

**Task 1 Advanced - Написання MapReduce на прикладі MongoDB  
(10 балів)**

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<http://docs.mongodb.org/manual/core/map-reduce/>

<http://docs.mongodb.org/manual/tutorial/map-reduce-examples/>

<http://docs.mongodb.org/manual/reference/command/mapReduce/#dbcmd.mapReduce>

- Використовуйте дані та колекції з завдання MongoDB Basics.

Використовуючи підхід Map / Reduce напишіть наступні запити. Деякі з запитів простіше робити через два Map / Reduce

1. Підрахувати скільки одиниць товару є у кожного виробника ("producer")
2. Підрахувати загальну вартість товарів у кожного виробника ("producer")
3. Підрахуйте сумарну вартість замовлень зроблену кожним замовником
4. Підрахуйте сумарну вартість замовлень зроблену кожним замовником за певний період часу (використовуйте query condition)
5. Підрахуйте середню вартість замовлення
6. Підрахуйте середню вартість замовлення кожного покупця
7. Підрахуйте в скількох замовленнях зустрічався кожен товар (скільки разів він був куплений)
8. Для кожного товару отримаєте список всіх замовників які купили його
9. Отримайте товар та список замовників, які купували його більше одного (двох) разу(ів)
10. Отримайте топ N товарів за популярністю (тобто топ товарів, які куплялись найчастіше) (функцію sort не застосовувати)
11. Для завдання 4) реалізуйте інкрементальний Map / Reduce використовуючи *out i action*
12. Для кожного користувача, визначить на яку суму їм було зроблено замовлень за кожен місяць цього року та за аналогічний місяць минулого року та динаміку збільшення/зменшення замовлень. Результуючий вигляд:

12: Andrii R.	name: Andrii R.
	month: 12
	year: 2017
	amount: 1234
	prev_year_amount: 1000
	diff: +234

Код:

Знаходиться в публічному репозиторії поряд з протоколом

Результат:

```
*** TASK 1: Calculate units per producer ***
```

```
Units per producer:
```

```
Document({_id=Lenovo, value=4.0})
```

```
Document({_id=Google, value=1.0})
```

```
Document({_id=Microsoft, value=7.0})
```

```
Document({_id=Dell, value=2.0})
```

```
Document({_id=Samsung, value=3.0})
```

```
Document({_id=Apple, value=3.0})
```

```
*** TASK 2: Total cost of goods per producer ***
```

```
Total cost per producer:
```

```
Document({_id=Lenovo, value=4804.0})
```

```
Document({_id=Google, value=1915.0})
```

```
Document({_id=Dell, value=3232.0})
```

```
Document({_id=Apple, value=4366.0})
```

```
Document({_id=Samsung, value=2721.0})
```

```
Document({_id=Microsoft, value=8529.0})
```

```
*** TASK 3: Calculate total cost of orders per customer ***
```

```
Total cost per customer:
```

```
Document({_id=Andrii Johnson, value=10438.0})
```

```
Document({_id=Olena Johnson, value=32533.0})
```

```
Document({_id=Andrii Smith, value=9401.0})
```

```
Document({_id=Olena Smith, value=30877.0})
```

Document({\_id=Ivan Brown, value=1817.0})

Document({\_id=Ivan Smith, value=7541.0})

Document({\_id=Anna Smith, value=16047.0})

Document({\_id=Andrii Brown, value=11942.0})

Document({\_id=Ivan Williams, value=13729.0})

Document({\_id=Andrii Williams, value=7108.0})

Document({\_id=Petro Smith, value=10440.0})

Document({\_id=Ivan Johnson, value=3666.0})

Document({\_id=Anna Williams, value=5656.0})

Document({\_id=Petro Jones, value=23500.0})

Document({\_id=Petro Brown, value=11563.0})

Document({\_id=Anna Brown, value=13472.0})

Document({\_id=Olena Brown, value=8272.0})

Document({\_id=Petro Williams, value=7408.0})

Document({\_id=Anna Johnson, value=12944.0})

Document({\_id=Anna Jones, value=14709.0})

Document({\_id=Olena Jones, value=12262.0})

Document({\_id=Olena Williams, value=19653.0})

Document({\_id=Petro Johnson, value=5827.0})

Document({\_id=Andrii Jones, value=7435.0})

Document({\_id=Ivan Jones, value=6343.0})

\*\*\* TASK 4: Total cost of summer orders per customer in 2023

\*\*\*

Total cost of summer orders per customer in 2023:

Document({\_id=Olena Johnson, value=5150.0})

Document({\_id=Olena Smith, value=4070.0})

Document({\_id=Andrii Smith, value=5421.0})

Document({\_id=Andrii Johnson, value=4441.0})

Document({\_id=Anna Smith, value=4009.0})

Document({\_id=Ivan Williams, value=1763.0})

Document({\_id=Andrii Brown, value=3273.0})

Document({\_id=Petro Smith, value=6830.0})

Document({\_id=Ivan Johnson, value=2212.0})

Document({\_id=Petro Jones, value=12761.0})

Document({\_id=Petro Brown, value=2663.0})

Document({\_id=Anna Johnson, value=4835.0})

Document({\_id=Olena Brown, value=2330.0})

Document({\_id=Petro Williams, value=1621.0})

Document({\_id=Andrii Jones, value=2492.0})

\*\*\* TASK 5: Average cost of the order \*\*\*

Average cost of the order: Document({\_id=average,  
value=3045.83})

\*\*\* TASK 6: Average cost of each customer's order \*\*\*

Average cost of each customer's order:

Document({\_id=Ivan Jones, value=3171.5})

Document({\_id=Andrii Johnson, value=3479.3333333333335})

Document({\_id=Olena Smith, value=3430.7777777777778})

Document({\_id=Olena Johnson, value=3614.7777777777778})

Document({\_id=Ivan Smith, value=3770.5})

Document({\_id=Andrii Smith, value=3133.6666666666665})

Document({\_id=Anna Smith, value=4011.75})

Document({\_id=Andrii Brown, value=2985.5})

Document({\_id=Ivan Williams, value=3432.25})

Document({\_id=Andrii Williams, value=2369.3333333333335})

Document({\_id=Petro Smith, value=2610.0})

Document({\_id=Ivan Johnson, value=1833.0})

Document({\_id=Anna Williams, value=2828.0})

Document({\_id=Petro Jones, value=2937.5})

Document({\_id=Petro Brown, value=3854.3333333333335})

Document({\_id=Olena Brown, value=2068.0})

Document({\_id=Petro Williams, value=2469.3333333333335})

Document({\_id=Anna Johnson, value=2588.8})

Document({\_id=Olena Jones, value=3065.5})

Document({\_id=Petro Johnson, value=2913.5})

Document({\_id=Anna Jones, value=2451.5})

Document({\_id=Anna Brown, value=3368.0})

Document({\_id=Olena Williams, value=2807.5714285714284})

Document({\_id=Andrii Jones, value=3717.5})

Document({\_id=Ivan Brown, value=1817.0})

\*\*\* TASK 7: Count how many orders each item was in \*\*\*

Count of orders each item was in:

Document({\_id=f12fc50d-1275-48d7-a062-51328778c928,  
value=12.0})

Document({\_id=774bac2c-030d-4cf2-b964-ca35e371cfbf,  
value=12.0})

Document({\_id=bb1f2f48-9ce2-4da9-ae1a-3c584d155dc4,  
value=14.0})

Document({\_id=96c08a2c-d23d-4b6e-b129-d4ece213ce30,  
value=13.0})

Document({\_id=1e528d6c-1b14-4684-a843-bab6c49a6729,  
value=12.0})

Document({\_id=3b00c5e3-9ecb-417a-8298-dfeecd231e24,  
value=12.0})

Document({\_id=720033dc-a764-4ccb-9088-1aa6774b2473,  
value=10.0})

Document({\_id=9852fe35-eb73-4310-8de6-97d1a7d837a4,  
value=6.0})

Document({\_id=e959fb61-a9c4-4b17-a274-5e287128cfa5,  
value=5.0})

Document({\_id=ec919be4-54ac-486d-b4ad-9af4192fcec6,  
value=10.0})

Document({\_id=f54f9cfb-c99f-47a2-ae04-eaa04e20ea0e,  
value=5.0})

Document({\_id=f54d98d6-35a4-442b-adb1-9f39967e3c91,  
value=15.0})

Document({\_id=e65061fc-3b4b-47b9-ad38-16935d58cf1a,  
value=11.0})

Document({\_id=07eb3364-c219-4ca2-b9f5-2bde490f993d,  
value=15.0})

```
Document({_id=aca826c6-9230-4883-bdbd-0a13ae30ef03,
value=12.0})
```

```
Document({_id=f84b0f11-365a-41f4-9ddc-54188203490c,
value=15.0})
```

```
Document({_id=727405d9-4b34-4c6b-a0de-86352ce3e02a,
value=15.0})
```

```
Document({_id=d1e40a49-b74a-420a-8ef7-97337a72344e,
value=15.0})
```

```
Document({_id=8c58f957-a464-4037-9147-975723766247,
value=15.0})
```

```
Document({_id=832a1a3f-1f39-4e1c-9997-5090c8fbfde0,
value=18.0})
```

\*\*\* TASK 8: For each product, list all customers who bought it  
\*\*\*

List of customers per product:

```
Document({_id=f12fc50d-1275-48d7-a062-51328778c928,
value=[Ivan Jones, Olena Williams, Andrii Jones, Petro
Williams, Andrii Smith, Andrii Brown, Petro Johnson, Olena
Brown, Anna Jones, Anna Williams]})
```

```
Document({_id=bb1f2f48-9ce2-4da9-ae1a-3c584d155dc4,
value=[Ivan Jones, Anna Brown, Petro Williams, Andrii Smith,
Anna Smith, Olena Johnson, Olena Brown, Olena Smith, Petro
Jones, Ivan Williams, Petro Johnson, Anna Johnson]})
```

```
Document({_id=774bac2c-030d-4cf2-b964-ca35e371cfbf,
value=[Andrii Johnson, Anna Jones, Olena Johnson, Andrii
```

Williams, Andrii Smith, Anna Williams, Olena Brown, Ivan Williams, Anna Smith, Olena Smith, Petro Jones]]}

Document({\_id=96c08a2c-d23d-4b6e-b129-d4ece213ce30,  
value=[Anna Johnson, Petro Jones, Ivan Brown, Ivan Williams,  
Petro Smith, Olena Williams, Ivan Johnson, Olena Smith, Andrii Brown, Anna Jones, Anna Williams]]})

Document({\_id=1e528d6c-1b14-4684-a843-bab6c49a6729,  
value=[Petro Jones, Olena Johnson, Ivan Williams, Anna Smith,  
Olena Williams, Ivan Johnson, Andrii Williams, Olena Jones,  
Ivan Jones]]})

Document({\_id=3b00c5e3-9ecb-417a-8298-dfeecd231e24,  
value=[Anna Jones, Ivan Jones, Ivan Williams, Petro Brown,  
Olena Brown, Olena Johnson, Anna Johnson, Olena Jones, Olena Smith, Petro Johnson]]})

Document({\_id=720033dc-a764-4ccb-9088-1aa6774b2473,  
value=[Anna Johnson, Ivan Johnson, Andrii Smith, Olena Smith,  
Olena Johnson, Anna Jones, Olena Brown, Olena Williams]]})

Document({\_id=9852fe35-eb73-4310-8de6-97d1a7d837a4,  
value=[Anna Smith, Andrii Smith, Anna Brown, Olena Jones,  
Andrii Williams, Andrii Johnson]]})

Document({\_id=e959fb61-a9c4-4b17-a274-5e287128cfa5,  
value=[Ivan Smith, Anna Johnson, Olena Johnson, Anna Jones,  
Olena Williams]]})

Document({\_id=ec919be4-54ac-486d-b4ad-9af4192fcec6,  
value=[Ivan Johnson, Olena Williams, Anna Johnson, Petro



Smith, Andrii Brown, Olena Johnson, Olena Smith, Petro Jones,  
Petro Williams]]}

Document({\_id=f54f9cfb-c99f-47a2-ae04-eaa04e20ea0e,  
value=[Olena Williams, Anna Johnson, Andrii Smith, Olena  
Johnson]]}

Document({\_id=f54d98d6-35a4-442b-adb1-9f39967e3c91,  
value=[Olena Smith, Andrii Johnson, Olena Williams, Petro  
Smith, Anna Brown, Petro Williams, Petro Brown, Anna Jones,  
Olena Jones, Andrii Williams, Anna Williams]]}

Document({\_id=e65061fc-3b4b-47b9-ad38-16935d58cf1a,  
value=[Olena Smith, Anna Brown, Andrii Smith, Petro Jones,  
Anna Williams, Andrii Williams, Petro Brown, Anna Jones,  
Andrii Johnson]]}

Document({\_id=07eb3364-c219-4ca2-b9f5-2bde490f993d,  
value=[Petro Williams, Olena Smith, Petro Jones, Andrii Jones,  
Anna Brown, Anna Smith, Olena Williams, Olena Johnson, Andrii  
Johnson, Andrii Brown]]}

Document({\_id=aca826c6-9230-4883-bdbd-0a13ae30ef03,  
value=[Anna Johnson, Anna Brown, Ivan Williams, Olena Smith,  
Olena Brown, Olena Williams, Petro Jones, Anna Williams]]}

Document({\_id=f84b0f11-365a-41f4-9ddc-54188203490c,  
value=[Anna Johnson, Anna Smith, Petro Smith, Olena Brown,  
Ivan Johnson, Olena Jones, Andrii Williams, Petro Jones, Olena  
Johnson, Andrii Brown]]}

```
Document({_id=727405d9-4b34-4c6b-a0de-86352ce3e02a,
value=[Olena Smith, Andrii Jones, Petro Jones, Anna Johnson,
Petro Smith, Andrii Williams, Anna Jones, Ivan Smith, Olena
Williams]}}
```

```
Document({_id=d1e40a49-b74a-420a-8ef7-97337a72344e,
value=[Olena Smith, Ivan Brown, Petro Brown, Andrii Smith,
Anna Brown, Anna Johnson, Olena Williams, Olena Jones, Olena
Brown, Petro Johnson, Anna Jones]}}
```

```
Document({_id=832a1a3f-1f39-4e1c-9997-5090c8fbfde0,
value=[Petro Brown, Ivan Jones, Andrii Jones, Petro Williams,
Petro Smith, Anna Brown, Ivan Williams, Anna Williams, Petro
Jones, Olena Johnson, Petro Johnson, Andrii Johnson, Andrii
Brown]}}
```

```
Document({_id=8c58f957-a464-4037-9147-975723766247,
value=[Olena Smith, Ivan Johnson, Olena Johnson, Olena
Williams, Ivan Williams, Andrii Smith, Anna Smith, Olena
Brown, Anna Williams, Anna Johnson]}}
```

\*\*\* TASK 9: Products and customers who bought more than once  
\*\*\*

Products and repeat customers:

```
Document({_id=774bac2c-030d-4cf2-b964-ca35e371cfbf,
value=[Ivan Williams]}}
```

```
Document({_id=bb1f2f48-9ce2-4da9-ae1a-3c584d155dc4,
value=[Olena Johnson]}}
```

```
Document({_id=96c08a2c-d23d-4b6e-b129-d4ece213ce30,
value=[Anna Johnson, Petro Smith]})

Document({_id=1e528d6c-1b14-4684-a843-bab6c49a6729,
value=[Petro Jones, Andrii Williams]})

Document({_id=3b00c5e3-9ecb-417a-8298-dfeecd231e24,
value=[Anna Jones]})

Document({_id=720033dc-a764-4ccb-9088-1aa6774b2473,
value=[Olena Johnson]})

Document({_id=e959fb61-a9c4-4b17-a274-5e287128cfa5, value=[]})

Document({_id=9852fe35-eb73-4310-8de6-97d1a7d837a4, value=[]})

Document({_id=ec919be4-54ac-486d-b4ad-9af4192fcec6,
value=[Olena Smith]})

Document({_id=f54d98d6-35a4-442b-adb1-9f39967e3c91,
value=[Olena Smith, Petro Brown, Anna Jones, Olena Jones]})

Document({_id=f54f9cfb-c99f-47a2-ae04-eaa04e20ea0e,
value=[Olena Williams]})

Document({_id=e65061fc-3b4b-47b9-ad38-16935d58cf1a,
value=[Olena Smith, Andrii Johnson]})

Document({_id=aca826c6-9230-4883-bdbd-0a13ae30ef03,
value=[Anna Johnson, Ivan Williams, Olena Smith]})

Document({_id=07eb3364-c219-4ca2-b9f5-2bde490f993d,
value=[Olena Smith, Petro Jones, Olena Johnson, Andrii
Brown]})

Document({_id=727405d9-4b34-4c6b-a0de-86352ce3e02a,
value=[Olena Smith, Petro Jones, Anna Johnson]})
```

```
Document({_id=f84b0f11-365a-41f4-9ddc-54188203490c,
value=[Anna Johnson, Anna Smith, Petro Smith, Petro Jones]})
Document({_id=d1e40a49-b74a-420a-8ef7-97337a72344e,
value=[Petro Brown, Anna Johnson, Olena Brown, Anna Jones]})
Document({_id=832a1a3f-1f39-4e1c-9997-5090c8fbfde0,
value=[Petro Smith, Anna Brown, Petro Jones, Olena Johnson]})
Document({_id=8c58f957-a464-4037-9147-975723766247,
value=[Olena Johnson, Olena Brown]})
Document({_id=f12fc50d-1275-48d7-a062-51328778c928,
value=[Andrii Brown, Anna Jones]})
```

\*\*\* TASK 10: Top 5 products by popularity \*\*\*

Top 5 products by popularity (without sorting):

```
Document({_id=832a1a3f-1f39-4e1c-9997-5090c8fbfde0,
value=18.0})
Document({_id=f54d98d6-35a4-442b-adb1-9f39967e3c91,
value=15.0})
Document({_id=07eb3364-c219-4ca2-b9f5-2bde490f993d,
value=15.0})
Document({_id=f84b0f11-365a-41f4-9ddc-54188203490c,
value=15.0})
Document({_id=727405d9-4b34-4c6b-a0de-86352ce3e02a,
value=15.0})
```

\*\*\* TASK 11: Incremental Map/Reduce for Orders in a Specific  
Time Period \*\*\*

Incremental Map/Reduce for Summer Orders:

Document({\_id=Andrii Johnson, value=4441.0})

Document({\_id=Olena Smith, value=4070.0})

Document({\_id=Andrii Smith, value=5421.0})

Document({\_id=Olena Johnson, value=5150.0})

Document({\_id=Anna Smith, value=4009.0})

Document({\_id=Ivan Williams, value=1763.0})

Document({\_id=Andrii Brown, value=3273.0})

Document({\_id=Petro Smith, value=6830.0})

Document({\_id=Ivan Johnson, value=2212.0})

Document({\_id=Petro Jones, value=12761.0})

Document({\_id=Petro Brown, value=2663.0})

Document({\_id=Anna Johnson, value=4835.0})

Document({\_id=Olena Brown, value=2330.0})

Document({\_id=Petro Williams, value=1621.0})

Document({\_id=Andrii Jones, value=2492.0})

\*\*\* TASK 12: Order Dynamics for Each User \*\*\*

Order Dynamics for Each User:

Document({name=Anna Jones, month=12, year=2023, amount=3683.0,  
prev\_year\_amount=0.0, diff=3683.0})

Document({name=Olena Johnson, month=5, year=2023,  
amount=9767.0, prev\_year\_amount=0.0, diff=9767.0})

Document({name=Petro Johnson, month=5, year=2023,  
amount=2171.0, prev\_year\_amount=0.0, diff=2171.0})

Document({name=Anna Johnson, month=10, year=2023,  
amount=2494.0, prev\_year\_amount=0.0, diff=2494.0})

Document{{name=Anna Brown, month=11, year=2023, amount=3139.0,  
prev\_year\_amount=0.0, diff=3139.0}}

Document{{name=Anna Brown, month=9, year=2023, amount=2631.0,  
prev\_year\_amount=0.0, diff=2631.0}}

Document{{name=Anna Johnson, month=9, year=2023,  
amount=2643.0, prev\_year\_amount=0.0, diff=2643.0}}

Document{{name=Olena Jones, month=12, year=2023,  
amount=2963.0, prev\_year\_amount=0.0, diff=2963.0}}

Document{{name=Anna Smith, month=4, year=2023, amount=4798.0,  
prev\_year\_amount=0.0, diff=4798.0}}

Document{{name=Olena Smith, month=6, year=2023, amount=4070.0,  
prev\_year\_amount=0.0, diff=4070.0}}

Document{{name=Olena Williams, month=3, year=2023,  
amount=4410.0, prev\_year\_amount=0.0, diff=4410.0}}

Document{{name=Petro Brown, month=12, year=2023,  
amount=4517.0, prev\_year\_amount=0.0, diff=4517.0}}

Document{{name=Petro Williams, month=7, year=2023,  
amount=1621.0, prev\_year\_amount=0.0, diff=1621.0}}

Document{{name=Petro Johnson, month=9, year=2023,  
amount=3656.0, prev\_year\_amount=0.0, diff=3656.0}}

Document{{name=Petro Jones, month=11, year=2023,  
amount=2523.0, prev\_year\_amount=0.0, diff=2523.0}}

Document{{name=Petro Brown, month=3, year=2023, amount=4383.0,  
prev\_year\_amount=0.0, diff=4383.0}}

```
Document{{name=Olena Williams, month=5, year=2023,
amount=4748.0, prev_year_amount=0.0, diff=4748.0}}

Document{{name=Ivan Williams, month=4, year=2023,
amount=2689.0, prev_year_amount=0.0, diff=2689.0}}

Document{{name=Olena Brown, month=5, year=2023, amount=4560.0,
prev_year_amount=0.0, diff=4560.0}}

Document{{name=Andrii Smith, month=6, year=2023,
amount=4097.0, prev_year_amount=0.0, diff=4097.0}}

Document{{name=Olena Johnson, month=9, year=2023,
amount=8541.0, prev_year_amount=0.0, diff=8541.0}}

Document{{name=Olena Smith, month=12, year=2023,
amount=2996.0, prev_year_amount=0.0, diff=2996.0}}

Document{{name=Andrii Johnson, month=1, year=2023,
amount=5997.0, prev_year_amount=0.0, diff=5997.0}}

Document{{name=Anna Smith, month=12, year=2023, amount=2509.0,
prev_year_amount=0.0, diff=2509.0}}

Document{{name=Petro Smith, month=1, year=2023, amount=3610.0,
prev_year_amount=0.0, diff=3610.0}}

Document{{name=Andrii Brown, month=6, year=2023,
amount=3273.0, prev_year_amount=0.0, diff=3273.0}}

Document{{name=Petro Smith, month=7, year=2023, amount=2548.0,
prev_year_amount=0.0, diff=2548.0}}

Document{{name=Ivan Williams, month=5, year=2023,
amount=4874.0, prev_year_amount=0.0, diff=4874.0}}
```

```
Document({name=Anna Brown, month=1, year=2023, amount=3536.0,
prev_year_amount=0.0, diff=3536.0})

Document({name=Olena Williams, month=9, year=2023,
amount=3520.0, prev_year_amount=0.0, diff=3520.0})

Document({name=Olena Johnson, month=12, year=2023,
amount=2790.0, prev_year_amount=0.0, diff=2790.0})

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