Chapter 3.
CRUD Operations

References

- MongoDB The Definitive Guide: Powerful and Scalable Data Storage 3rd Edition
- https://docs.mongodb.com/
- https://www.mongodb.com/docs/manual/

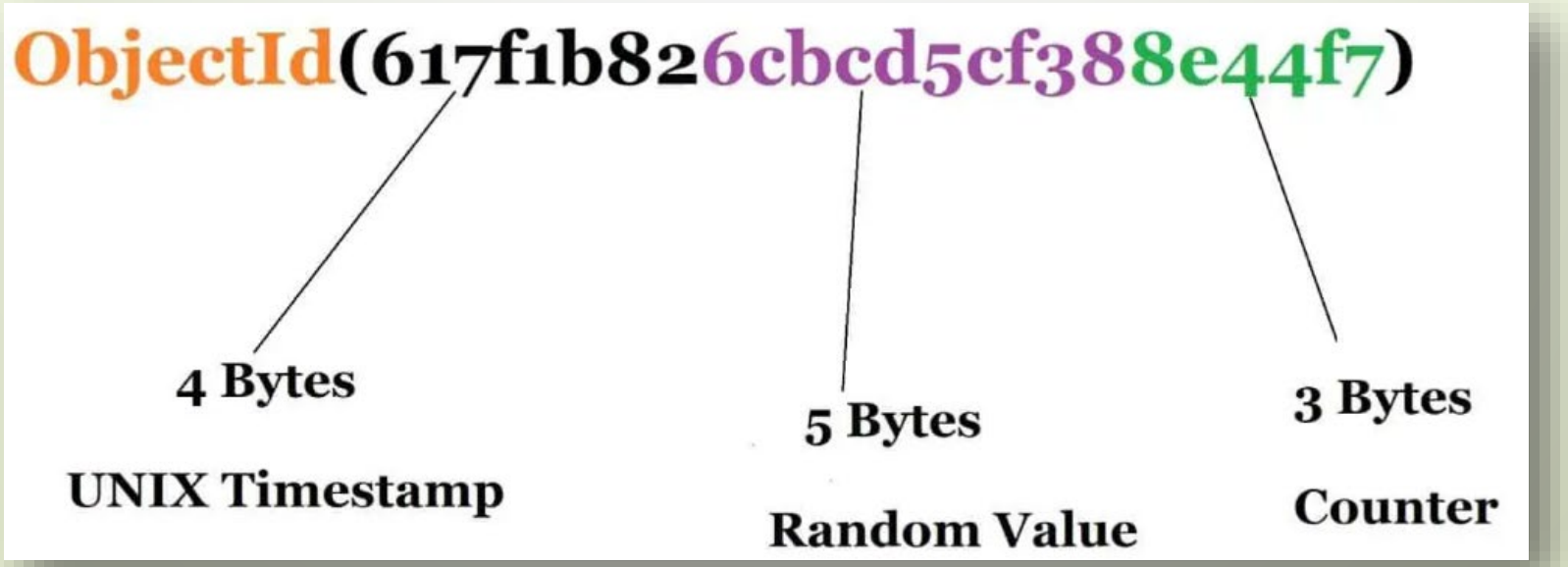
Learning objectives

- Query, insert, update, delete document

Contents

1. Insert document _id, ObjectId()

- In MongoDB, each document stored in a collection requires a unique _id field that acts as a primary key.
- If an inserted document omits the _id field, the MongoDB driver automatically generates an ObjectId for the _id field.



1. Insert documents

Method	Description
db.collection.insert()	Inserts a single document or multiple documents into a collection.
db.collection.insertOne()	Inserts a single document into a collection.
db.collection.insertMany()	Inserts multiple documents into a collection.

1. Insert documents
Insert() method

```
db.collection.insert(
    <[documents]>,
    {
        writeConcern: <document>,
        ordered: <boolean>    //only UpdateMany command supported
    }
)
```

Parameter	Type	Description
<[documents]>	document	*document* or *[array of documents]* to insert into the collection.
writeConcern	document	Optional. A document expressing the write concern. Omit to use the default write concern.
ordered	boolean	Optional. A boolean specifying whether the mongod instance should perform an ordered or unordered insert. Defaults to true.

1. Insert documents Example

- Insert a document without specifying an _id field:

```
db.products.insertOne( { item: "card", qty: 15 } )
```

→ mongod creates and adds the _id field.

- Insert a document specifying an _id field:

```
db.products.insertOne( { _id: 10, item: "box", qty: 20 } )
```

- Insert several document:

```
db.products.insertMany( [ { _id: 10, item: "card", qty: 15, type: "no.2" },
                          { item: "envelope", qty: 20 },
                          { item: "stamps" , qty: 30 }
                        ] )
```

1. Insert documents Example

- Try to execute the commands below, then make your conclusion:

```
db.products.insert( [{id : 905, item: "tape"}, {id : 905, item: "glue"}] )

db.products.insert( [{ _id: 905, item: "tape", qty: 20}, { _id: 905,  item: "bubble
                    wrap", qty: 30}, { _id: 906,  item: "bubble wrap", qty: 30}] )

db.products.insert( [{ _id: 805, item: "tape", qty: 20}, { _id: 806,  item: "bubble
                    wrap", qty: 30}, { _id: 807,  item: " medium box", qty: 30}],
                    { ordered: false } )

db.products.insert( [{ _id: 808, item: "tape", qty: 20}, { _id: 809,  item: "bubble
                    wrap", qty: 30}] )
```

1. Insert documents
Create a field date

- new Date(): Returns a date and time as a Date object.
- ISODate(): Returns a date and time as a Date object.
- Date(): Returns a date and time as a string.

```
db.dates.insertMany([
    { name: "Created with `new Date()`",
      date: new Date(),
    },
    { name: "Created with `ISODate()`",
      date: ISODate(),
    },
    { name: "Created with `Date()`",
      date: Date(),
    } ])
```

```
db.dates.insertMany([
    {  name: "Future date",
       date: ISODate("2040-10-28T23:58:18Z"),
    },
    {  name: "Past date",
       date: new Date("1852-01-15T11:25"),
    }
])
```

Contents

1. Insert document
2. **Query document**
3. Update document
4. Delete document

2. Query document find() method

- find() method selects documents in a collection or view and returns a cursor to the selected documents
- Syntax:

  db.<collectionname>**.find(**<query>, <projection>**)**

Parameter	Type	Description
query	document	Optional. Specifies selection filter using query operators. To return all documents in a collection, omit this parameter or pass an empty document ({}).
projection	document	Optional. Specifies the fields to return in the documents that match the query filter. To return all fields in the matching documents, omit this parameter

2. Query document find() method example

- The examples in this section use documents from the bios collection where the documents generally have the form:

```
{
        “_id” : value,
        “name” : { “first” : string, “last” : string },
        “birth” : ISODate,
        “death” : ISODate,
        “contribs” : [ string, ... ],
        “awards” : [
                { “award” : string, “year”: number, “by”: string }
                ...
        ]
}
```

2. Query document find() method example

- Find all documents in a collection:

  db.bios.find()

- Find all documents in the bios collection where _id equals 5:

  db.bios.find({ _id: *5* })

- Find all documents in the bios collection where the field last in the name embedded document equals "Hopper":

  db.bios.find({ "name.last": *"Hopper"* })

To access fields in an **embedded document**, use dot notation ("<embedded document>.<field>").

2. Query document find() method example

- To return all documents in the bios collection where the embedded document name is **exactly** {first: "Yukihiro", last: "Matsumoto"}, **including the order**:

```
db.bios.find( { name: { first: "Yukihiro", last: "Matsumoto" } } )
```

- To return all documents in the bios collection where the embedded document name contains a field first with the value "Yukihiro" and a field last with the value "Matsumoto":

```
db.bios.find( { "name.first": "Yukihiro", "name.last": "Matsumoto" } )
```

The query would match documents with name fields that held either of the following values:

{ first: "Yukihiro", aka: "Matz", last: "Matsumoto" }
{ last: "Matsumoto", first: "Yukihiro" }

2. Query document find() method example

- To returns documents in the bios collection where the **array** field contains the element "UNIX":

```
db.bios.find( {"contribs" : "UNIX" } )
```

- To returns documents in the bios collection where the awards **array** contains an element with award field equals "Turing Award":

```
db.bios.find( { "awards.award": "Turing Award" } )
```

2. Query document find() method example

- To query for all documents in inventory where the field tags value is an array with **exactly** two elements, “A" and “B", in the specified order:

```
db.inventory.find( { tags: ["A", "B"] } )        //match an array
```

Output:
```
tags: [ "A", "B" ]
tags: [ ["A", "B"], "C" ]
```

- To find an array that contains both the elements “A" and “B", **without regard to order or other elements** in the array, use the $all operator

```
db.inventory.find( { tags: { $all: ["A", "B"] } } )
```

Output:
```
tags: [ "A", "B", "C" ]
tags: [ "B", "A" ]
tags: [ "A", "B" ]
```

2. Query document
Query operators

Name	Syntax	Description and Example
$eq	{field: { $eq: *value* }}	Matches values that are equal to a specified value. db.inventory.find({ qty: { $eq: *20* } })
$ne	{field: { $ne: *value* }}	Matches values that are not equal to a specified value. db.inventory.find({ qty: { $ne: *20* } })
$in	{field: { $in: [*value1, value2, ... valueN*] }}	Matches any of the values specified in an array. db.inventory.find({ qty: { $in: [*5, 15*] } }) db.bios.find({ contribs: { $in: [*"ALGOL", "Lisp"*] } })
$nin	{field: { $nin: [*value1, value2, ... valueN*]}}	Matches none of the values specified in an array. db.inventory.find({ qty: { $nin: [*5, 15*] } })

2. Query document
Query operators

Name	Syntax	Description and Example
$gt	{field: {$gt: *value*}}	Matches values that are greater than a specified value. db.inventory.find({ qty: { $gt: *20* } })
$gte	{field: {$gte: *value*}}	Matches values that are greater than or equal to a specified value. db.inventory.find({ qty: { $gte: *20* } })
$lt	{field: {$lt: *value*}}	Matches values that are less than a specified value. db.inventory.find({ qty: { $lt: *20* } })
$lte	{field: {$lte: *value*}}	Matches values that are less than or equal to a specified value. db.inventory.find({ qty: { $lte: *20* } })

2. Query document
Query operators

- $and: Returns all documents that satisfy **all** the expressions.
  - Syntax: { $and: [{ exp1 }, { exp2 }, ..., { expN }] }
  - Example: selects all documents in the inventory collection where the price field exists and not equal to 1.99:

```
db.inventory.find( { $and: [ { price: { $ne: 1.99 } }, { price: { $exists: true } } ] } )
```

```
db.inventory.find( { price: { $ne: 1.99, $exists: true } } )
```

2. Query document
Query operators

- $or: Selects the documents that satisfy **at least one** of the expressions.
  - Syntax: { $or: [{ exp1 }, { exp2 } , ... , { expN }] }
  - Example: select all documents in the inventory collection where either the quantity field value is less than 20 or the price field value equals 10.

```
db.inventory.find( { $or: [ { quantity: { $lt: 20 } }, { price: 10 } ] } )
```

- $nor: selects the documents that **fail** all the query expressions in the array
  - Syntax: { $nor: [{ *exp1* }, { *exp2* }, ... { *expN* }] }
  - Example:

```
db.inventory.find( { $nor: [ { price: 1.99 }, { qty: 2 } ] } )
```

2. Query document
Query operators

- $not: Returns documents that do not match the <operator-expression>. This includes documents that do not contain the field.
  - Syntax: { field: { $not: { *operator-expression* } } }
  - Example:

    db.inventory.find({ price: { $not: { $gt: *1.99* } } })

    This query will select all documents in the inventory collection where:
    • the price field value is less than or equal to 1.99 **or**
    • the price field does not exist
  - {$not: { $gt: 1.99 }} is different from the $lte operator
  - {$lte: 1.99} returns only the documents where price field exists and its value is less than or equal to 1.99

2. Query document
Query operators

Name	Syntax	Description and Example
$exists	{ field: { $exists: *<boolean>* } }	When <boolean> is true, $exists matches the documents that contain the field, including documents where the field value is null db.inventory.find({ qty: { $exists: *true*, $nin: *[5, 15]* } })
$all	{ field: { $all: [*value1, value2 ...*] } }	Selects the documents where the value of a field is an array that contains all the specified elements, without regard to order or other elements in the array. Equivalent to $and operation db.inventory.find({ tags: { $all: [*"A", "B"*] } })
$size	{ field: { $size: *number* } }	Selects documents if the array field is a specified size. db.inventory.find({ tags: { $size: *3* } })

2. Query document
Query operators

- $regex: Selects documents where values match a specified regular expression. MongoDB uses Perl Compatible Regular Expressions ("PCRE") library to match regular expressions.
  - Syntax:

```
{ <field>: { $regex: /pattern/, $options: '<options>' } }
{ <field>: { $regex: 'pattern', $options: '<options>' } }
{ <field>: { $regex: /pattern/<options> } }
```

  - Example: `db.products.find( { sku: { $regex: /abc/ } } )`

Option	Description
i	Do case-insensitive pattern matching
m	Treat the string being matched against as multiple lines. For patterns that include anchors (i.e. ^ for the start, $ for the end), match at the beginning or end of each line for strings with multiline values.
s	Treat the string as single line. Allows the dot character to match all characters *including* newline characters

2. Query document
Query operators

- $regex: Example:
  - match all products documents where the sku field is ended with "789":

    db.products.find({ sku: { $regex: /789$/ } })
  - select documents with sku values starting with “ABC” case-insensitive:

    db.products.find({ sku: { $regex: /^ABC/*i* } })
  - match lines starting with the letter S for multiline strings:

    db.products.find({ description: { $regex: /^S/*m* } })
  - match all characters including new line characters:

    db.products.find({ description: { $regex: /m.*line/, $options: 'si' } })

2. Query document
Query operators

- $elemMatch: matches documents that contain an array field with **at least one element** that matches all the specified query criteria.
  - Syntax: `{ <field>: { $elemMatch: { <query1>, <query2>, ... } } }`
  - Example 1: Suppose the scores collection

```
{ _id: 1, results: [ 82, 85, 88 ] }
{ _id: 2, results: [ 75, 88, 89 ] }
```

Find documents where the results array contains at least one element that is both greater than or equal to 80 and is less than 85.

```
db.scores.find({ results: { $elemMatch: { $gte: 80, $lt: 85 } } } )
```

The result is:

```
{ "_id" : 1, "results" : [ 82, 85, 88 ] }
```

2. Query document
Query operators

- $elemMatch:
  - Example 2: array of embedded documents

```
db.survey.insertMany( [
  { "_id": 1, "results": [ { "product": "abc", "score": 10 },
                           { "product": "xyz", "score": 5 } ] },
  { "_id": 2, "results": [ { "product": "abc", "score": 8 },
                           { "product": "xyz", "score": 7 } ] },
  { "_id": 3, "results": [ { "product": "abc", "score": 7 },
                           { "product": "xyz", "score": 8 } ] },
  { "_id": 4, "results": [ { "product": "abc", "score": 7 },
                           { "product": "def", "score": 8 } ] }
] )
```

This query matches only those documents where the results array contains at least one element with both product equal to "xyz" and score greater than or equal to 8:

```
survey.find({ results: { $elemMatch: { product: "xyz", score: { $gte: 8 } } } })
```

Output: `{ "_id" : 3, "results" : [ { "product" : "abc", "score" : 7 }, { "product" : "xyz", "score" : 8 } ] }`

2. Query document count() method

- count(): Counts the number of documents referenced by a cursor. Append the count() method to a find() query to return the number of matching documents.
  - Example:

```
db.restaurants.find({'address.zipcode': '11369'}).count()        // the result is 5

db.restaurants.count({'address.zipcode': '11369'})       // the result is 5
```

2. Query document
limit() method

- limit(): To maximize performance and prevent MongoDB from returning more results than required for processing.
  - Example:

```
db.restaurants.find({ 'address.zipcode': '11369'}).limit(3)        // the result is 3
```

2. Query document skip() method

- skip(): Controls the starting point of the results set.
  - Example:

```
db.restaurants.find({ 'address.zipcode': '11369'}).skip(1)        // the result is 4
```

2. Query document sort() method

- sort(): Orders the documents in the result set
  - Example:

1: ascending
-1: descending

```
db.restaurants.find({ 'address.zipcode': '11369'}).sort( {name: 1} )

db.restaurants.find({ 'address.zipcode': '11369'}, {name: 1}).sort( {name: 1} )
```

projection

2. Query document Projection

- The projection parameter specifies which fields to return, syntax:
  { field1: ***value*****, field2:** ***value*****, ... }** with value is *<1 or true>* or *<0 or false>*
- Unless the _id field is explicitly excluded in the projection document _id: 0, the _id field is returned.
- Example:
  - Find all documents in the bios collection and returns only the name field, contribs field and _id field: `db.bios.find( { }, { name: 1, contribs: 1 } )`
  - Find documents in the bios collection and returns only the name field and the contribs field: `db.bios.find( { }, { name: 1, contribs: 1, _id: 0 } )`

Bài tập

restaurants.json

```
{
        address: {
        building: '7715',
        coord: [ -73.9973325, 40.61174889999999 ],
        street: '18 Avenue',
        zipcode: '11214' },
        borough: 'Brooklyn',
        cuisine: 'American ',
        grades:
        [
                {date: ISODate("2014-04-16T00:00:00.000Z"),grade: 'A',score: 5},
                {date: ISODate("2013-04-23T00:00:00.000Z"),grade: 'A', score: 2},
                {date: ISODate("2012-04-24T00:00:00.000Z"),grade: 'A', score: 5},
                {date: ISODate("2011-12-16T00:00:00.000Z"), grade: 'A',score: 2}
        ],
        name: 'C & C Catering Service',
        restaurant_id: '40357437'
}
```

Bài tập

1. Hiển thị tất cả các documents có trong collection restaurants.
2. Chèn thêm 1 document vào collection restaurants.
3. Hiển thị tất cả các documents có trong collection restaurants, tuy nhiên chỉ xuất các fields restaurant_id, name, borough and cuisine.
4. Hiển thị tất cả các documents có trong collection restaurants, tuy nhiên chỉ xuất các fields restaurant_id, name, borough and cuisine và không xuất field _id.
5. Hiển thị tất cả các documents có trong collection restaurants với field borough có giá trị là Bronx.
6. Hiển thị 5 documents đầu tiên có trong collection restaurants với field borough có giá trị là Bronx.
7. Hiển thị 5 documents tiếp theo sau khi bỏ qua 5 documents đầu tiên có trong collection restaurants với field borough có giá trị là Bronx.
8. Hiển thị tất cả các documents có trong collection restaurants với điều kiện score trong field grades lớn hơn 90.

Bài tập

9. Hiển thị tất cả các documents có trong collection restaurants với điều kiện score trong field grades lớn hơn 80 và nhỏ hơn 100.
10. Hiển thị tất cả các documents có trong collection restaurants, tuy nhiên chỉ xuất các fields restaurant Id, name, borough, cuisine với name có chứa 3 ký tự bắt đầu là 'Wil'.
11. Hiển thị tất cả các documents có trong collection restaurants, tuy nhiên chỉ xuất các fields restaurant Id, name, borough, cuisine với name có chứa 3 ký tự cuối cùng là 'ces'.
12. Hiển thị tất cả các documents có trong collection restaurants với field borough có giá trị là Bronx và field cusine có giá trị là American hoặc Chinese.
13. Hiển thị tất cả các documents có trong collection restaurants với field borough có giá trị Staten Island or Queens or Bronxor Brooklyn, chỉ xuất các field restaurant Id, name, borough, cuisine.

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2. Query document
3. **Update document**
4. Delete document

1. Insert documents

Method	Description
db.collection.insert()	Inserts a single document or multiple documents into a collection.
db.collection.insertOne()	Inserts a single document into a collection.
db.collection.insertMany()	Inserts multiple documents into a collection.

1. Insert documents
Insert() method

```
db.collection.insert(
    <[documents]>,
    {
        writeConcern: <document>,
        ordered: <boolean>    //only UpdateMany command supported
    }
)
```

Parameter	Type	Description
<[documents]>	document	*document* or *[array of documents]* to insert into the collection.
writeConcern	document	Optional. A document expressing the write concern. Omit to use the default write concern.
ordered	boolean	Optional. A boolean specifying whether the mongod instance should perform an ordered or unordered insert. Defaults to true.

3. Update documents updateOne(), updateMany() method

- Syntax:

```
db.collection.updateOne/updateMany (
    <filter>,
    <update>,
    {
        upsert: <boolean>,
        arrayFilters: [ <filterdocument1>, ... ],
        ...
    }
)
```

Parameter	Type	Description	
filter	document	The selection criteria for the update, same as the find() method.	
update	document/ pipeline	Update document	Contains only update operator expressions: { $set: { <field1>: <value1>, ... } }
		Aggregation pipeline	Contains only the following aggregation stages:
upsert	boolean	Defaults to false. When true, updateOne() creates a new document if no documents match the filter.	
arrayFilters	array	Optional. An array of filter documents that determine which array elements to modify for an update operation on an array field.	

3. Update documents updateOne(), updateMany() method

- The method returns a document that contains:
  - `matchedCount` containing the number of matched documents
  - `modifiedCount` containing the number of modified documents
  - `upsertedId` containing the _id for the upserted document.
  - A boolean `acknowledged` as true if the operation ran with write concern or false if write concern was disabled

3. Update documents updateOne(), updateMany() method

- Example:

Create the products collection:

```
db.products.insertOne( {
    _id: 1,
    quantity: 250,
    instock: true,
    reorder: false,
    details: { model: "14QQ", make: "Clothes Corp" },
    tags: [ "apparel", "clothing" ],
    ratings: [ { by: "Customer007", rating: 4 } ]
} )
```

- Set top-level fields:

```
db.products.update(
        { _id: 1 },
        { $set:{  qty: 500,
                  details: { model: "14Q3", make: "xyz" },
                  tags: [ "coats", "outerwear", "clothing" ] } }
)
```

3. Update documents updateOne(), updateMany() method

- Set fields in embedded documents: updates the *make* field in the *details* document.

```
db.products.updateOne(
   { _id: 1 },
   { $set: { "details.make": "zzz" } }
)
```

- Set elements in arrays: updates the value second element (array index of 1) in the *tags* field and the *rating* field in the first element (array index of 0) of the ratings array.

```
db.products.update( { _id: 1 }, { $set: { "tags.1": "rain gear", "ratings.0.rating": 2  } })
```

3. Update documents
Field update operators

- $currentDate operator: Set the value of a field to the current date, either as a Date or a timestamp. The default type is Date. If the field does not exist, $currentDate will create the field.

{ $currentDate: { <field1>: <typeSpecification1>, ... } }

<typeSpecification> can be either:

- a boolean true to set the field value to the current date as a Date, or
- a document { $type: "timestamp" } or { $type: "date" } which explicitly specifies the type.

- Example:

```
db.inventory.update (
    { "item.name": "Apple" },
    {$set: { "size.uom": "cm", status: "P" },
    $currentDate:{ lastModified: true }}
)
```

3. Update documents
Field update operators

Name	Description, syntax and example
$inc	{ $inc: { <field1>: <amount1>, ... } } Increment the value of the field by the specified amount, positive or negative values. If the field does not exist, $inc creates the field and sets the field to the specified value. db.products.update({ sku: "abc123" }, { $inc: { qty: -2, "metrics.orders": 1 } })
$mul	{ $mul: { <field1>: <number1>, ... } } Multiply the value of a field by a number. If the field does not exist, $mul creates the field and sets the value to zero of the same numeric type as the multiplier. db.products.update({ sku: "abc123" }, { $mul: {qty: 2 } }) Apply $mul operator to a non-existing field: db.products.update({ _id: 104 }, { $mul: { unit_price: 100 } })
$unset	{ $unset: { <field1>: "", ... } } Removes the specified field from a document. db.products.update({ _id: 104 }, { $unset: { unit_price: "" } })

3. Update documents
Field update operators

Name	Description, syntax and example
$min	{ $min: { <field1>: <value1>, ... } } Updates the value of the field to a specified value *if* the specified value is **less than** the current value of the field. If the field does not exist, the $min operator sets the field to the specified value. Example: Create the scores collection: db.scores.insertOne({ _id: 1, highScore: 800, lowScore: 200 }) db.scores.update({ _id: 1 }, { $min: { lowScore: 150 } }) → { _id: *1*, highScore: *800*, lowScore: *150* } db.scores.update({ _id: 1 }, { $min: { lowScore: 250 } }) → { _id: 1, highScore: 800, lowScore: 150 }

3. Update documents
Field update operators

Name	Description, syntax and example
$max	{ $max: { <field1>: <value1>, ... } } Updates the value of the field to a specified value *if* the specified value is **greater than** the current value of the field. If the field does not exist, the $min operator sets the field to the specified value. Example: Create the scores collection: db.scores.insertOne({ _id: 1, highScore: 800, lowScore: 200 }) db.scores.update({ _id: 1 }, { $max: { highScore: 950 } }) → { _id: *1*, highScore: *950*, lowScore: *200* } db.scores.update({ _id: 1 }, { $max: { highScore: 870 } }) → { _id: 1, highScore: 950, lowScore: 200 }

3. Update documents
Array update operators

Name	Description	Syntax and Example
$	The positional $ operator identifies an element in an array to update without explicitly specifying the position of the element in the array. It update the **first element** that matches the query condition	{ "<array>.$" : *value*}

Consider the following document in the students collection:

```
{ _id : 1, grades : [85, 80, 80] },
{ _id : 2, grades : [88, 90, 92] },
{ _id : 3, grades : [85, 100, 90] }
```

```
{ _id: 4, grades: [
    { grade: 80, mean: 75, std: 8 },
    { grade: 85, mean: 90, std: 5 },
    { grade: 85, mean: 85, std: 8 } ]}
```

Update values in an array: update the first element whose value is 80 to 82 in the in the grades array:

```
db.students.update ({ _id: 1, grades: 80 }, { $set: { "grades.$" : 82 } } )
```

→ { **"_id"** : 1, **"grades"** : [85, 82, 80] }

Update documents in an array: update the std field of the first array element that matches the grade equal to 85 condition:

```
db.students.updateOne( { _id: 4, "grades.grade": 85 }, { $set: { "grades.$.std" : 6 } })
```

→ { "_id" : 4, "grades" : [{ "grade" : 80, "mean" : 75, "std" : 8 }, { "grade" : 85, "mean" : 90, "std" : 6 }, { "grade" : 85, "mean" : 85, "std" : 8 }]}

3. Update documents
Array update operators

Consider the following document in the students collection:

```
{ _id: 5, grades: [
    { grade: 80, mean: 75, std: 8 },
    { grade: 85, mean: 90, std: 5 },
    { grade: 90, mean: 85, std: 3 } ]}
```

Update embedded documents using multiple field matches: updates the value of the std field in the first embedded document that has grade field with a value less than or equal to 90 and a mean field with a value greater than 80:

```
db.students.updateOne( { _id: 5,
                         grades: { $elemMatch: { grade: { $lte: 90 }, mean: { $gt: 80 } } }
                       },
                       { $set: { "grades.$.std" : 6 } }
)
```

→

```
{ _id: 5, grades: [
    { grade: 80, mean: 75, std: 8 },
    { grade: 85, mean: 90, std: 6 },
    { grade: 90, mean: 85, std: 3 } ]}
```

3. Update documents
Array update operators

Name	Description	Syntax and Example
$[]	update all elements in the specified array field	{ <update operator>: { "<array>.$[]" : value } }

Consider the following document in the students collection:

```
{ _id : 1, grades : [85, 82, 80] },
{ _id : 2, grades : [88, 90, 92] },
{ _id : 3, grades : [85, 100, 90] }
```

Update all elements in an array:

- Increment all elements in the grades array by 10 for all documents in the collection:

```
db.students.updateMany( { }, { $inc: { "grades.$[]" : 10 } } )
```

- Increment all elements in the grades array by 10 for all documents except those with the value 100 in the grades array:

```
db.students.update(
        { grades : { $ne: 100 } },
        { $inc: { "grades.$[]" : 10 },
        { multi: true } }
    )
```

3. Update documents
Array update operators ($[])

Consider the following document in the students collection:

```
{ _id: 13, grades: [ { grade: 80, mean: 75, std: 8 },
                     { grade: 85, mean: 90, std: 5 },
                     { grade: 85, mean: 85, std: 8 } ] }
```

Update all documents in an array: modify the value of the std field for all elements in the grades array:

```
db.students.updateMany( {_id: 13 }, { $inc: { "grades.$[].std" : -2 } })
```

Consider the following document in the students3 collection:

```
{ _id : 1, grades : [ { type: "quiz", questions: [ 10, 8, 5 ] },
                      { type: "quiz", questions: [ 8, 9, 6 ] },
                      { type: "hw", questions: [ 5, 4, 3 ] },
                      { type: "exam", questions: [ 25, 10, 23, 0 ] } ]
}
```

Update Nested Arrays in Conjunction with $[<identifier>]: Update all values that are greater than or equal to 8 in the nested grades.questions array:

```
db.students.updateMany(
                      { _id: 1 },
                      { $inc: { "grades.$[].questions.$[score]": 2 } },
                      { arrayFilters: [ { score: { $gte: 8 } } ] }
)
```

```
{
  _id: 1,
  grades: [
    { type: 'quiz', questions: [ 12, 10, 5 ] },
    { type: 'quiz', questions: [ 10, 11, 6 ] },
    { type: 'hw', questions: [ 5, 4, 3 ] },
    { type: 'exam', questions: [ 27, 12, 25, 0 ] }
  ]
}
```