Large-Scale and Multi-Structured Databases

Mongo DB Query 1

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Copyright Issues

Most of the information included this presentation have been extracted from the official documentation of MongoDB.

Cursor Methods

Loading Data

Load the following collection:

```
db.inventory.insertMany([
   { item: "journal", qty: 25, size: { h: 14, w: 21, uom: "cm" }, status: "A" },
   { item: "notebook", qty: 50, size: { h: 8.5, w: 11, uom: "in" }, status: "A" },
   { item: "paper", qty: 100, size: { h: 8.5, w: 11, uom: "in" }, status: "D" },
   { item: "planner", qty: 75, size: { h: 22.85, w: 30, uom: "cm" }, status: "D" },
   { item: "postcard", qty: 45, size: { h: 10, w: 15.25, uom: "cm" }, status: "A" }
]);
```

The Find Method and its Cursor

The find() method returns a ***cursor*** to the results.

In the mongo shell, if the returned cursor is not assigned to a variable using the var keyword, the cursor is automatically iterated to access ***up to the first 20 documents*** that match the query.

To manually iterate over the results, assign the returned cursor to a variable with the var keyword, as shown in the following slide.

The mongo shell and the ***drivers*** provide several cursor methods that call on the cursor returned by the find() method to modify its behavior.

Cursor Use: A Simple Example

```
> db.inventory.find();
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> var myCursor = db.inventory.find( );
>
> var myDocument = myCursor.hasNext() ? myCursor.next() : null;
>
> if (myDocument) {
...     var myName = myDocument.item;
...     print (tojson(myName));
... }
"journal"
```

If we update myDocument…

```
> myDocument = myCursor.hasNext() ? myCursor.next() : null;
{
        "_id" : ObjectId("5db99d408215ec9bc20c6c8a"),
        "item" : "notebook",
        "qty" : 50,
        "size" : {
                "h" : 8.5,
                "w" : 11,
                "uom" : "in"
        },
        "status" : "A"
}
> if (myDocument) {     var myName = myDocument.item;     print (tojson(myName)); }
"notebook"
```

Find and Limit

The ***limit()*** method limits the number of documents in the result set. The following operation returns at most 3 documents in the collection inventory.

```
> db.inventory.find();
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find().limit(3);
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
>
```

Find and Skip

The ***skip()*** method controls the ***starting point*** of the results set. The following operation skips the first 3 documents in the inventory collection and returns all remaining documents:

```
> db.inventory.find();
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find().limit(3);
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
> db.inventory.find().skip(3);
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
>
```

Find and Sort

The ***sort()*** method orders the documents in the result set. The following operation returns documents in the inventory collection sorted ***in ascending order*** by the ***qty field***:

```
> db.inventory.find();
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find().sort({qty:1});
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
```

Find and Sort

The following operation returns documents in the inventory collection sorted in ***descending*** order by the ***qty field***:

```
> db.inventory.find().sort({qty:-1});
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
```

The following operation returns documents in the inventory collection sorted in ***ascending*** order by the ***status field*** (at first) and in ***descending*** order by the ***qty field:***

```
> db.inventory.find().sort({status:1,qty:-1});
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
>
```

Combining Cursor Method

The previous cursor methods can be combined as follows:

```
> db.inventory.find();
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find().sort({qty:-1});
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
> db.inventory.find().sort({qty:-1}).skip(2);
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
>
```

The db.inventory.find().sort({qty:-1}).skip(2) query sorts the collections in ***descending*** order considering the ***qty field*** but ***skips*** the ***first two documents***.

Counting Documents

The method ***db.collection.countDocuments(query, options)*** returns the count of documents that would match a find() query for the collection.

The method ***db.collection.countDocuments does not perform the find()*** operation but instead counts and returns the number of results that match a query.

In Mongo 5 the ***db.collection.count*** has been deprecated***.***

```
exer> db.inventory.find()
[
  {
    _id: ObjectId("6377b1597ceaa1fffab54e6b"),
    item: 'journal',
    qty: 25,
    size: { h: 14, w: 21, uom: 'cm' },
    status: 'A'
  },
  {
    _id: ObjectId("6377b1597ceaa1fffab54e6c"),
    item: 'notebook',
    qty: 50,
    size: { h: 8.5, w: 11, uom: 'in' },
    status: 'A'
  },
  {
    _id: ObjectId("6377b1597ceaa1fffab54e6d"),
    item: 'paper',
    qty: 100,
    size: { h: 8.5, w: 11, uom: 'in' },
    status: 'D'
  },
  {
    _id: ObjectId("6377b1597ceaa1fffab54e6e"),
    item: 'planner',
    qty: 75,
    size: { h: 22.85, w: 30, uom: 'cm' },
    status: 'D'
  },
  {
    _id: ObjectId("6377b1597ceaa1fffab54e6f"),
    item: 'postcard',
    qty: 45,
    size: { h: 10, w: 15.25, uom: 'cm' },
    status: 'A'
  }
]
exer> - db.inventory.countDocuments({status:"A"})
-3
exer>
```

Query on Embedded/Nested Documents

Match an Embedded Document

We can use use the ***query filter*** document { <field>: <value> } where <value> is the document to match.

For example, the following query ***selects all documents*** where the field size equals the document { h: 14, w: 21, uom: "cm" }:

```
> db.inventory.find()
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find( { size: { h: 14, w: 21, uom: "cm" } } )
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
> db.inventory.find(  { size: { w: 21, h: 14, uom: "cm" } }  )
>
```

Query on Nested Field

To specify a query condition on fields in an embedded/nested document, use ***dot notation*** ("field.nestedField").

The following example selects all documents where the field *uom,* nested in the *size* field, equals "in":

```
> db.inventory.find()
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find( { "size.uom": "in" } )
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
```

Specify Match using Query Operator

The following query uses the ***less than*** operator (*$lt*) on the field “h” embedded in the “size” field:

```
> db.inventory.find()
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find( { "size.h": { $lt: 15 } } )
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
```

Specify AND Condition

The following query selects all documents where the ***nested field*** “h” is less than 15, the ***nested field*** “uom” equals "in", and the “status” field equals "D":

```
> db.inventory.find()
{ "_id" : ObjectId("5dade2b94a004f52120160a7"), "item" : "journal", "qty" : 25, "size" : { "h" : 14, "w" : 21, "uom" : "cm" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a8"), "item" : "notebook", "qty" : 50, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "A" }
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160aa"), "item" : "planner", "qty" : 75, "size" : { "h" : 22.85, "w" : 30, "uom" : "cm" }, "status" : "D" }
{ "_id" : ObjectId("5dade2b94a004f52120160ab"), "item" : "postcard", "qty" : 45, "size" : { "h" : 10, "w" : 15.25, "uom" : "cm" }, "status" : "A" }
> db.inventory.find( { "size.h": { $lt: 15 }, "size.uom": "in", status: "D" } )
{ "_id" : ObjectId("5dade2b94a004f52120160a9"), "item" : "paper", "qty" : 100, "size" : { "h" : 8.5, "w" : 11, "uom" : "in" }, "status" : "D" }
```

Query an Array

Data to Load for the Example

```
db.inventory.insertMany([
   { item: "journal", qty: 25, tags: ["blank", "red"], dim_cm: [ 14, 21 ] },
   { item: "notebook", qty: 50, tags: ["red", "blank"], dim_cm: [ 14, 21 ] },
   { item: "paper", qty: 100, tags: ["red", "blank", "plain"], dim_cm: [ 14, 21 ] },
   { item: "planner", qty: 75, tags: ["blank", "red"], dim_cm: [ 22.85, 30 ] },
   { item: "postcard", qty: 45, tags: ["blue"], dim_cm: [ 10, 15.25 ] }
]);
```

Match an Array

To specify equality condition on an array, use the query document *{ <field>: <value> }* where <value> is the ***exact array to match***, including the ***order*** of the elements.

The following example queries for all documents where the ***field "tags" value*** is an array with exactly two elements, "red" and "blank", ***in the specified order***:

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { tags: ["red", "blank"] } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
> db.inventory.find( { tags: ["red", "blank"] } ).count();
1
```

Match an Array

If we wish to find an array that contains ***both the elements*** "red" and "blank", ***without regard to order*** or other elements in the array, use the ***$all*** operator:

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { tags: ["red", "blank"] } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
> db.inventory.find( { tags: { $all: ["red", "blank"] } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
```

Query an Array for an Element

To query if the array field contains ***at least one*** element with the ***specified value***, use the filter { <field>: <value> } where <value> is the element value.

The following example queries for all documents where “tags“ is an array that ***contains the string "red" as one of its elements:***

```
> db.inventory.find( );
{ "_id" : ObjectId("5db99a948215ec9bc20c6c7f"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c80"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c81"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c82"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c83"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { tags: "red" } )
{ "_id" : ObjectId("5db99a948215ec9bc20c6c7f"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c80"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c81"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db99a948215ec9bc20c6c82"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
```

Specify Conditions in Array Elements

To specify conditions on the elements in the array field, use ***query operators*** in the ***query filter document*** { *<array field>: { <operator1>: <value1>, ... }* }

The following operations queries for all documents where the array ”dim_cm” contains at ***least one element*** whose value is greater than 25 (first query) and is greater than 20 (second query).

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { dim_cm: { $gt: 25 } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
> db.inventory.find( { dim_cm: { $gt: 20 } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
```

Multiple Conditions for Array Elements (I)

The following example, queries for documents where the “dim_cm” array contains elements that in ***some combination*** satisfy the query conditions; e.g., one element can satisfy the greater than 15 condition and another element can satisfy the less than 20 condition, or a single element can satisfy both:

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { dim_cm: { $gt: 15, $lt: 20 } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
```

Has been excluded because none of the elements satisfies the condition $lt:20

Multiple Conditions for Array Elements (II)

The following example queries for documents where the “dim_cm” array contains ***at least one element that is both*** greater than ($gt) 22 and less than ($lt) 30:

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { dim_cm: { $elemMatch: { $gt: 22, $lt: 30 } } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
>
```

Query for an Element by the Array Index Position

Using ***dot notation***, we can specify query conditions for an element at a particular index or position of the array. The array uses ***zero-based indexing***.

The following example queries for all documents where ***the second element*** in the array "dim_cm" ***is greater than 25***:

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { "dim_cm.1": { $gt: 25 } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
```

Query an Array by Array Length

Use the *$size* operator to query for arrays by number of elements.

For example, the following selects documents where the ***array "tags" has 3 elements***.

```
> db.inventory.find();
{ "_id" : ObjectId("5db6b2c20029e92d462c38d8"), "item" : "journal", "qty" : 25, "tags" : [ "blank", "red" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38d9"), "item" : "notebook", "qty" : 50, "tags" : [ "red", "blank" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38db"), "item" : "planner", "qty" : 75, "tags" : [ "blank", "red" ], "dim_cm" : [ 22.85, 30 ] }
{ "_id" : ObjectId("5db6b2c20029e92d462c38dc"), "item" : "postcard", "qty" : 45, "tags" : [ "blue" ], "dim_cm" : [ 10, 15.25 ] }
> db.inventory.find( { "tags": { $size: 3 } } )
{ "_id" : ObjectId("5db6b2c20029e92d462c38da"), "item" : "paper", "qty" : 100, "tags" : [ "red", "blank", "plain" ], "dim_cm" : [ 14, 21 ] }
```

Suggested Readings

Students are invited to read the official documentation regarding cursors operations with MongoDB.

The documentation is available at:
https://docs.mongodb.com/manual/reference/method/db.collection.find/
https://docs.mongodb.com/manual/reference/method/db.collection.countDocuments/
https://docs.mongodb.com/manual/tutorial/query-embedded-documents/
https://docs.mongodb.com/manual/tutorial/query-arrays/

Students are also invited to repeat all the examples on their MongoDB shell.

Exercises

1. Import the restaurants datasets from the restaurants.json file.
2. Write a MongoDB query to count the total number of documents.
3. Write a MongoDB query to display all the restaurant which is in the borough Bronx
4. Write a MongoDB query to display the next 5 restaurants after skipping first 5 which are in the borough Bronx
5. Write a MongoDB query to find the restaurants that achieved a score, more than 80 but less than 100
6. Write a MongoDB query to find the restaurants which locate in a latitude value less than -95.754168.
7. Write a MongoDB query to find the restaurants that do not prepare any cuisine of 'American' and their grade score more than 70 and latitude less than -65.754168
8. Write a MongoDB query to find the restaurants which do not prepare any cuisine of 'American ' and achieved a grade point 'A' not belongs to the borough Brooklyn. The document must be displayed according to the cuisine in descending order.