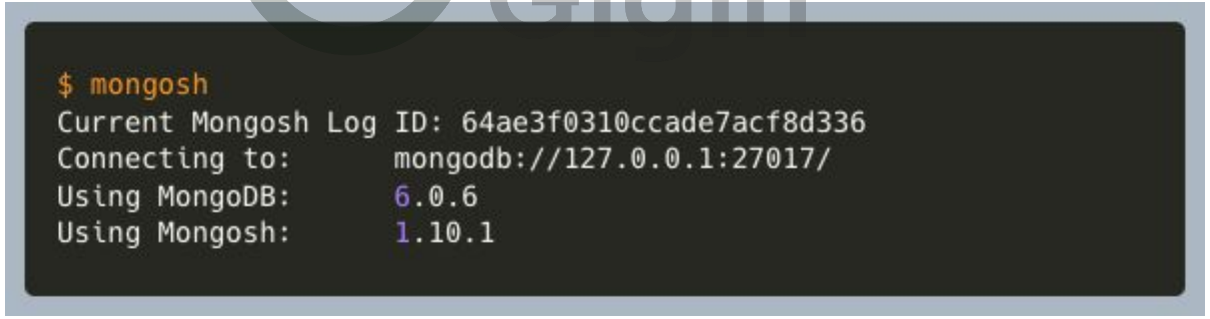
A full-featured JavaScript interpreter, capable of running arbitrary JavaScript programs



```
$ mongosh
Current Mongosh Log ID: 64ae3f0310ccade7acf8d336
Connecting to:          mongodb://127.0.0.1:27017/
Using MongoDB:          6.0.6
Using Mongosh:          1.10.1
```

MongoDB Shell

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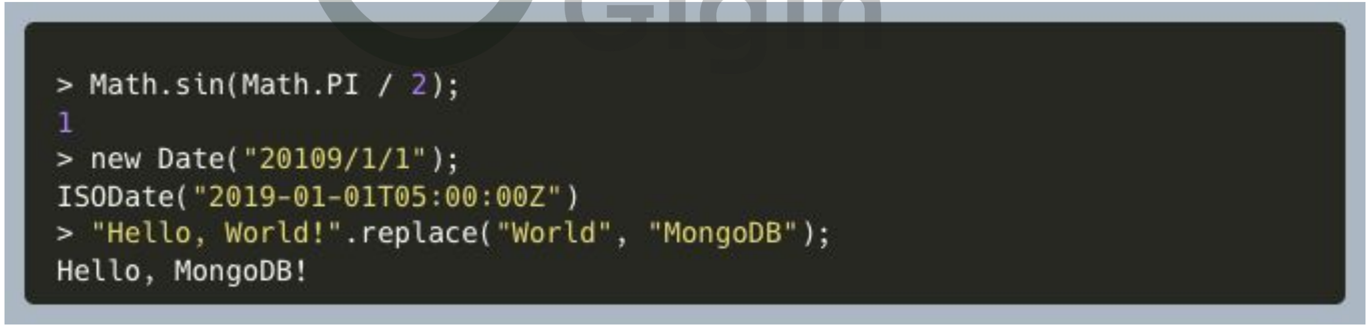
Example of running standard Javascript libraries in MongoDB shell:



```
> Math.sin(Math.PI / 2);
1
> new Date("20109/1/1");
ISODate("2019-01-01T05:00:00Z")
> "Hello, World!".replace("World", "MongoDB");
Hello, MongoDB!
```

MongoDB Shell

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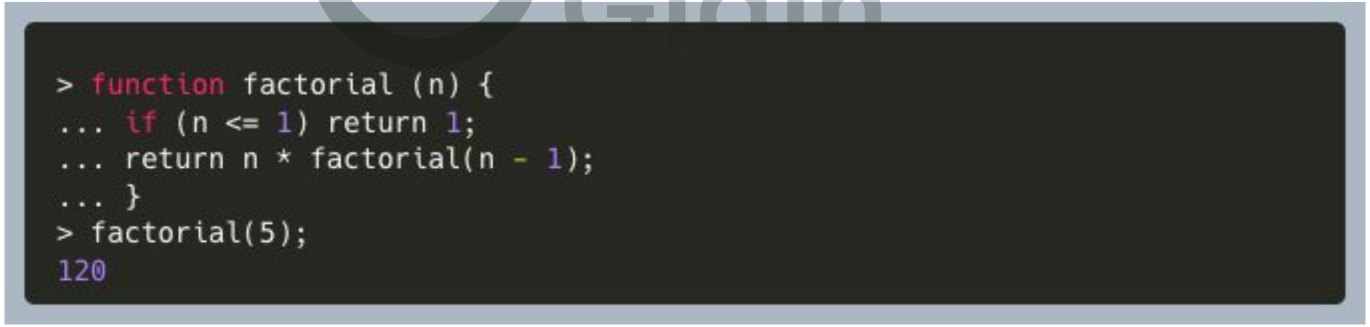
Example of defining and calling a Javascript function in MongoDB shell:



```
> function factorial (n) {
... if (n <= 1) return 1;
... return n * factorial(n - 1);
... }
> factorial(5);
120
```

Basic Operations - Create a Database

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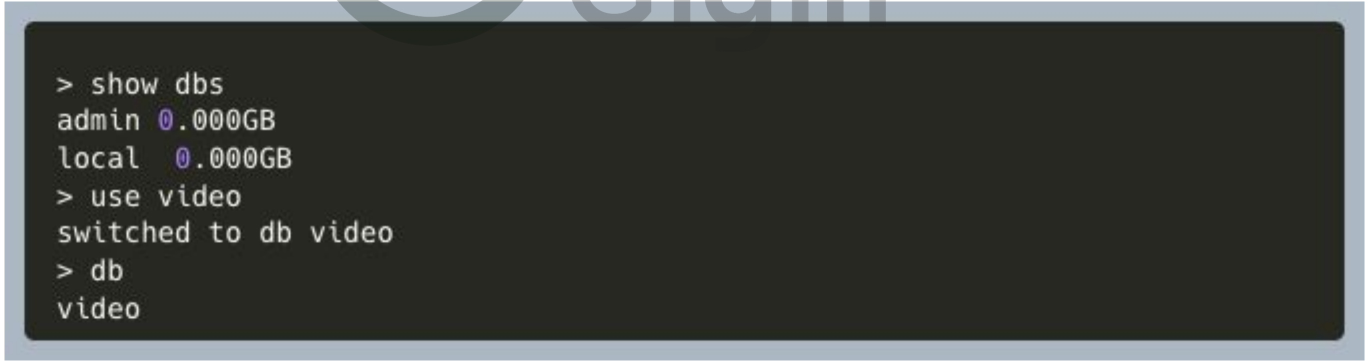
No “create” command in MongoDB, to create a database, simply switch context to a non-existing database:



```
> show dbs
admin 0.000GB
local  0.000GB
> use video
switched to db video
> db
video
```

Basic Operations - Create a Collection

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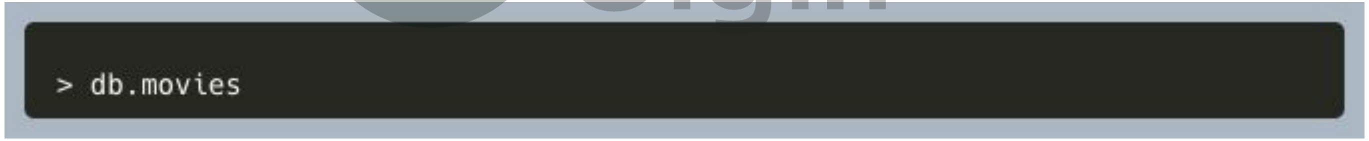
While there is a command to create a collection in MongoDB, we can also simply use a non-existent collection to create one:



```
> db.movies
```

Basic Operations - Create a Collection

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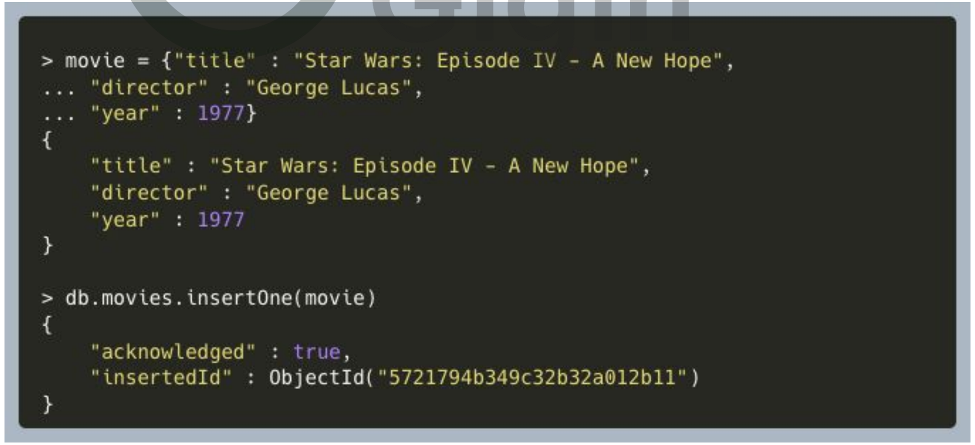
The insertOne function adds a document to a collection. For example, suppose we want to store a movie. First, we'll create a local variable called movie that is a JavaScript object representing our document. It will have the keys "title", "director", and "year" (the year it was released):



```
> movie = {"title" : "Star Wars: Episode IV - A New Hope",
... "director" : "George Lucas",
... "year" : 1977}
{
    "title" : "Star Wars: Episode IV - A New Hope",
    "director" : "George Lucas",
    "year" : 1977
}

> db.movies.insertOne(movie)
{
    "acknowledged" : true,
    "insertedId" : ObjectId("5721794b349c32b32a012b11")
}
```

Basic Operations - Read a Collection

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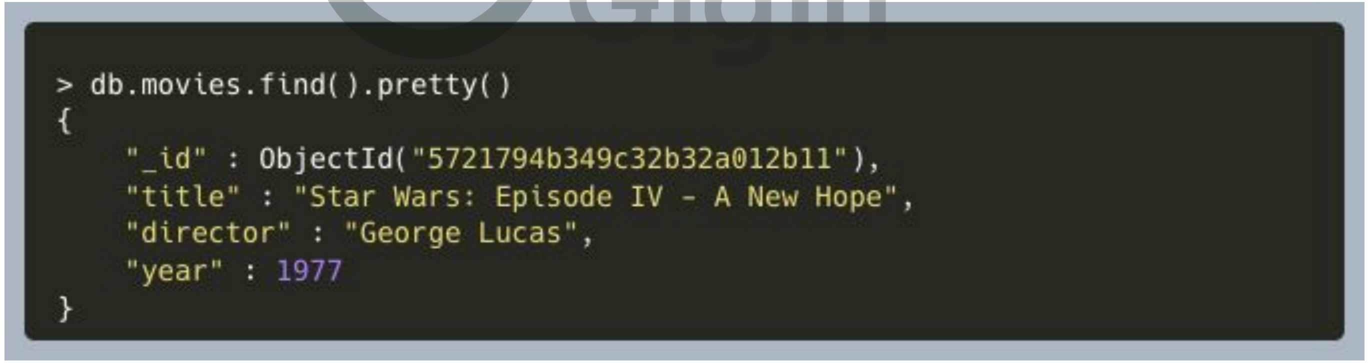
The find function reads an entire collection. The following example can be used to read the entire collection of movies:



```
> db.movies.find().pretty()
{
    "_id" : ObjectId("5721794b349c32b32a012b11"),
    "title" : "Star Wars: Episode IV - A New Hope",
    "director" : "George Lucas",
    "year" : 1977
}
```

Basic Operations - Read a Document

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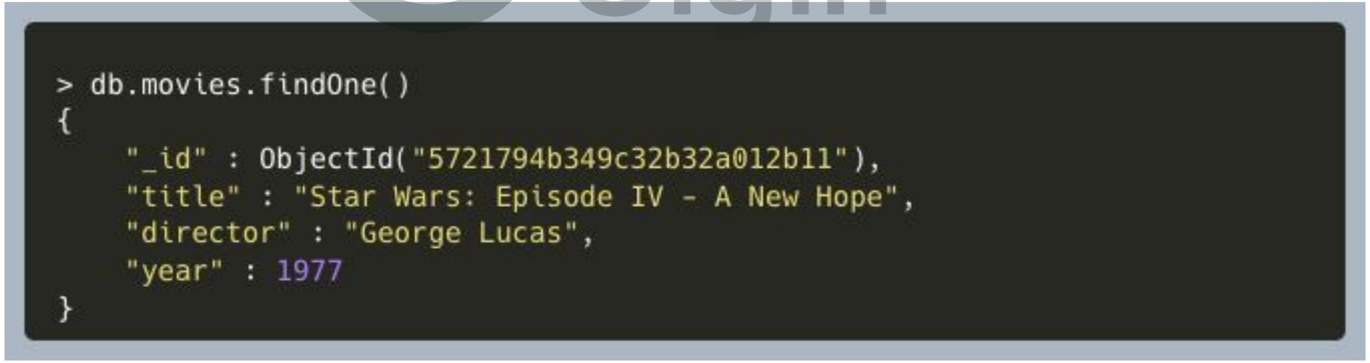
The findOne function reads a document from a collection. The following snippet will get us the first document in movies collection:



```
> db.movies.findOne()
{
    "_id" : ObjectId("5721794b349c32b32a012b11"),
    "title" : "Star Wars: Episode IV - A New Hope",
    "director" : "George Lucas",
    "year" : 1977
}
```

Basic Operations - Update a Document (1)

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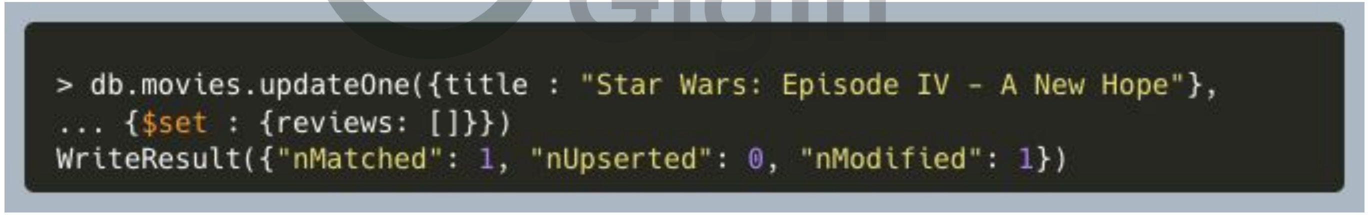
To update a document, we can use updateOne function:



```
> db.movies.updateOne({title : "Star Wars: Episode IV - A New Hope"},
... {$set : {reviews: []}})
WriteResult({"nMatched": 1, "nUpserted": 0, "nModified": 1})
```

Basic Operations - Update a Document (2)

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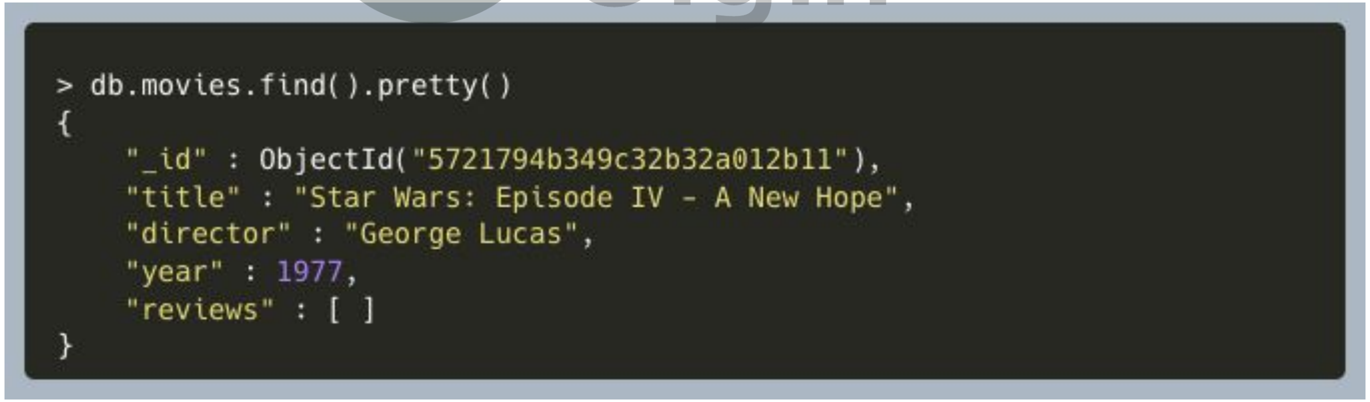
As the result of the previous snippet, if we try to read the first document in movies collection, we'll get the following output:



```
> db.movies.find().pretty()
{
    "_id" : ObjectId("5721794b349c32b32a012b11"),
    "title" : "Star Wars: Episode IV - A New Hope",
    "director" : "George Lucas",
    "year" : 1977,
    "reviews" : [ ]
}
```

Basic Operations - Delete a Document

To delete a document, we can use deleteOne function as follows:

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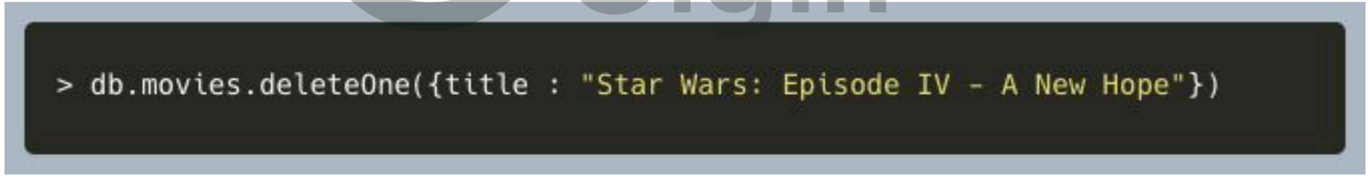

```
> db.movies.deleteOne({title : "Star Wars: Episode IV - A New Hope"})
```

Basic Data Types (1)

Documents in MongoDB can be thought of as “JSON-like” in that they are conceptually similar to objects in JavaScript. JSON is a simple representation of data, its specification can be described in about one paragraph. This is a good thing as it’s easy to understand, parse, and remember. On the other hand, JSON’s expressive capabilities are limited because its only types are:

- null
- boolean
- numeric
- string
- array
- object

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Basic Data Types (2)

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MongoDB adds support for a number of additional data types while keeping JSON's essential key/value–pair nature. Exactly how values of each type are represented varies by language, but this is a list of the commonly supported types and how they are represented as part of a document in the shell. The most common types are:

- null
- boolean
- number
- string
- date
- regular expressions
- array
- embedded document
- object ID
- binary data
- code

Questions?

Homework

Homework

1. Create a database that stores the following information:
    - Songs, containing the following data: the title of the song, the name of the artist(s), and the album
    - Artists, containing the following data: name, date of birth, genre(s)
    - Popular Songs, containing the following data: the title of the song, how many times it's played, period of time
2. Populate the database you've created above with at least 10 data for each collection