

Министерство науки и высшего образования Российской Федерации
федеральное государственное автономное образовательное учреждение высшего
образования
«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО»

Отчет

по лабораторной работе №8

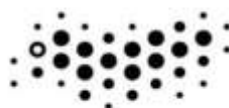
по дисциплине «**Проектирование и реализация баз данных**»

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УНИВЕРСИТЕТ ИТМО

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Цель работы: овладеть практическими навыками работы с CRUD-операциями, с вложенными объектами в коллекции базы данных MongoDB, агрегации и изменения данных, со ссылками и индексами в базе данных MongoDB.

Практическое задание 8.1.1:

```
1: > use unicorns
2: switched to db unicorns
3: > db.unicorns.insert({name: 'Unicrom', loves: ['energon', 'redbull'], weight: 984,
4:   gender: 'm', vampires: 182});
5: WriteResult({ "nInserted" : 1 })
6: > db.unicorns.insert({name: 'Roooooodles', loves: [ 'apple'], weight: 575, gender: 'm',
7:   vampires: 99});
8: WriteResult({ "nInserted" : 1 })
9: > db.unicorns.insert({name: 'Solnara', loves: [ 'apple', 'chocolate'], weight: 550,
10:   gender: 'f', vampires: 80});
11: WriteResult({ "nInserted" : 1 })
12: > db.unicorns.insert({name: 'Ayna', loves: [ 'strawberry', 'lemon'], weight: 733,
13:   gender: 'f', vampires: 40});
14: WriteResult({ "nInserted" : 1 })
15: > db.unicorns.insert({name: 'Kenny', loves: [ 'grade', 'lemon'], weight: 690, gender:
16:   'm', vampires: 39});
17: WriteResult({ "nInserted" : 1 })
18: > db.unicorns.insert({name: 'Raleigh', loves: [ 'apple', 'sugar'], weight: 421, gender:
19:   'm', vampires: 2});
20: WriteResult({ "nInserted" : 1 })
21: > db.unicorns.insert({name: 'Leia', loves: [ 'apple', 'watermelon'], weight: 601,
22:   gender: 'f', vampires: 33});
23: WriteResult({ "nInserted" : 1 })
24: > db.unicorns.insert({name: 'Pilot', loves: [ 'apple', 'watermelon'], weight: 650,
25:   gender: 'm', vampires: 54});
26: WriteResult({ "nInserted" : 1 })
27: > db.unicorns.insert({name: 'Nimue', loves: [ 'grade', 'carrot'], weight: 540, gender:
28:   'f'});
29: WriteResult({ "nInserted" : 1 })
30:
```

```

1: > document = ({name: 'Dunx', loves: ['grape', 'watermelon'], weight: 704, gender: 'm',
vampires: 165})
2: {
3:     "name" : "Dunx",
4:     "loves" : [
5:         "grape",
6:         "watermelon"
7:     ],
8:     "weight" : 704,
9:     "gender" : "m",
10:    "vampires" : 165
11: }
12: > db.unicorns.insert(document)
13: WriteResult({ "nInserted" : 1 })
14: > db.unicorns.find()
15: { "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"), "name" : "Aurora", "loves" : [
"carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
16: { "_id" : ObjectId("60bd4a02b4a6bf68c9e1a624"), "name" : "Unicrom", "loves" : [
"energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
17: { "_id" : ObjectId("60bd4a3fb4a6bf68c9e1a625"), "name" : "Roooooodles", "loves" : [
"apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
18: { "_id" : ObjectId("60bd4aa0b4a6bf68c9e1a626"), "name" : "Solnara", "loves" : [
"apple", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
19: { "_id" : ObjectId("60bd4ad4b4a6bf68c9e1a627"), "name" : "Ayna", "loves" : [
"strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
20: { "_id" : ObjectId("60bd4af3b4a6bf68c9e1a628"), "name" : "Kenny", "loves" : [ "grade",
"lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
21: { "_id" : ObjectId("60bd4b19b4a6bf68c9e1a629"), "name" : "Raleigh", "loves" : [
"apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
22: { "_id" : ObjectId("60bd4b3eb4a6bf68c9e1a62a"), "name" : "Leia", "loves" : [ "apple",
"watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
23: { "_id" : ObjectId("60bd4b5cb4a6bf68c9e1a62b"), "name" : "Pilot", "loves" : [ "apple",
"watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
24: { "_id" : ObjectId("60bd4b82b4a6bf68c9e1a62c"), "name" : "Nimue", "loves" : [ "grade",
"carrot" ], "weight" : 540, "gender" : "f" }
25: { "_id" : ObjectId("60bd4c22b4a6bf68c9e1a62d"), "name" : "Dunx", "loves" : [ "grape",
"watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 165 }
26:

```

Практическое задание 8.1.2:

```

1: > db.unicorns.find({gender: "f"}).limit(3).sort({name:1})
2: { "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"), "name" : "Aurora", "loves" : [
"carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
3: { "_id" : ObjectId("60bd4ad4b4a6bf68c9e1a627"), "name" : "Ayna", "loves" : [
"strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
4: { "_id" : ObjectId("60bd4b3eb4a6bf68c9e1a62a"), "name" : "Leia", "loves" : [ "apple",
"watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
5:

```

```

1: > db.unicorns.findOne({loves: 'carrot', gender: 'f'})
2: {
3:   "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"),
4:   "name" : "Aurora",
5:   "loves" : [
6:     "carrot",
7:     "grape"
8:   ],
9:   "weight" : 450,
10:  "gender" : "f",
11:  "vampires" : 43
12: }
> db.unicorns.find({loves: 'carrot', gender: 'f'}).limit(1)
13: { "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"), "name" : "Aurora", "loves" : [
    "carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }

```

Практическое задание 8.1.3:

```

1: > db.unicorns.find({gender:'m'}, {loves:0});
2: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "weight" : 600,
   "gender" : "m", "vampires" : 63 }
3: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "weight" : 984,
   "gender" : "m", "vampires" : 182 }
4: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "weight" : 575,
   "gender" : "m", "vampires" : 99 }
5: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "weight" : 690,
   "gender" : "m", "vampires" : 39 }
6: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "weight" : 421,
   "gender" : "m", "vampires" : 2 }
7: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "weight" : 650,
   "gender" : "m", "vampires" : 54 }
8: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "weight" : 704,
   "gender" : "m", "vampires" : 165 }

```

Практическое задание 8.1.4:

```

1: db.unicorns.find().sort({$natural:-1});
2: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
   "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 165 }
3: { "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : [ "grade",
   "carrot" ], "weight" : 540, "gender" : "f" }
4: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
   "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
5: { "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : [ "apple",
   "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
6: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : [
   "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
7: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade",
   "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
8: { "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "loves" : [
   "strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
9: { "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : [
   "apple", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
10: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [
   "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
11: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
   "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
12: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
   "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }

```

Практическое задание 8.1.5:

```
1: > db.unicorns.find({}, {loves:{$slice:-1}, _id:false});
2: { "name" : "Horny", "loves" : [ "papaya" ], "weight" : 600, "gender" : "m", "vampires"
   : 63 }
3: { "name" : "Unicrom", "loves" : [ "redbull" ], "weight" : 984, "gender" : "m",
   "vampires" : 182 }
4: { "name" : "Roooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m",
   "vampires" : 99 }
5: { "name" : "Solnara", "loves" : [ "chocolate" ], "weight" : 550, "gender" : "f",
   "vampires" : 80 }
6: { "name" : "Ayna", "loves" : [ "lemon" ], "weight" : 733, "gender" : "f", "vampires" :
   40 }
7: { "name" : "Kenny", "loves" : [ "lemon" ], "weight" : 690, "gender" : "m", "vampires" :
   39 }
8: { "name" : "Raleigh", "loves" : [ "sugar" ], "weight" : 421, "gender" : "m", "vampires"
   : 2 }
9: { "name" : "Leia", "loves" : [ "watermelon" ], "weight" : 601, "gender" : "f",
   "vampires" : 33 }
10: { "name" : "Pilot", "loves" : [ "watermelon" ], "weight" : 650, "gender" : "m",
   "vampires" : 54 }
11: { "name" : "Nimue", "loves" : [ "carrot" ], "weight" : 540, "gender" : "f" }
12: { "name" : "Dunx", "loves" : [ "watermelon" ], "weight" : 704, "gender" : "m",
   "vampires" : 165 }
```

Практическое задание 8.1.6:

```
1: > db.unicorns.find({gender: "f"},{_id:false}, {weight:{$gt:500, $lt:700}, "_id" :
   false});
2: { "name" : "Solnara", "loves" : [ "apple", "chocolate" ], "weight" : 550, "gender" :
   "f", "vampires" : 80 }
3: { "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 733, "gender" : "f",
   "vampires" : 40 }
4: { "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f",
   "vampires" : 33 }
5: { "name" : "Nimue", "loves" : [ "grade", "carrot" ], "weight" : 540, "gender" : "f" }
6: > db.unicorns.find({gender: "f"},{_id:false}, {weight:{$gt:500, $lt:700}});
7: { "name" : "Solnara", "loves" : [ "apple", "chocolate" ], "weight" : 550, "gender" :
   "f", "vampires" : 80 }
8: { "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 733, "gender" : "f",
   "vampires" : 40 }
9: { "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f",
   "vampires" : 33 }
10: { "name" : "Nimue", "loves" : [ "grade", "carrot" ], "weight" : 540, "gender" : "f" }
```

Практическое задание 8.1.7:

```
1: > db.unicorns.find( {loves:{$all:['lemon', 'grade']}}, {_id:false}, {weight:{$gt:500}},
   {gender:'m'});
2: { "name" : "Kenny", "loves" : [ "grade", "lemon" ], "weight" : 690, "gender" : "m",
   "vampires" : 39 }
```

Практическое задание 8.1.8:

```
1: > db.unicorns.find({vampires:{$exists:false}});
2: { "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : [ "grade",
   "carrot" ], "weight" : 540, "gender" : "f" }
```

Практическое задание 8.1.9:

```
1: > db.unicorns.find( {gender:'m'}, {loves:{$slice:1}}).sort({name:1});
2: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape" ],
  "weight" : 704, "gender" : "m", "vampires" : 165 }
3: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot"
  ], "weight" : 600, "gender" : "m", "vampires" : 63 }
4: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade"
  ], "weight" : 690, "gender" : "m", "vampires" : 39 }
5: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple"
  ], "weight" : 650, "gender" : "m", "vampires" : 54 }
6: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : [ "apple"
  ], "weight" : 421, "gender" : "m", "vampires" : 2 }
7: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [
  "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
8: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
  "energon" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
```

Практическое задание 8.2.1:

```
1: > db.towns.insert({name: "New York",
2: ... populatiuon: 22200000,
3: ... last_sensus: ISODate("2009-07-31"),
4: ... famous_for: ["status of liberty", "food"],
5: ... mayor: {
6: ...   name: "Michael Bloomberg",
7: ... party: "I"}}
8: ... )
9: WriteResult({ "nInserted" : 1 })
10: > db.towns.insert({name: "Portland",
11: ... populatiuon: 528000,
12: ... last_sensus: ISODate("2009-07-20"),
13: ... famous_for: ["beer", "food"],
14: ... mayor: {
15: ...   name: "Sam Adams",
16: ... party: "D"}}
17: ... )
18: WriteResult({ "nInserted" : 1 })
19:
20: db.towns.find({'mayor.party':'I'}, {'name':1, 'mayor':1} )
21: { "_id" : ObjectId("60be3f32a0990b3ce62127e1"), "name" : "New York", "mayor" : { "name"
  : "Michael Bloomberg", "party" : "I" } }
22:
23: db.towns.find({'mayor.party':{$exists:false}}, {'name':1, 'mayor':1} )
24: { "_id" : ObjectId("60be3f1ba0990b3ce62127e0"), "name" : "Punxsutawney ", "mayor" : {
  "name" : "Jim Wehrle" } }
```

Практическое задание 8.2.2:

```
1: > db.unicorns.find(fn)
2: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
3:   "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
4: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
5:   "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
6: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [
7:   "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
8: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade",
9:   "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
10: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : [
11:   "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
12: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
13:   "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
14: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
15:   "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 165 }

9:
10: > var cursor = db.unicorns.find(fn)
11: > var cursor = db.unicorns.find(fn)
12: > cursor.sort({name:1}).limit(2)
13: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
14:   "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 165 }
15: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
16:   "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
```

Практическое задание 8.2.3:

```
1: > db.unicorns.find({gender: "f"},{_id:false}, {weight:{>:500, <:700}, "_id" :
2:   false}).count();
3: 4
```

Практическое задание 8.2.4:

```
1: > db.unicorns.distinct('loves')
2: [
3:   "apple",
4:   "carrot",
5:   "chocolate",
6:   "energon",
7:   "grade",
8:   "grape",
9:   "lemon",
10:  "papaya",
11:  "redbull",
12:  "strawberry",
13:  "sugar",
14:  "watermelon"
15: ]
```

Практическое задание 8.2.5:

```
1: > db.unicorns.aggregate({$group:{_id:'$gender', total:{$sum:1}}})
2: { "_id" : "f", "total" : 4 }
3: { "_id" : "m", "total" : 7 }
```

Практическое задание 8.2.6:

```
1: > db.unicorns.save({name: 'Barny', loves: ['grape'],
2: ... weight: 340, gender: 'm'})
3: WriteResult({ "nInserted" : 1 })
4: > db.unicorns.find();
5: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
  "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
6: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
  "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
7: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [
  "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
8: { "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : [
  "apple", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
9: { "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "loves" : [
  "strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
10: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade",
  "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
11: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : [
  "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
12: { "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : [ "apple",
  "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
13: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
  "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
14: { "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : [ "grade",
  "carrot" ], "weight" : 540, "gender" : "f" }
15: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
  "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 165 }
16: { "_id" : ObjectId("60be4917a0990b3ce62127e3"), "name" : "Barny", "loves" : [ "grape"
  ], "weight" : 340, "gender" : "m" }
17: { "_id" : ObjectId("60be4918a0990b3ce62127e4"), "name" : "Barny", "loves" : [ "grape"
  ], "weight" : 340, "gender" : "m" }
```

Практическое задание 8.2.7:

```
1: > db.unicorns.update({name:'Ayna'}, {name:'Ayna', weight:800, vampires:51})
2: WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
3: > db.unicorns.find({name:'Ayna'});
4: { "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "weight" : 800,
  "vampires" : 51 }
```

Практическое задание 8.2.8:

```
1: > db.unicorns.update({name:'Raleigh', gender:'m'}, {name:'Raleigh', gender:'m',
  loves:'RedBull'})
2: WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
3: > db.unicorns.find({name:'Raleigh'});
4: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m",
  "loves" : "RedBull" }
```


Практическое задание 8.2.9:

```
1: .> db.unicorns.update({ gender:'m'}, {$inc:{vampires:5}}, {multi:true})
2: WriteResult({ "nMatched" : 9, "nUpserted" : 0, "nModified" : 9 })
3: > db.unicorns.find({gender:'m'});
4: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
  "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 73 }
5: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
  "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187 }
6: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [
  "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
7: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade",
  "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
8: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m",
  "loves" : "RedBull", "vampires" : 5 }
9: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
  "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
10: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
  "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 170 }
11: { "_id" : ObjectId("60be4917a0990b3ce62127e3"), "name" : "Barney", "loves" : [ "grape"
  ], "weight" : 340, "gender" : "m", "vampires" : 5 }
12: { "_id" : ObjectId("60be4918a0990b3ce62127e4"), "name" : "Barney", "loves" : [ "grape"
  ], "weight" : 340, "gender" : "m", "vampires" : 5 }
```

Практическое задание 8.2.10:

```
1: > db.towns.update({name:'Portland'}, {$unset:{'mayor.party':1}})
2: WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
3: > db.towns.find({name:'Portland'})
4: { "_id" : ObjectId("60be3f45a0990b3ce62127e2"), "name" : "Portland", "populatiuon" :
  528000, "last_sensus" : ISODate("2009-07-20T00:00:00Z"), "famous_for" : [ "beer",
  "food" ], "mayor" : { "name" : "Sam Adams" } }
```

Практическое задание 8.2.11:

```
1: > db.unicorns.update({ name:'Pilot'}, {$push:{loves:'chocolate'}})
2: WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
3: > db.unicorns.find({ name:'Pilot'})
4: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
  "watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
```

Практическое задание 8.2.12:

```
1: > db.unicorns.update({ name:'Aurora'}, {$addToSet: {loves: {$each:['sugar',
  'lemon']}}})
2: WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
3: > db.unicorns.find({ name:'Aurora'})
4: { "_id" : ObjectId("60be4d6fa0990b3ce62127e5"), "name" : "Aurora", "dob" :
  ISODate("1991-01-24T10:00:00Z"), "loves" : [ "carrot", "grape", "sugar", "lemon" ],
  "weight" : 450, "gender" : "f", "vampires" : 43 }
```

Практическое задание 8.2.13:

```
1: > db.towns.remove({'mayor.party':{$exists:false}})
2: WriteResult({'nRemoved' : 3 })
3: > db.towns.find()
4: { "_id" : ObjectId("60be3f32a0990b3ce62127e1"), "name" : "New York", "populatiuon" :
  22200000, "last_sensus" : ISODate("2009-07-31T00:00:00Z"), "famous_for" : [ "status of
  liberty", "food" ], "mayor" : { "name" : "Michael Bloomberg", "party" : "I" } }
5: { "_id" : ObjectId("60be4dfba0990b3ce62127e7"), "name" : "New York", "popujatiuon" :
  22200000, "last_sensus" : ISODate("2009-07-31T00:00:00Z"), "famous_for" : [ "status of
  liberty", "food" ], "mayor" : { "name" : "Michael Bloomberg", "party" : "I" } }
6: { "_id" : ObjectId("60be4e0ba0990b3ce62127e8"), "name" : "Portland", "popujatiuon" :
  528000, "last_sensus" : ISODate("2009-07-20T00:00:00Z"), "famous_for" : [ "beer",
  "food" ], "mayor" : { "name" : "Sam Adams", "party" : "D" } }
7: > db.towns.remove({})
8: WriteResult({'nRemoved' : 3 })
9: > db.towns.find()
10:
```

Практическое задание 8.3.1:

```
1: > db.unicorns.update({ name:'Aurora'}, {$set:{zone:{$ref:'zones', $id:'fr'}}})
2: WriteResult({'nMatched' : 1, "nUpserted" : 0, "nModified" : 1 })
3: > db.unicorns.update({ name:'Unicrom'}, {$set:{zone:{$ref:'zones', $id:'pr'}}})
4: WriteResult({'nMatched' : 1, "nUpserted" : 0, "nModified" : 1 })
5: > db.unicorns.update({ name:'Ayna'}, {$set:{zone:{$ref:'zones', $id:'ds'}}})
6: WriteResult({'nMatched' : 1, "nUpserted" : 0, "nModified" : 1 })
7: > db.unicorns.find()
8: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
  "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 73 }
9: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
  "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187, "zone" :
  DBRef("zones", "pr") }
10: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Rooooooodles", "loves" : [
  "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
11: { "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : [
  "apple", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
12: { "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "weight" : 800,
  "vampires" : 51, "zone" : DBRef("zones", "ds") }
13: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade",
  "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
14: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m",
  "loves" : "RedBull", "vampires" : 5 }
15: { "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : [ "apple",
  "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
16: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
  "watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
17: { "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : [ "grade",
  "carrot" ], "weight" : 540, "gender" : "f" }
18: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
  "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 170 }
19: { "_id" : ObjectId("60be4917a0990b3ce62127e3"), "name" : "Barney", "loves" : [ "grape"
  ], "weight" : 340, "gender" : "m", "vampires" : 5 }
20: { "_id" : ObjectId("60be4918a0990b3ce62127e4"), "name" : "Barney", "loves" : [ "grape"
  ], "weight" : 340, "gender" : "m", "vampires" : 5 }
21: { "_id" : ObjectId("60be4d6fa0990b3ce62127e5"), "name" : "Aurora", "dob" :
  ISODate("1991-01-24T10:00:00Z"), "loves" : [ "carrot", "grape", "sugar", "lemon" ],
  "weight" : 450, "gender" : "f", "vampires" : 43, "zone" : DBRef("zones", "fr") }
```

Практическое задание 8.3.2:

```
1: > db.unicorns.ensureIndex({'name':1}, {'unique':true})
2: {
3:     "createdCollectionAutomatically" : false,
4:     "numIndexesBefore" : 1,
5:     "numIndexesAfter" : 2,
6:     "ok" : 1
7: }
8: > db.unicorns.find()
9: { "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot",
10: "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 73 }
11: { "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [
12: "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187, "zone" :
13: DBRef("zones", "pr") }
14: { "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [
15: "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
16: { "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : [
17: "apple", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
18: { "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "weight" : 800,
19: "vampires" : 51, "zone" : DBRef("zones", "ds") }
20: { "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade",
"lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
21: { "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m",
"loves" : "RedBull", "vampires" : 5 }
22: { "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : [ "apple",
"watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
23: { "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple",
"watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
24: { "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : [ "grade",
"carrot" ], "weight" : 540, "gender" : "f" }
25: { "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape",
"watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 170 }
26: { "_id" : ObjectId("60be4d6fa0990b3ce62127e5"), "name" : "Aurora", "dob" :
ISODate("1991-01-24T10:00:00Z"), "loves" : [ "carrot", "grape", "sugar", "lemon" ],
"weight" : 450, "gender" : "f", "vampires" : 43, "zone" : DBRef("zones", "fr") }
```

Практическое задание 8.3.3:

```

1: > db.unicorns.getIndexes()
2: [
3:     {
4:         "v" : 2,
5:         "key" : {
6:             "_id" : 1
7:         },
8:         "name" : "_id_"
9:     },
10:    {
11:        "v" : 2,
12:        "unique" : true,
13:        "key" : {
14:            "name" : 1
15:        },
16:        "name" : "name_1"
17:    }
18: ]
19: > db.unicorns.dropIndexes('name_1')
20: { "nIndexesWas" : 2, "ok" : 1 }
21: > db.unicorns.dropIndexes('_id_') - попытка удаление индекса
22: uncaught exception: Error: error dropping indexes : {
23:     "ok" : 0,
24:     "errmsg" : "cannot drop _id index",
25:     "code" : 72,
26:     "codeName" : "InvalidOptions"
27:

```

Практическое задание 8.3.4:

```

28: > for(i = 0; i < 100000; i++){db.numbers.insert({value: i})}
29: WriteResult({ "nInserted" : 1 })
30: > db.numbers.getIndexes()
31: [ { "v" : 2, "key" : { "_id" : 1 }, "name" : "_id_" } ]
32: > db.numbers.find({value:{$in:[99999, 99998, 99997, 99996]}})
33: { "_id" : ObjectId("60be557fa0990b3ce622ae85"), "value" : 99996 }
34: { "_id" : ObjectId("60be557fa0990b3ce622ae86"), "value" : 99997 }
35: { "_id" : ObjectId("60be557fa0990b3ce622ae87"), "value" : 99998 }
36: { "_id" : ObjectId("60be557fa0990b3ce622ae88"), "value" : 99999 }
37: > db.numbers.explain('executionStats').find({executionTimeMillis:1})
38: {
39:   "queryPlanner" : {
40:     "plannerVersion" : 1,
41:     "namespace" : "learn.numbers",
42:     "indexFilterSet" : false,
43:     "parsedQuery" : {
44:       "executionTimeMillis" : {
45:         "$eq" : 1
46:       }
47:     },
48:     "winningPlan" : {
49:       "stage" : "COLLSCAN",
50:       "filter" : {
51:         "executionTimeMillis" : {
52:           "$eq" : 1
53:         }
54:       },
55:       "direction" : "forward"
56:     },
57:     "rejectedPlans" : [ ]
58:   },
59:   "executionStats" : {
60:     "executionSuccess" : true,
61:     "nReturned" : 0,
62:     "executionTimeMillis" : 58,
63:     "totalKeysExamined" : 0,
64:     "totalDocsExamined" : 100000,
65:     "executionStages" : {
66:       "stage" : "COLLSCAN",
67:       "filter" : {
68:         "executionTimeMillis" : {
69:           "$eq" : 1
70:         }
71:       },
72:       "nReturned" : 0,
73:       "executionTimeMillisEstimate" : 0,
74:       "works" : 100002,
75:       "advanced" : 0,
76:       "needTime" : 100001,
77:       "needYield" : 0,
78:       "saveState" : 100,
79:       "restoreState" : 100,
80:       "isEOF" : 1,
81:       "direction" : "forward",
82:       "docsExamined" : 100000
83:     }
84:   },
85:   "serverInfo" : {
86:     "host" : "User-PC",
87:     "port" : 27017,
88:     "version" : "4.4.6",
89:     "gitVersion" : "72e66213c2c3eab37d9358d5e78ad7f5c1d0d0d7"
90:   },
91:   "ok" : 1
92: }
93: > db.numbers.ensureIndex({'value':1}, {'unique':true})
94: {
95:   "createdCollectionAutomatically" : false,

```

```

96:         "numIndexesBefore" : 1,
97:         "numIndexesAfter" : 2,
98:         "ok" : 1
99:     }
100: > db.numbers.getIndexes()
101: [
102:     {
103:         "v" : 2,
104:         "key" : {
105:             "_id" : 1
106:         },
107:         "name" : "_id_"
108:     },
109:     {
110:         "v" : 2,
111:         "unique" : true,
112:         "key" : {
113:             "value" : 1
114:         },
115:         "name" : "value_1"
116:     }
117: ]
118: > db.numbers.find({value:{$in:[99999, 99998, 99997, 99996]}})
119: { "_id" : ObjectId("60be557fa0990b3ce622ae85"), "value" : 99996 }
120: { "_id" : ObjectId("60be557fa0990b3ce622ae86"), "value" : 99997 }
121: { "_id" : ObjectId("60be557fa0990b3ce622ae87"), "value" : 99998 }
122: { "_id" : ObjectId("60be557fa0990b3ce622ae88"), "value" : 99999 }
123: > db.numbers.explain('executionStats').find({executionTimeMillis:1})
124: {
125:     "queryPlanner" : {
126:         "plannerVersion" : 1,
127:         "namespace" : "learn.numbers",
128:         "indexFilterSet" : false,
129:         "parsedQuery" : {
130:             "executionTimeMillis" : {
131:                 "$eq" : 1
132:             }
133:         },
134:         "winningPlan" : {
135:             "stage" : "COLLSCAN",
136:             "filter" : {
137:                 "executionTimeMillis" : {
138:                     "$eq" : 1
139:                 }
140:             },
141:             "direction" : "forward"
142:         },
143:         "rejectedPlans" : [ ]
144:     },
145:     "executionStats" : {
146:         "executionSuccess" : true,
147:         "nReturned" : 0,
148:         "executionTimeMillis" : 57,
149:         "totalKeysExamined" : 0,
150:         "totalDocsExamined" : 100000,
151:         "executionStages" : {
152:             "stage" : "COLLSCAN",
153:             "filter" : {
154:                 "executionTimeMillis" : {
155:                     "$eq" : 1
156:                 }
157:             },
158:             "nReturned" : 0,
159:             "executionTimeMillisEstimate" : 3,
160:             "works" : 100002,
161:             "advanced" : 0,
162:             "needTime" : 100001,
163:             "needYield" : 0,
164:             "saveState" : 100,

```

```
165:         "restoreState" : 100,
166:         "isEOF" : 1,
167:         "direction" : "forward",
168:         "docsExamined" : 100000
169:     }
170: },
171: "serverInfo" : {
172:   "host" : "User-PC",
173:   "port" : 27017,
174:   "version" : "4.4.6",
175:   "gitVersion" : "72e66213c2c3eab37d9358d5e78ad7f5c1d0d0d7"
176: },
177: "ok" : 1
178: }
```

ВЫВОДЫ

MongoDB оказалась мощной и удобной СУБД. В рамках работы были реализованы операции добавления, обновления и удаления данных, фильтр и поиск.