Завдання 1.

```yaml
version: "3.9"
services:
  mongo_main_server:
    image: "mongo"
    ports:
      - "27017:27017"
    hostname: mongo_main_server

  mongo_config_server:
    image: "mongo"
    deploy:
      replicas: 3
    depends_on:
      - mongo_main_server
    entrypoint: ["bash", "-c", "sleep 10 && mongosh --host mongo_main_server:27017"]

  mongo_data_server:
    image: "mongo"
    deploy:
      replicas: 4
    depends_on:
      - mongo_main_server
    entrypoint: ["bash", "-c", "sleep 10 && mongosh --host mongo_main_server:27017"]

  mongo_data_replica_server:
    image: "mongo"
    deploy:
      replicas: 6
    depends_on:
      - mongo_main_server
    entrypoint: ["bash", "-c", "sleep 10 && mongosh --host mongo_main_server:27017"]
```

```
PS C:\Uni\HL\hl_2022\lab_3\task_1> docker-compose up
[+] Running 15/15
 - Network task_1_default                              Created                                          0.0s
 - Container task_1-mongo_main_server-1                Created                                          0.8s
 - Container task_1-mongo_data_replica_server-6        Created                                          2.1s
 - Container task_1-mongo_data_server-4                Created                                          2.1s
 - Container task_1-mongo_data_server-1                Created                                          2.0s
 - Container task_1-mongo_data_replica_server-1        Created                                          2.0s
 - Container task_1-mongo_data_server-2                Created                                          2.1s
 - Container task_1-mongo_config_server-3              Created                                          2.1s
 - Container task_1-mongo_data_replica_server-3        Created                                          2.1s
 - Container task_1-mongo_data_replica_server-4        Created                                          2.0s
 - Container task_1-mongo_config_server-1              Created                                          2.1s
 - Container task_1-mongo_data_replica_server-5        Created                                          2.0s
 - Container task_1-mongo_data_server-3                Created                                          2.1s
 - Container task_1-mongo_config_server-2              Created                                          2.1s
 - Container task_1-mongo_data_replica_server-2        Created                                          2.1s
Attaching to task_1-mongo_config_server-1, task_1-mongo_config_server-2, task_1-mongo_config_server-3, task_1-mongo_data_replica_s
```

Завдання 2.

```javascript
use db

var foundStuff = db.london_postcodes.find({ Northing: 168873 })
printjson(foundStuff)
```

```
951f439bd681_task_2-mongo_find-1   | db> [
951f439bd681_task_2-mongo_find-1   |   {
951f439bd681_task_2-mongo_find-1   |     _id: ObjectId("63c2db5b36cae69b6f6ae675"),
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.779+00:00"},"s":"I",  "c":"-",        "id":208
ted","attr":{"opId":719}}
951f439bd681_task_2-mongo_find-1   |     Postcode: 'BR1 1AA',
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.780+00:00"},"s":"I",  "c":"NETWORK",  "id":229
3:44004","uuid":"95f4cd9b-8406-42e1-9a4b-12871abf539d","connectionId":4,"connectionCount":5}}
951f439bd681_task_2-mongo_find-1   |     'In Use?': 'Yes',
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.780+00:00"},"s":"I",  "c":"NETWORK",  "id":229
3:44006","uuid":"6980207d-bf03-4a44-bebd-01d5d86fe10b","connectionId":5,"connectionCount":4}}
951f439bd681_task_2-mongo_find-1   |     Latitude: 51.401546,
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.780+00:00"},"s":"I",  "c":"NETWORK",  "id":229
3:44018","uuid":"607c90fe-7e09-43dd-aab0-8a0d2dced0af","connectionId":9,"connectionCount":3}}
951f439bd681_task_2-mongo_find-1   |     Longitude: 0.015415,
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.780+00:00"},"s":"I",  "c":"NETWORK",  "id":229
3:44010","uuid":"86a5be75-3053-4a98-89ce-1d2fb1fd0910","connectionId":7,"connectionCount":1}}
951f439bd681_task_2-mongo_find-1   |     Easting: 540291,
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.780+00:00"},"s":"I",  "c":"NETWORK",  "id":229
3:44016","uuid":"764a496d-2617-4fd1-875e-2bdcaf059144","connectionId":8,"connectionCount":2}}
951f439bd681_task_2-mongo_find-1   |     Northing: 168873,
task_2-mongo_main_server-1         | {"t":{"$date":"2023-01-14T16:42:12.780+00:00"},"s":"I",  "c":"NETWORK",  "id":229
3:44008","uuid":"243e7b2b-d4c4-4348-b98f-0e9bfe60b598","connectionId":6,"connectionCount":0}}
951f439bd681_task_2-mongo_find-1   |     GridRef: 'TQ402688',
951f439bd681_task_2-mongo_find-1   |     County: 'Greater London',
951f439bd681_task_2-mongo_find-1   |     District: 'Bromley',
951f439bd681_task_2-mongo_find-1   |     Ward: 'Bromley Town',
951f439bd681_task_2-mongo_find-1   |     DistrictCode: 'E09000006',
951f439bd681_task_2-mongo_find-1   |     WardCode: 'E05000109',
951f439bd681_task_2-mongo_find-1   |     Country: 'England',
951f439bd681_task_2-mongo_find-1   |     CountyCode: 'E11000009',
951f439bd681_task_2-mongo_find-1   |     Constituency: 'Bromley and Chislehurst',
951f439bd681_task_2-mongo_find-1   |     Introduced: '2016-05-01',
951f439bd681_task_2-mongo_find-1   |     Terminated: '',
951f439bd681_task_2-mongo_find-1   |     Parish: '',
951f439bd681_task_2-mongo_find-1   |     NationalPark: '',
951f439bd681_task_2-mongo_find-1   |     Population: '',
951f439bd681_task_2-mongo_find-1   |     Households: '',
951f439bd681_task_2-mongo_find-1   |     'Built up area': 'Greater London',
951f439bd681_task_2-mongo_find-1   |     'Built up sub-division': 'Bromley',
951f439bd681_task_2-mongo_find-1   |     'Lower layer super output area': 'Bromley 018B',
951f439bd681_task_2-mongo_find-1   |     'Rural/urban': 'Urban major conurbation',
951f439bd681_task_2-mongo_find-1   |     Region: 'London',
951f439bd681_task_2-mongo_find-1   |     Altitude: 71,
951f439bd681_task_2-mongo_find-1   |     'London zone': 5,
951f439bd681_task_2-mongo_find-1   |     'LSOA Code': 'E01000675'
951f439bd681_task_2-mongo_find-1   |   },
951f439bd681_task_2-mongo_find-1   |   {
951f439bd681_task_2-mongo_find-1   |     _id: ObjectId("63c2db5b36cae69b6f6ae6b0")
```

Завдання 3.

```
222    use db
223
224    db.createCollection('orders')
225
226    db.createCollection('clients')
227
228    db.createCollection('drivers')
229
230    addDriversToCollection(2000)
231
232    addClientsToCollection(4000)
233
234
235    // to generate 10 GB of data put 10000000 as the argument of this function
236    // it takes around 3 second for 100 entries, so it would take a very long time
237    addOrdersToCollection(1000)
238
239    printjson(db.orders.count())
240    printjson(db.clients.count())
241    printjson(db.drivers.count())
242
243    printjson(db.orders.findOne())
244
```

```
task_3-mongo_find-1          | db> Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          | Added 100 orders
task_3-mongo_find-1          |
task_3-mongo_find-1          | db>
task_3-mongo_find-1          | db> DeprecationWarning: Collection.count() is deprecated. Use countDocuments or estimatedDocumentCount.
task_3-mongo_find-1          | 1000
task_3-mongo_find-1          |
task_3-mongo_find-1          | db> 4000
task_3-mongo_find-1          |
task_3-mongo_find-1          | db> 2000
task_3-mongo_find-1          |
task_3-mongo_find-1          | db>
task_3-mongo_find-1          | db> {
task_3-mongo_find-1          |   _id: ObjectId("63c2dde055088afc3f8b74dc"),
task_3-mongo_find-1          |   driverId: ObjectId("63c2ddc755088afc3f8b5d6c"),
task_3-mongo_find-1          |   clientId: ObjectId("63c2ddbecea5c6c23a02aff4"),
task_3-mongo_find-1          |   departureLatitude: 51.528974,
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.966+00:00"},"s":"I",  "c":"-",        "id":20883,   "ctx":"conn4","msg":"Interrupted operatio
n as its client disconnected","attr":{"opId":12228}}
task_3-mongo_main_server-1   |   departureLongitude: -0.169514,
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.966+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn10","msg":"Connection ended","
attr":{"remote":"172.30.0.3:39832","uuid":"c0bad506-e6bd-4887-a85d-342c87f0fc4d","connectionId":10,"connectionCount":6}}
task_3-mongo_find-1          |   arrivalLatitude: 51.509853,
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.967+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn4","msg":"Connection ended","a
ttr":{"remote":"172.30.0.3:39814","uuid":"46b90e6c-7c1a-45e5-93df-38e441c46b10","connectionId":4,"connectionCount":5}}
task_3-mongo_find-1          |   arrivalLongitude: -0.307601,
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.967+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn6","msg":"Connection ended","a
ttr":{"remote":"172.30.0.3:39818","uuid":"cad894ac-2dc5-4064-b245-c5df5dafa347","connectionId":6,"connectionCount":4}}
task_3-mongo_find-1          |   price: 50,
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.968+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn9","msg":"Connection ended","a
ttr":{"remote":"172.30.0.3:39826","uuid":"dba40769-65d8-41df-b717-bffb899a8160","connectionId":9,"connectionCount":3}}
task_3-mongo_find-1          |   startDate: ISODate("2023-01-15T16:41:16.127Z"),
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.968+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn8","msg":"Connection ended","a
ttr":{"remote":"172.30.0.3:39824","uuid":"bba72394-b6e0-4807-8924-48836a954948","connectionId":8,"connectionCount":2}}
task_3-mongo_find-1          |   endDate: ISODate("2023-01-15T16:41:16.127Z"),
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.968+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn5","msg":"Connection ended","a
ttr":{"remote":"172.30.0.3:39816","uuid":"b8b0679a-c5f0-4daa-9607-f279e28c9588","connectionId":5,"connectionCount":1}}
task_3-mongo_find-1          |   clientReview: 5,
task_3-mongo_main_server-1   | {"t":{"$date":"2023-01-14T16:53:12.968+00:00"},"s":"I",  "c":"NETWORK",  "id":22944,   "ctx":"conn7","msg":"Connection ended","a
ttr":{"remote":"172.30.0.3:39820","uuid":"ee426184-f70c-4f29-bea6-e44287fad259","connectionId":7,"connectionCount":0}}
task_3-mongo_find-1          |   driverReview: 5,
task_3-mongo_find-1          |   clientWrittenReview: null,
task_3-mongo_find-1          |   driverWrittenReview: null,
task_3-mongo_find-1          |   drivingSkillsReview: 5,
task_3-mongo_find-1          |   conversationSkillsReview: 5,
task_3-mongo_find-1          |   politeAttitudeReview: 2
task_3-mongo_find-1          | }
task_3-mongo_find-1          |
```

Завдання 4.

```
1    use db
2
3    // variant 5, get 100 drivers who earned the most amount
4
5    // is is said that mapreduce is deprecated in the modern version of mongodb and using aggregate is preferable
6
7    var bestEarningDrivers = db.orders.aggregate([
8        {
9            $group:
10           {
11               _id: "$driverId",
12               moneyMade: { $sum: "$price" }
13           }
14       },
15       {
16           $sort:
17           {
18               moneyMade: -1
19           }
20       },
21       {
22           $limit: 100
23       }
24   ]).toArray()
25
26   // however, here is the same query as mapreduce
27
28   var mapReduceResult = db.orders.mapReduce(
29                                   function() { emit(this.driverId, this.price); },
30                                   function(key, values) { return Array.sum(values) },
31                                   {
32                                       out: 'result'
33                                   }
34                               )
35
36   printjson("Aggregate query result")
37
38   printjson(bestEarningDrivers)
39
40   printjson("MapReduce query result")
41
42   printjson(db.result.find().sort({ value: -1 }).limit(100).toArray())
```

```
task_4-mongo_find-1
task_4-mongo_find-1
task_4-mongo_find-1      db> Aggregate query result
task_4-mongo_find-1
task_4-mongo_find-1      db>
task_4-mongo_find-1      db> [
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a31fd3dd74230db88768"),
task_4-mongo_find-1          moneyMade: 9011.187500000173
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a31ed3dd74230db88713"),
task_4-mongo_find-1          moneyMade: 8577.965000000038
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a323d3dd74230db888d0"),
task_4-mongo_find-1          moneyMade: 8449.634999999844
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a323d3dd74230db88903"),
task_4-mongo_find-1          moneyMade: 8441.87249999988
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a327d3dd74230db88a89"),
task_4-mongo_find-1          moneyMade: 8357.297500000079
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a324d3dd74230db88978"),
task_4-mongo_find-1          moneyMade: 8332.082499999944
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a323d3dd74230db888eb"),
task_4-mongo_find-1          moneyMade: 8116.942500000076
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a322d3dd74230db8886d"),
task_4-mongo_find-1          moneyMade: 8103.149999999783
task_4-mongo_find-1        },
task_4-mongo_find-1        {
task_4-mongo_find-1          _id: ObjectId("63c1a323d3dd74230db8891b"),
```

```
task_4-mongo_find-1    | db>
task_4-mongo_find-1    | db> MapReduce query result
task_4-mongo_find-1    |
task_4-mongo_find-1    | db>
task_4-mongo_find-1    | db> [
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a31fd3dd74230db88768"),
task_4-mongo_find-1    |     value: 9011.187500000175
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a31ed3dd74230db88713"),
task_4-mongo_find-1    |     value: 8577.96500000004
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a323d3dd74230db888d0"),
task_4-mongo_find-1    |     value: 8449.634999999844
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a323d3dd74230db88903"),
task_4-mongo_find-1    |     value: 8441.872499999881
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a327d3dd74230db88a89"),
task_4-mongo_find-1    |     value: 8357.297500000077
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a324d3dd74230db88978"),
task_4-mongo_find-1    |     value: 8332.082499999946
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a323d3dd74230db888eb"),
task_4-mongo_find-1    |     value: 8116.9425000000765
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
task_4-mongo_find-1    |     _id: ObjectId("63c1a322d3dd74230db8886d"),
task_4-mongo_find-1    |     value: 8103.14999999782
task_4-mongo_find-1    |   },
task_4-mongo_find-1    |   {
```