

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB REPORT

on

BIG DATA ANALYTICS (20CS6PEBDA)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

BENGALURU-560019

May-2022 to July-2022

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(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled “**BIG DATA ANALYTICS**” was carried out by **RAHUL PRAKASHA (1BM18CS078)**, who is bona fide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of the course **BIG DATA ANALYTICS (20CS6PEBDA)** work prescribed for the said degree.

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INDEX SHEET

Sl. No.	Experiment Title	Page No.
1	Cassandra Lab Program 1: - Student Database	3
2	Cassandra Lab Program 2: - Library Database	8
3	MongoDB- CRUD Demonstration	13
4	Hadoop Installation	28
5	Hadoop Commands	29
6	Hadoop Programs: Word Count	32
7	Hadoop Programs: Top N	36
8	Hadoop Programs: Average Temperature & Mean max temperature	40
9	Hadoop Programs: Join	49
10	Scala Programs: Word Count and print “Hello world”	62
11	Scala Programs: Word Count greater than 4	65

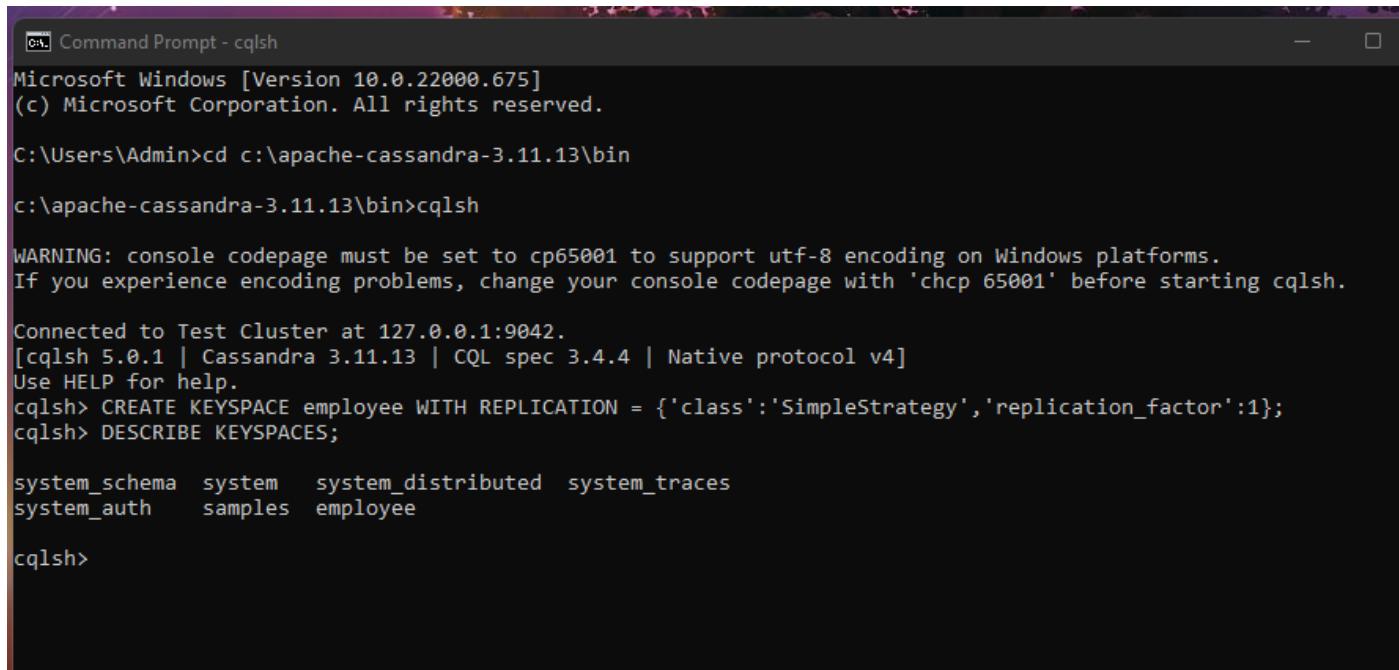
Course Outcome

CO1	Apply the concept of NoSQL, Hadoop or Spark for a given task
CO2	Analyze the Big Data and obtain insight using data analytics mechanisms.
CO3	Design and implement Big data applications by applying NoSQL, Hadoop or Spark

1. Cassandra Lab Program 1: -

Perform the following DB operations using Cassandra.

1. Create a key space by name Employee



```
Microsoft Windows [Version 10.0.22000.675]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Admin>cd c:\apache-cassandra-3.11.13\bin

c:\apache-cassandra-3.11.13\bin>cqlsh

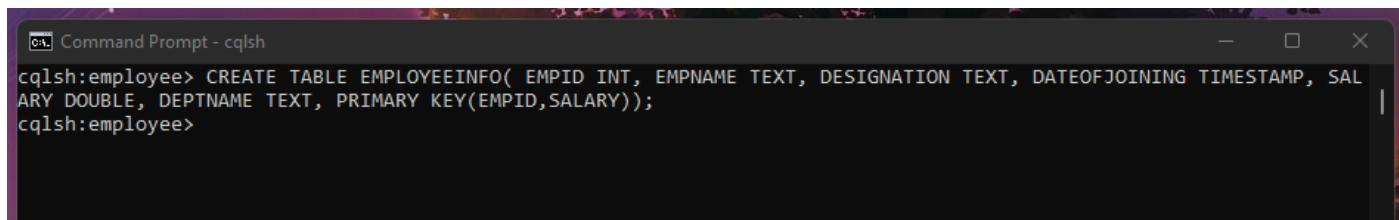
WARNING: console codepage must be set to cp65001 to support utf-8 encoding on Windows platforms.
If you experience encoding problems, change your console codepage with 'chcp 65001' before starting cqlsh.

Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 3.11.13 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
cqlsh> CREATE KEYSPACE employee WITH REPLICATION = {'class':'SimpleStrategy','replication_factor':1};
cqlsh> DESCRIBE KEYSPACES;

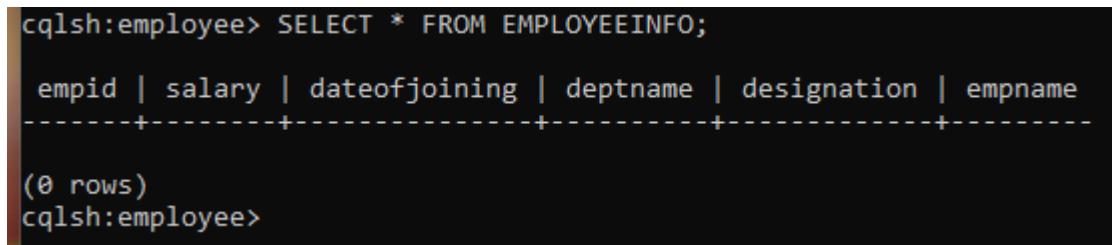
system_schema  system    system_distributed  system_traces
system_auth     samples   employee

cqlsh>
```

2. Create a column family by name Employee-Info with attributes Emp_Id Primary Key, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name



```
cqlsh:employee> CREATE TABLE EMPLOYEEINFO( EMPID INT, EMPNAME TEXT, DESIGNATION TEXT, DATEOFJOINING TIMESTAMP, SALARY DOUBLE, DEPTNAME TEXT, PRIMARY KEY(EMPID,SALARY));
cqlsh:employee>
```



```
cqlsh:employee> SELECT * FROM EMPLOYEEINFO;

 empid | salary | dateofjoining | deptname | designation | empname
-----+-----+-----+-----+-----+
(0 rows)
cqlsh:employee>
```

3. Insert the values into the table in batch

```
cqlsh:employee> BEGIN BATCH
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(1,'LOKESH','ASSISTANT MANAGER', '2005-04-6', 5000, 'MARKETING')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(2,'DHEERAJ','ASSISTANT MANAGER', '2013-11-10', 3000, 'LOGISTICS')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(3,'CHIRAG','ASSISTANT MANAGER', '2011-07-1', 11500, 'SALES')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(4,'DHANUSH','ASSISTANT MANAGER', '2010-04-26', 7500, 'MARKETING')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(5,'ESHA','ASSISTANT MANAGER', '2010-04-26', 8500, 'TECHNICAL')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(6,'FARHAN','MANAGER', '2010-04-26', 9500, 'TECHNICAL')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(7,'JIMMY','MANAGER', '2010-04-26', 9500, 'PR')
... INSERT INTO EMPLOYEEINFO (EMPID, EMPNAME, DESIGNATION, DATEOFJOINING, SALARY, DEPTNAME)
... VALUES(121,'HARRY','REGIONAL MANAGER', '2010-04-26', 9900, 'MANAGEMENT')
... APPLY BATCH;
```

```
cqlsh:employee> SELECT * FROM EMPLOYEEINFO;
```

empid	salary	dateofjoining	deptname	designation	empname
5	85000	2010-04-25 18:30:00.000000+0000	TECHNICAL	ASSISTANT MANAGER	ESHA
1	50000	2005-04-05 18:30:00.000000+0000	MARKETING	ASSISTANT MANAGER	LOKESH
2	30000	2013-11-09 18:30:00.000000+0000	LOGISTICS	ASSISTANT MANAGER	DHEERAJ
4	75000	2010-04-25 18:30:00.000000+0000	MARKETING	ASSISTANT MANAGER	DHANUSH
121	99000	2010-04-25 18:30:00.000000+0000	MANAGEMENT	REGIONAL MANAGER	HARRY
7	95000	2010-04-25 18:30:00.000000+0000	PR	MANAGER	JIMMY
6	95000	2010-04-25 18:30:00.000000+0000	TECHNICAL	MANAGER	FARHAN
3	1.15e+05	2011-06-30 18:30:00.000000+0000	SALES	ASSISTANT MANAGER	CHIRAG

(8 rows)

```
cqlsh:employee>
```

4. Update Employee name and Department of Emp-Id 121

```
cqlsh:employee> UPDATE EMPLOYEEINFO SET EMPNAME='HARRY', DEPTNAME='MANAGEMENT' WHERE EMPID=121 AND SALARY=99000;
cqlsh:employee> SELECT * FROM EMPLOYEEINFO;
```

empid	salary	dateofjoining	deptname	designation	empname
5	85000	2010-04-25 18:30:00.000000+0000	TECHNICAL	ASSISTANT MANAGER	ESHA
1	50000	2005-04-05 18:30:00.000000+0000	MARKETING	ASSISTANT MANAGER	LOKESH
2	30000	2013-11-09 18:30:00.000000+0000	LOGISTICS	ASSISTANT MANAGER	DHEERAJ
4	75000	2010-04-25 18:30:00.000000+0000	MARKETING	ASSISTANT MANAGER	DHANUSH
121	99000	2010-04-25 18:30:00.000000+0000	MANAGEMENT	REGIONAL MANAGER	HARRY
7	95000	2010-04-25 18:30:00.000000+0000	PR	MANAGER	JIMMY
6	95000	2010-04-25 18:30:00.000000+0000	TECHNICAL	MANAGER	FARHAN
3	1.15e+05	2011-06-30 18:30:00.000000+0000	SALES	ASSISTANT MANAGER	CHIRAG

(8 rows)

```
cqlsh:employee>
```

5. Sort the details of Employee records based on salary (Note:- cql>PAGING OFF)

```
cqlsh:employee> select * from EMPLOYEEINFO where empid IN(1,2,3,4,5,6,7) ORDER BY salary DESC allow filtering;
+-----+-----+-----+-----+-----+-----+
| empid | salary | dateofjoining | deptname | designation | empname |
+-----+-----+-----+-----+-----+-----+
| 3 | 1.15e+05 | 2011-06-30 18:30:00.000000+0000 | SALES | ASSISTANT MANAGER | CHIRAG |
| 6 | 95000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | MANAGER | FARHAN |
| 7 | 95000 | 2010-04-25 18:30:00.000000+0000 | PR | MANAGER | JIMMY |
| 5 | 85000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | ASSISTANT MANAGER | ESHA |
| 4 | 75000 | 2010-04-25 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | DHANUSH |
| 1 | 50000 | 2005-04-05 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | LOKESH |
| 2 | 30000 | 2013-11-09 18:30:00.000000+0000 | LOGISTICS | ASSISTANT MANAGER | DHEERAJ |
+-----+-----+-----+-----+-----+-----+
(7 rows)
cqlsh:employee>
```

6. Alter the schema of the table Employee_Info to add a column Projects which stores a set of Projects done by the corresponding Employee.

```
(7 rows)
cqlsh:employee> ALTER TABLE EMPLOYEEINFO ADD PROJECTS LIST<TEXT>;
cqlsh:employee> SELECT * FROM EMPLOYEEINFO;
+-----+-----+-----+-----+-----+-----+-----+
| empid | salary | dateofjoining | deptname | designation | empname | projects |
+-----+-----+-----+-----+-----+-----+-----+
| 5 | 85000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | ASSISTANT MANAGER | ESHA | null |
| 1 | 50000 | 2005-04-05 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | LOKESH | null |
| 2 | 30000 | 2013-11-09 18:30:00.000000+0000 | LOGISTICS | ASSISTANT MANAGER | DHEERAJ | null |
| 4 | 75000 | 2010-04-25 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | DHANUSH | null |
| 121 | 99000 | 2010-04-25 18:30:00.000000+0000 | MANAGEMENT | REGIONAL MANAGER | HARRY | null |
| 7 | 95000 | 2010-04-25 18:30:00.000000+0000 | PR | MANAGER | JIMMY | null |
| 6 | 95000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | MANAGER | FARHAN | null |
| 3 | 1.15e+05 | 2011-06-30 18:30:00.000000+0000 | SALES | ASSISTANT MANAGER | CHIRAG | null |
+-----+-----+-----+-----+-----+-----+-----+
(8 rows)
cqlsh:employee>
```

7. Update the altered table to add project names.

```
Command Prompt - cqlsh
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['FACEBOOK', 'SNAPCHAT'] WHERE EMPID=1 AND SALARY=50000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['FACEBOOK', 'SNAPCHAT'] WHERE EMPID=7 AND SALARY=95000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['PINTEREST', 'INSTAGRAM'] WHERE EMPID=121 AND SALARY=99000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['PINTEREST', 'INSTAGRAM'] WHERE EMPID=4 AND SALARY=75000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['YOUTUBE', 'SPOTIFY'] WHERE EMPID=2 AND SALARY=30000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['YOUTUBE', 'SPOTIFY'] WHERE EMPID=3 AND SALARY=115000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['YOUTUBE', 'SPOTIFY'] WHERE EMPID=6 AND SALARY=95000;
cqlsh:employee> UPDATE EMPLOYEEINFO SET PROJECTS=['YOUTUBE', 'SPOTIFY'] WHERE EMPID=5 AND SALARY=85000;
cqlsh:employee> SELECT * FROM EMPLOYEEINFO;
+-----+-----+-----+-----+-----+-----+-----+
| empid | salary | dateofjoining | deptname | designation | empname | projects |
+-----+-----+-----+-----+-----+-----+-----+
| 5 | 85000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | ASSISTANT MANAGER | ESHA | ['YOUTUBE', 'SPOTIFY'] |
| 1 | 50000 | 2005-04-05 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | LOKESH | ['FACEBOOK', 'SNAPCHAT'] |
| 2 | 30000 | 2013-11-09 18:30:00.000000+0000 | LOGISTICS | ASSISTANT MANAGER | DHEERAJ | ['YOUTUBE', 'SPOTIFY'] |
| 4 | 75000 | 2010-04-25 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | DHANUSH | ['PINTEREST', 'INSTAGRAM'] |
| 121 | 99000 | 2010-04-25 18:30:00.000000+0000 | MANAGEMENT | REGIONAL MANAGER | HARRY | ['PINTEREST', 'INSTAGRAM'] |
| 7 | 95000 | 2010-04-25 18:30:00.000000+0000 | PR | MANAGER | JIMMY | ['FACEBOOK', 'SNAPCHAT'] |
| 6 | 95000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | MANAGER | FARHAN | ['YOUTUBE', 'SPOTIFY'] |
| 3 | 1.15e+05 | 2011-06-30 18:30:00.000000+0000 | SALES | ASSISTANT MANAGER | CHIRAG | ['YOUTUBE', 'SPOTIFY'] |
+-----+-----+-----+-----+-----+-----+-----+
(8 rows)
cqlsh:employee>
```

8. Create a TTL of 15 seconds to display the values of Employees.

//BEFORE 15 seconds

```
c:\ Command Prompt - cqlsh
cqlsh:employee> update EMPLOYEEINFO USING TTL 15 SET EMPNAME='LOKESH' where empid=1 AND salary=50000;
cqlsh:employee> SELECT * FROM EMPLOYEEINFO;

  empid | salary      | dateofjoining           | deptname    | designation      | empname | projects
-----+-----+-----+-----+-----+-----+-----+
      5 | 85000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | ASSISTANT MANAGER | ESHA | ['YOUTUBE', 'SPOTIFY']
      1 | 50000 | 2005-04-05 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | LOKESH | ['FACEBOOK', 'SNAPCHAT']
      2 | 30000 | 2013-11-09 18:30:00.000000+0000 | LOGISTICS | ASSISTANT MANAGER | DHEERAJ | ['YOUTUBE', 'SPOTIFY']
      4 | 75000 | 2010-04-25 18:30:00.000000+0000 | MARKETING | ASSISTANT MANAGER | DHANUSH | ['PINTEREST', 'INSTAGRAM']
  121 | 99000 | 2010-04-25 18:30:00.000000+0000 | MANAGEMENT | REGIONAL MANAGER | HARRY | ['PINTEREST', 'INSTAGRAM']
      7 | 95000 | 2010-04-25 18:30:00.000000+0000 | PR          | MANAGER          | JIMMY | ['FACEBOOK', 'SNAPCHAT']
      6 | 95000 | 2010-04-25 18:30:00.000000+0000 | TECHNICAL | MANAGER          | FARHAN | ['YOUTUBE', 'SPOTIFY']
      3 | 1.15e+05 | 2011-06-30 18:30:00.000000+0000 | SALES       | ASSISTANT MANAGER | CHIRAG | ['YOUTUBE', 'SPOTIFY']

(8 rows)
cqlsh:employee>
```

2. Cassandra Lab Program 2: -

Perform the following DB operations using Cassandra.

1.Create a key space by name Library

```
cqlsh> create keyspace library with replication = {  
... 'class':'SimpleStrategy', 'replication_factor':1  
... };  
cqlsh> describe keyspaces  
  
system_schema  system    samples          employee  
system_auth     library   system_distributed  system_traces  
  
cqlsh> USE library;  
cqlsh:library> -
```

2. Create a column family by name Library-Info with attributes Stud_Id Primary Key,

Counter_value of type Counter,

Stud_Name, Book-Name, Book-Id, Date_of_issue

```
cqlsh> USE library;  
cqlsh:library> CREATE TABLE LIBRARY_INFO( STUDID INT PRIMARY KEY, STUDNAME TEXT, BOOKNAME TEXT, DATEOFISSUE TIMESTAMP,  
COUNTER_VALUE COUNTER);  
InvalidRequest: Error from server: code=2200 [Invalid query] message="Cannot mix counter and non counter columns in th  
e same table"  
cqlsh:library> CREATE TABLE LIBRARY_INFO( STUDID INT, STUDNAME TEXT, BOOKNAME TEXT, BOOKID INT, DATEOFISSUE TIMESTAMP,  
COUNTER_VALUE COUNTER, PRIMARY KEY(STUDID, STUDNAME, BOOKNAME, BOOKID, DATEOFISSUE));  
cqlsh:library> SELECT * FROM LIBRARYINFO;  
InvalidRequest: Error from server: code=2200 [Invalid query] message="unconfigured table libraryinfo"  
cqlsh:library> SELECT * FROM LIBRARY_INFO;  
  
studid | studname | bookname | bookid | dateofissuse | counter_value  
-----+-----+-----+-----+-----+-----+  
(0 rows)  
cqlsh:library>
```

3.Insert the values into the table in batch

```
cqlsh:library> update library_info set counter_value = counter_value + 1 where studid = 1 and studname = 'MAHESH' and bookname = 'Harry Potter' and bookid = 1 and dateofissue = '2022-01-02';
cqlsh:library> SELECT * FROM LIBRARY_INFO;
studid | studname | bookname      | bookid | dateofissue           | counter_value
-----+-----+-----+-----+-----+-----+
  1 | MAHESH | Harry Potter |     1 | 2022-01-01 18:30:00.000000+0000 |           1
(1 rows)
cqlsh:library>
```

```
cqlsh:library> update library_info set counter_value = counter_value + 1 where studid = 2 and studname = 'Ramesh' and bookname = 'Wings of Fire' and bookid = 2 and dateofissue = '2022-01-02';
cqlsh:library> SELECT * FROM LIBRARY_INFO;
studid | studname | bookname      | bookid | dateofissue           | counter_value
-----+-----+-----+-----+-----+-----+
  1 | MAHESH | Harry Potter |     1 | 2022-01-01 18:30:00.000000+0000 |           1
  2 | Ramesh  | Wings of Fire |     2 | 2022-01-01 18:30:00.000000+0000 |           1
(2 rows)
cqlsh:library>
```

4. Display the details of the table created and increase the value of the counter

```
cqlsh:library> update library_info set counter_value = counter_value + 1 where studid = 112 and studname = 'Rajesh' and bookname = 'BDA' and bookid = 3 and dateofissue = '2022-01-02';
cqlsh:library> SELECT * FROM LIBRARY_INFO;
studid | studname | bookname      | bookid | dateofissue           | counter_value
-----+-----+-----+-----+-----+-----+
  1 | MAHESH | Harry Potter |     1 | 2022-01-01 18:30:00.000000+0000 |           1
  2 | Ramesh  | Wings of Fire |     2 | 2022-01-01 18:30:00.000000+0000 |           1
  112 | Rajesh  | BDA          |     3 | 2022-01-01 18:30:00.000000+0000 |           1
(3 rows)
cqlsh:library>
```

```
(3 rows)
cqlsh:library> update library_info set counter_value = counter_value + 1 where studid = 112 and studname = 'Rajesh' and bookname = 'BDA' and bookid = 3 and dateofissue = '2022-01-02';
cqlsh:library> SELECT * FROM LIBRARY_INFO;
studid | studname | bookname      | bookid | dateofissue           | counter_value
-----+-----+-----+-----+-----+-----+
  1 | MAHESH | Harry Potter |     1 | 2022-01-01 18:30:00.000000+0000 |           1
  2 | Ramesh  | Wings of Fire |     2 | 2022-01-01 18:30:00.000000+0000 |           1
  112 | Rajesh  | BDA          |     3 | 2022-01-01 18:30:00.000000+0000 |           2
(3 rows)
cqlsh:library>
```

studid	studname	bookname	bookid	dateofissuse	counter_value
113	Ranjith	rpa	4	2022-01-01 18:30:00.000000+0000	1
1	MAHESH	Harry Potter	1	2022-01-01 18:30:00.000000+0000	1
2	Ramesh	Wings of Fire	2	2022-01-01 18:30:00.000000+0000	1
112	Rajesh	BDA	3	2022-01-01 18:30:00.000000+0000	3

(4 rows)

5. Write a query to show that a student with id 112 has taken a book “BDA” 3 times.

Command Prompt - CQLSH					
cqlsh:library> select * from library_info where studid = 112;					
studid	studname	bookname	bookid	dateofissuse	counter_value
112	Rajesh	BDA	3	2022-01-01 18:30:00.000000+0000	3
(1 rows)					
cqlsh:library>					

6. Export the created column to a csv file

```
cqlsh:library> copy library_info (studid, studname, bookname, bookid, dateofissuse, counter_value) to 'C:\Users\Admin\OneDrive\Desktop\BDA Lab\data.csv';
Using 7 child processes

Starting copy of library.library_info with columns [studid, studname, bookname, bookid, dateofissuse, counter_value].
Processed: 4 rows; Rate: 2 rows/s; Avg. rate: 1 rows/s
4 rows exported to 1 files in 3.004 seconds.
cqlsh:library> -
```

Clipboard | Font | Alignment

POSSIBLE DATA LOSS Some features might be lost if you save this workbook in the comma-delimited

A1	B	C	D	E	F	G	H	I
113	Ranjith	rpa	4	2022-01-0	1			
2	Ramesh	Wings of R	2	2022-01-0	1			
3	112	Rajesh	BDA	3	2022-01-0	3		
4	1	MAHESH	Harry Pott	1	2022-01-0	1		
5								
6								
7								

7. Import a given csv dataset from local file system into Cassandra column family

```
cqlsh:library> copy library_info (studid, studname, bookname, bookid, dateofissue, counter_value) from 'C:\Users\Admin\OneDrive\Desktop\BDA Lab\data.csv';
Using 7 child processes
Starting copy of library.library_info with columns [studid, studname, bookname, bookid, dateofissue, counter_value].
process ImportProcess-0:      2 rows/s; Avg. rate:      2 rows/s
Traceback (most recent call last):
process ImportProcess-11:
process ImportProcess-8:
process ImportProcess-11:
process ImportProcess-11:
process ImportProcess-11:
process ImportProcess-11:
process ImportProcess-12:
process ImportProcess-13:
process ImportProcess-14:
T File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2339, in run
self.run()
Traceback (most recent call last):
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
Traceback (most recent call last):
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
Traceback (most recent call last):
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
process ImportProcess-12:
process ImportProcess-13:
process ImportProcess-14:
T File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2339, in run
self.run()
Traceback (most recent call last):
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
Traceback (most recent call last):
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
Traceback (most recent call last):
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2339, in run
self.close()
self.run()
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2343, in close
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2339, in run
self.close()
File "c:\python27\lib\multiprocessing\process.py", line 267, in _bootstrap
reraise(*exc_info)
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2343, in close
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2339, in run
self.close()
self.session.cluster.shutdown()
self.run()
self.close()
File "c:\apache-cassandra-3.11.13\bin..\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\cluster.py", line 1259, in shutdown
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2343, in close
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2339, in run
self.close()
self.close()
self.close()
File "c:\apache-cassandra-3.11.13\bin..\pylib\cqlshlib\copyutil.py", line 2343, in close
```

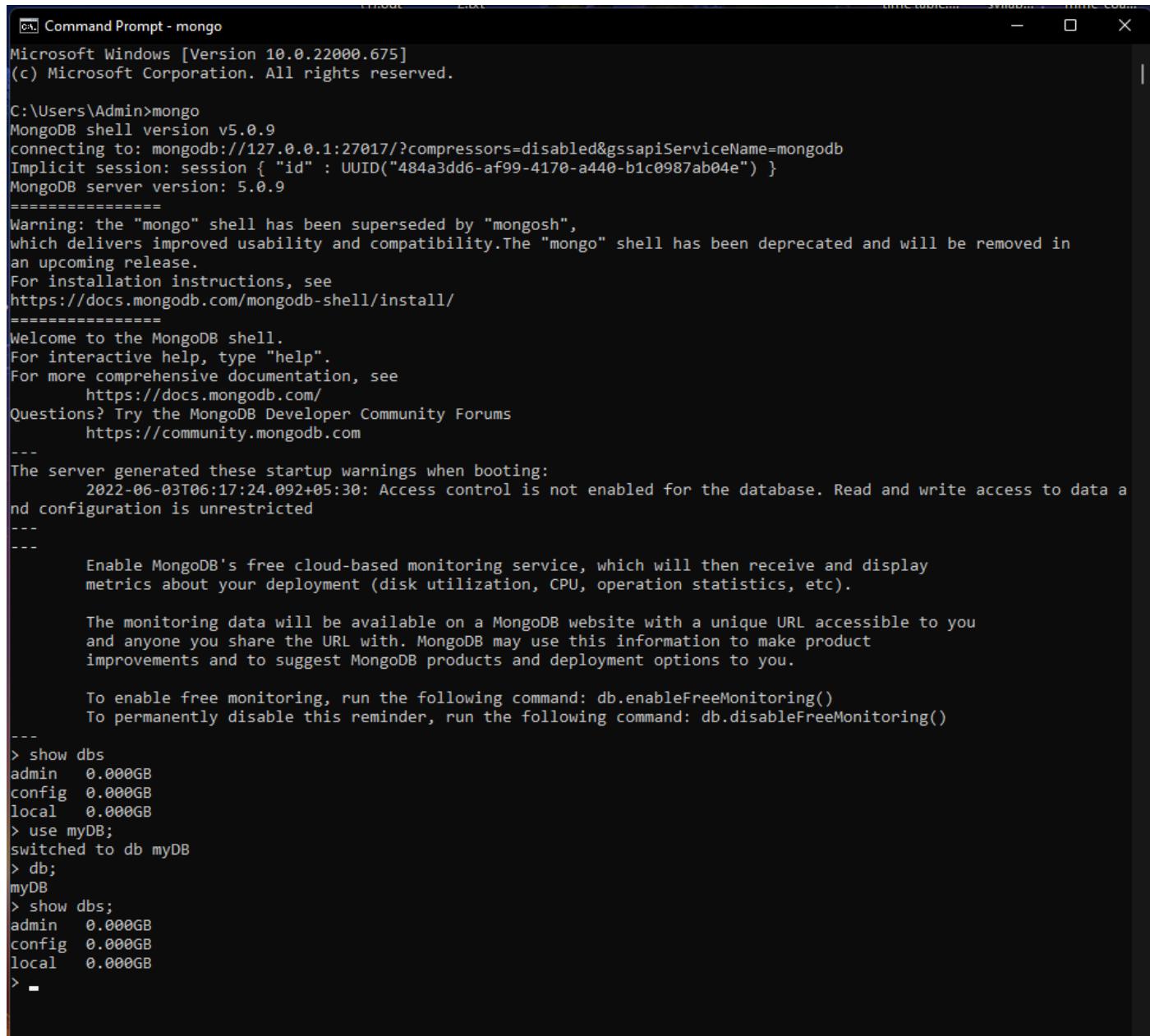
```
File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 373, in shutdown
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 373, in close
    File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 373, in create_timer
      self._connection.close()
    File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 373, in close
      self._connection.close()
    AsyncoreConnection.create_timer(0, partial(asyncore.dispatcher.close, self))
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 373, in close
    cls._loop.add_timer(timer)
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 373, in close
    AsyncoreConnection.create_timer(0, partial(asyncore.dispatcher.close, self))
AA   AsyncoreConnection.create_timer(0, partial(asyncore.dispatcher.close, self))
AttributeError: 'NoneType' object has no attribute 'add_timer'
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 335, in create_timer
AttributeError: 'NoneType' object has no attribute 'add_timer'
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 335, in create_timer
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 335, in create_timer
    AsyncoreConnection.create_timer(0, partial(asyncore.dispatcher.close, self))
    cls._loop.add_timer(timer)
  File "c:\apache cassandra-3.11.13\bin\..\\lib\cassandra-driver-internal-only-3.11.0-bb96859b.zip\cassandra-driver-3.11.0-bb96859b\cassandra\io\asyncorereactor.py", line 335, in create_timer
AttributeError: 'NoneType' object has no attribute 'add_timer'
AttributeError: 'NoneType' object has no attribute 'add_timer'
AttributeError: 'NoneType' object has no attribute 'add_timer'
Processed: 4 rows; Rate: 1 rows/s; Avg. rate: 2 rows/s
4 rows imported from 1 files in 2.356 seconds (0 skipped).
cqish:library>
```

3.a. MongoDB Lab Program 1 (CRUD Demonstration): -

Execute the queries and upload a document with output.

I. CREATE DATABASE IN MONGODB.

```
use myDB;  
db; (Confirm the existence of your database)  
show dbs; (To list all databases)
```



The screenshot shows a Windows Command Prompt window titled "Command Prompt - mongo". The prompt shows the MongoDB shell version 5.0.9 connecting to the local host. It displays several startup messages, including a warning about the deprecation of the "mongo" shell and instructions for installation and documentation. The user then runs the commands "use myDB;" and "show dbs;" to demonstrate the creation of a database and listing of databases.

```
C:\Users\Admin>mongo  
MongoDB shell version v5.0.9  
connecting to: mongodb://127.0.0.1:27017/?compressors=disabled&gssapiServiceName=mongodb  
Implicit session: session { "id" : UUID("484a3dd6-af99-4170-a440-b1c0987ab04e") }  
MongoDB server version: 5.0.9  
=====  
Warning: the "mongo" shell has been superseded by "mongosh",  
which delivers improved usability and compatibility. The "mongo" shell has been deprecated and will be removed in  
an upcoming release.  
For installation instructions, see  
https://docs.mongodb.com/mongodb-shell/install/  
=====  
Welcome to the MongoDB shell.  
For interactive help, type "help".  
For more comprehensive documentation, see  
 https://docs.mongodb.com/  
Questions? Try the MongoDB Developer Community Forums  
 https://community.mongodb.com  
---  
The server generated these startup warnings when booting:  
 2022-06-03T06:17:24.092+05:30: Access control is not enabled for the database. Read and write access to data a  
nd configuration is unrestricted  
---  
---  
   Enable MongoDB's free cloud-based monitoring service, which will then receive and display  
   metrics about your deployment (disk utilization, CPU, operation statistics, etc).  
  
   The monitoring data will be available on a MongoDB website with a unique URL accessible to you  
   and anyone you share the URL with. MongoDB may use this information to make product  
   improvements and to suggest MongoDB products and deployment options to you.  
  
   To enable free monitoring, run the following command: db.enableFreeMonitoring()  
   To permanently disable this reminder, run the following command: db.disableFreeMonitoring()  
---  
> show dbs  
admin 0.000GB  
config 0.000GB  
local 0.000GB  
> use myDB;  
switched to db myDB  
> db;  
myDB  
> show dbs;  
admin 0.000GB  
config 0.000GB  
local 0.000GB  
> -
```

II.CRUD (CREATE, READ, UPDATE, DELETE) OPERATIONS

1. To create a collection by the name “Student”. Let us take a look at the collection list prior to the creation of the new collection “Student”.

```
db.createCollection("Student"); => sql equivalent CREATE TABLE STUDENT(...);
```

2. To drop a collection by the name “Student”.

```
db.Student.drop();
```

3. Create a collection by the name “Students” and store the following data in it.

```
db.Student.insert({_id:1,StudName:"MichelleJacintha",Grade:"VII",Hobbies:"InternetSurfing"});
```

4. Insert the document for “AryanDavid” in to the Students collection only if it does not already exist in the collection. However, if it is already present in the collection, then update the document with new values. (Update his Hobbies from “Skating” to “Chess”).

-) Use “Update else insert” (if there is an existing document, it will attempt to update it, if there is no existing document then it will insert it).

```
db.Student.update({_id:3,StudName:"AryanDavid",Grade:"VII"},{$set:{Hobbies:"Skatin"},{upsert:true}});
```

```
local 0.000GB
> db.createCollection("Student");
{ "ok" : 1 }
> db.Student.drop();
true
> db.createCollection("Student");
{ "ok" : 1 }
> db.Student.insert({_id:1, StudName:"MichelleJacintha", Grade:"VII", Hobbies:"InternetSurfing"});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:1, StudName:"MichelleJacintha", Grade:"VII", Hobbies:"InternetSurfing"});
WriteResult({
    "nInserted" : 0,
    "writeError" : {
        "code" : 11000,
        "errmsg" : "E11000 duplicate key error collection: myDB.Student index: _id_ dup key: { _id: 1.0 }"
    }
})
> db.Student.updateElseInsert({_id:3, StudName:"AryanDavid", Grade:"VII"},{$set:{Hobbies:"Skating"}},{upsert:true});
uncaught exception: TypeError: db.Student.updateElseInsert is not a function :
@(shell):1:1
> db.Student.update({_id:3, StudName:"AryanDavid", Grade:"VII"},{$set:{Hobbies:"Skating"}},{upsert:true});
WriteResult({ "nMatched" : 0, "nUpserted" : 1, "nModified" : 0, "_id" : 3 })
```

```
Command Prompt - mongo
> show collections
Student
> db.Student.find();
{ "_id" : 1, "StudName" : "MichelleJacintha", "Grade" : "VII", "Hobbies" : "InternetSurfing" }
{ "_id" : 3, "Grade" : "VII", "StudName" : "AryanDavid", "Hobbies" : "Skating" }
>
```

5. FIND METHOD

- A. To search for documents from the “Students” collection based on certain search criteria.

```
db.Student.find({StudName:"Aryan David"});  
({cond..},{columns.. column:1, columnname:0} )
```

```
> db.Student.find({StudName:"AryanDavid"});
{ "_id" : 3, "Grade" : "VII", "StudName" : "AryanDavid", "Hobbies" : "Skating" }
>
```

- B. To display only the StudName and Grade from all the documents of the Students collection. The identifier _id should be suppressed and NOT displayed.

```
db.Student.find({}, {StudName:1,Grade:1,_id:0});
```

```
Command Prompt - mongo
> db.Student.find({}, {StudName:1,Grade:1,_id:0});
{ "StudName" : "MichelleJacintha", "Grade" : "VII" }
{ "Grade" : "VII", "StudName" : "AryanDavid" }
>
```

- C. To find those documents where the Grade is set to ‘VII’

```
db.Student.find({Grade:{$eq:'VII'}}).pretty();
```

```
Command Prompt - mongo
> db.Student.find({Grade:{$eq:'VII'}}).pretty();
{
    "_id" : 1,
    "StudName" : "MichelleJacintha",
    "Grade" : "VII",
    "Hobbies" : "InternetSurfing"
}
{
    "_id" : 3,
    "Grade" : "VII",
    "StudName" : "AryanDavid",
    "Hobbies" : "Skating"
}
> -
```

- D. To find those documents from the Students collection where the Hobbies is set to either ‘Chess’ or is set to ‘Skating’.

```
db.Student.find({Hobbies :{ $in: ['Chess','Skating']}}).pretty();
```

```
Command Prompt - mongo
> db.Student.find({Hobbies:{$in: ['Chess','Skating']}}).pretty();
{
    "_id" : 3,
    "Grade" : "VII",
    "StudName" : "AryanDavid",
    "Hobbies" : "Skating"
}
> -
```

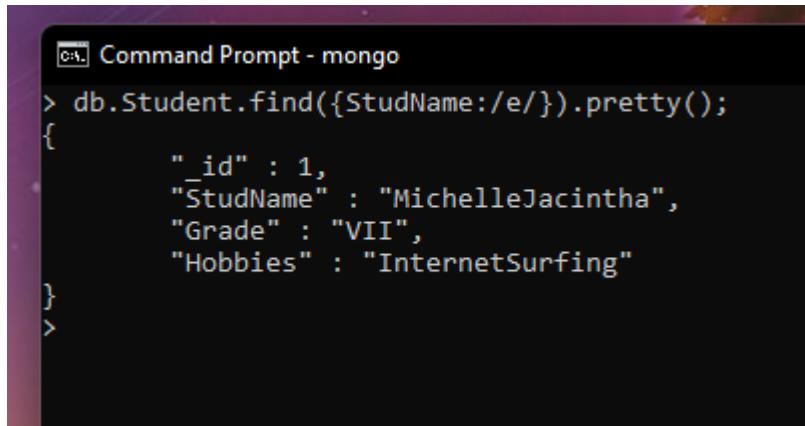
- E. To find documents from the Students collection where the StudName begins with “M”.

```
db.Student.find({StudName:/^M/}).pretty();
```

```
Command Prompt - mongo
> db.Student.find({StudName:/^M/}).pretty();
{
    "_id" : 1,
    "StudName" : "MichelleJacintha",
    "Grade" : "VII",
    "Hobbies" : "InternetSurfing"
}
>
```

- F. To find documents from the Students collection where the StudName has an “e” in any position.

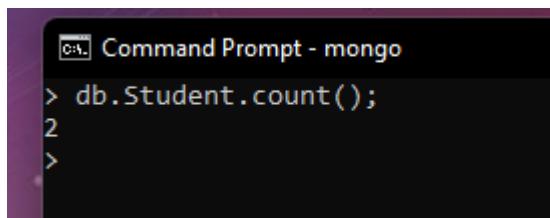
```
db.Student.find({StudName:/e/}).pretty();
```



```
Command Prompt - mongo
> db.Student.find({StudName:/e/}).pretty();
{
    "_id" : 1,
    "StudName" : "MichelleJacintha",
    "Grade" : "VII",
    "Hobbies" : "InternetSurfing"
}
>
```

G. To find the number of documents in the Students collection.

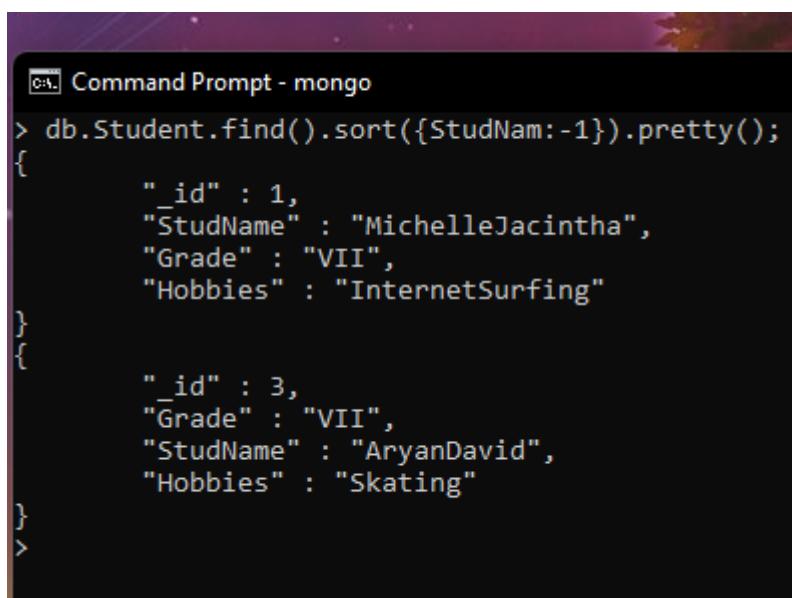
```
db.Student.count();
```



```
Command Prompt - mongo
> db.Student.count();
2
>
```

H. To sort the documents from the Students collection in the descending order of StudName.

```
db.Student.find().sort({StudName:-1}).pretty();
```

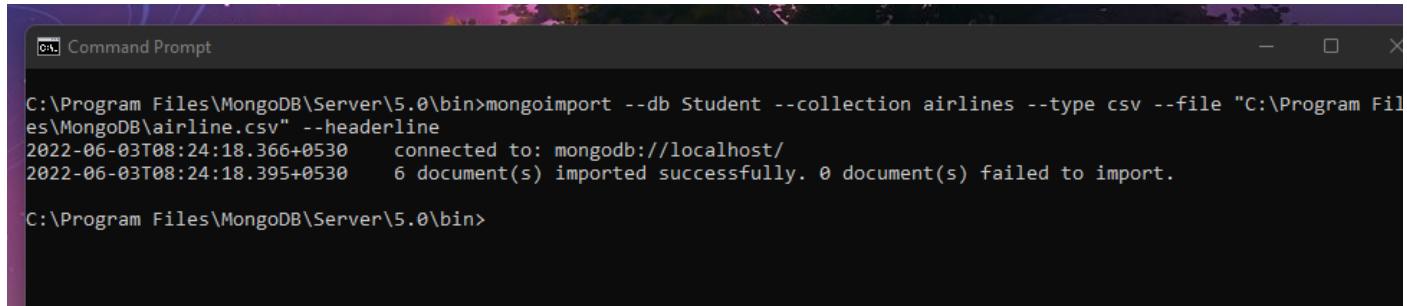


```
Command Prompt - mongo
> db.Student.find().sort({StudName:-1}).pretty();
{
    "_id" : 1,
    "StudName" : "MichelleJacintha",
    "Grade" : "VII",
    "Hobbies" : "InternetSurfing"
}
{
    "_id" : 3,
    "Grade" : "VII",
    "StudName" : "AryanDavid",
    "Hobbies" : "Skating"
}
>
```

III. Import data from a CSV file

Given a CSV file “sample.txt” in the D:drive, import the file into the MongoDB collection, “SampleJSON”. The collection is in the database “test”.

```
mongoimport --db Student --collection airlines --type csv --headerline --file  
/home/hduser/Desktop/airline.csv
```

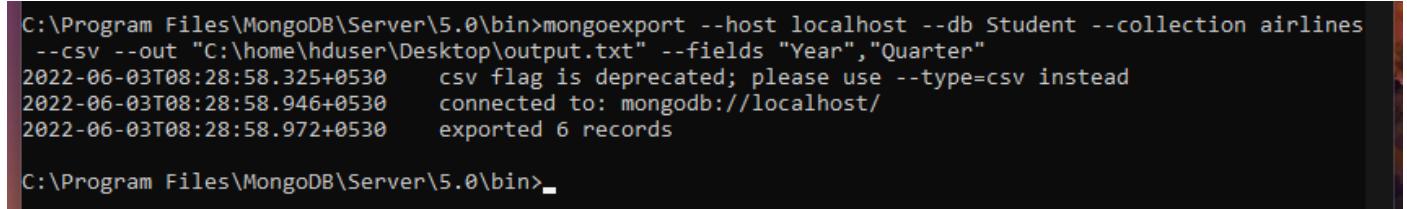


```
C:\Program Files\MongoDB\Server\5.0\bin>mongoimport --db Student --collection airlines --type csv --file "C:\Program Files\MongoDB\airline.csv" --headerline  
2022-06-03T08:24:18.366+0530      connected to: mongodb://localhost/  
2022-06-03T08:24:18.395+0530      6 document(s) imported successfully. 0 document(s) failed to import.  
C:\Program Files\MongoDB\Server\5.0\bin>
```

IV. Export data to a CSV file

This command used at the command prompt exports MongoDB JSON documents from “Customers” collection in the “test” database into a CSV file “Output.txt” in the D:drive.

```
mongoexport --host localhost --db Student --collection airlines --csv --out  
/home/hduser/Desktop/output.txt --fields "Year","Quarter"
```



```
C:\Program Files\MongoDB\Server\5.0\bin>mongoexport --host localhost --db Student --collection airlines  
--csv --out "C:\home\hduser\Desktop\output.txt" --fields "Year","Quarter"  
2022-06-03T08:28:58.325+0530      csv flag is deprecated; please use --type=csv instead  
2022-06-03T08:28:58.946+0530      connected to: mongodb://localhost/  
2022-06-03T08:28:58.972+0530      exported 6 records  
C:\Program Files\MongoDB\Server\5.0\bin>
```

V. Save Method :

Save() method will insert a new document, if the document with the _id does not exist. If it exists it will replace the existing document.

```
db.Students.save({StudName:"Vamsi", Grade:"VI"})
```

```
switched to db Student
> db.Students.save({StudName:"Vamsi",Grade:"VII"})
WriteResult({ "nInserted" : 1 })
> -
```

VI. Add a new field to existing Document:

```
db.Students.update({_id:4},{$set:{Location:"Network"}})
```

```
> db.Students.update({_id:4},{$set:{Location:"Network"}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" : 0 })
> -
```

VII. Remove the field in an existing Document

```
db.Students.update({_id:4},{$unset:{Location:"Network"}})
```

```
Command Prompt - mongo
> db.Students.update({_id:4},{$unset:{Location:"Network"}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" : 0 })
> -
```

VIII. Finding Document based on search criteria suppressing few fields

```
db.Student.find({_id:1},{StudName:1,Grade:1,_id:0});
```

To find those documents where the Grade is not set to 'VII'

```
db.Student.find({Grade:{$ne:'VII'}}).pretty();
```

To find documents from the Students collection where the StudName ends with s.

```
db.Student.find({StudName:/s$/}).pretty();
```

```
> db.Student.find({_id:1},{StudName:1,Grade:1,_id:0});
> -
```

```
Command Prompt - mongo
> db.Student.find({Grade:{$ne:'VII'}}).pretty();
> db.Student.find({StudName:/s$/}).pretty();
> -
```

IX. to set a particular field value to NULL

```
> db.Students.update({_id:3},{$set:{Location:null}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" : 0 })
> -
```

X Count the number of documents in Student Collections

```
> db.Student.count()
0
\
```

XI. Count the number of documents in Student Collections with grade :VII

db.Students.count({Grade:"VII"})

retrieve first 3 documents

```
db.Students.find({Grade:"VII"}).limit(3).pretty();
```

Sort the document in Ascending order

```
db.Students.find().sort({StudName:1}).pretty();
```

Note:

for desending order : db.Students.find().sort({StudName:-1}).pretty();

to Skip the 1 st two documents from the Students Collections

```
db.Students.find().skip(2).pretty()
```

```
> db.Students.find().sort({StudName:1}).pretty();
{
    "_id" : ObjectId("629979944de3211e43081306"),
    "StudName" : "Vamsi",
    "Grade" : "VII"
}
>
```

XII. Create a collection by name “food” and add to each document add a “fruits” array

```
db.food.insert( { _id:1, fruits:['grapes';'mango';'apple'] } )
```

```
db.food.insert( { _id:2, fruits:['grapes';'mango';'cherry'] } )
```

```
db.food.insert( { _id:3, fruits:['banana';'mango'] } )
```

```
c:\ Command Prompt - mongo
> db.food.insert({_id:1,fruits:['grapes','mango','apple']})
WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:2,fruits:['grapes','mango','cherry']})
WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:3,fruits:['banana','mango']})
WriteResult({ "nInserted" : 1 })
>
```

To find those documents from the “food” collection which has the “fruits array” constitute of “grapes”, “mango” and “apple”.

```
db.food.find( {fruits: ['grapes','mango','apple']} ).pretty()
```

```
> db.food.find({fruits:['grapes','mango','apple']}).pretty()
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }
>
```

To find in “fruits” array having “mango” in the first index position.

```
db.food.find( {fruits:1:'grapes'} )
```

```
> db.food.find({fruits:1:'grapes'})
>
```

To find those documents from the “food” collection where the size of the array is two.

```
db.food.find( {"fruits": {$size:2}} )
```

```
> db.food.find( {"fruits": {$size:2}} )
{ "_id" : 3, "fruits" : [ "banana", "mango" ] }
> -
```

To find the document with a particular id and display the first two elements from the array “fruits”

```
db.food.find({_id:1}, {"fruits":{$slice:2}})
```

```
> db.food.find({_id:1}, {"fruits":{$slice:2}})
{ "_id" : 1, "fruits" : [ "grapes", "mango" ] }
> -
```

To find all the documents from the food collection which have elements mango and grapes in the array “fruits”

```
db.food.find( {fruits:{$all:["mango","grapes"]}} )
```

```
> db.food.find({fruits:{$all:["mango","grapes"]}})  
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }  
{ "_id" : 2, "fruits" : [ "grapes", "mango", "cherry" ] }  
>
```

update on Array:

using particular id replace the element present in the 1 st index position of the fruits array with apple

```
db.food.update({_id:3},{$set:{'fruits.1':'apple'}})
```

insert new key value pairs in the fruits array

```
db.food.update({_id:2},{$push:{price:{grapes:80,mango:200,cherry:100}}})
```

```
> db.food.update({_id:3},{$set:{'fruits.1':'apple'}})  
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })  
> db.food.update({_id:2},{$push:{price:{grapes:80,mango:200,cherry:100}}})  
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })  
> ■
```

Note: perform query operations using - pop, addToSet, pullAll and pull

XII. Aggregate Function :

Create a collection Customers with fields custID, AcctBal, AcctType.

Now group on “custID” and compute the sum of “AccBal”.

```
db.Customers.aggregate ( {$group : { _id : "$custID",TotAccBal : {$sum:"$AccBal"} } } );
```

match on AcctType:”S” then group on “CustID” and compute the sum of “AccBal”.

```
db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id : "$custID",TotAccBal : {$sum:"$AccBal"} } } );
```

match on AcctType:”S” then group on “CustID” and compute the sum of “AccBal” and total balance greater than 1200.

```
db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id : "$custID",TotAccBal : {$sum:"$AccBal"} } }, {$match:{TotAccBal:{$gt:1200}}});
```

```
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Customers.aggregate ( {$group : { _id : "$custID",TotAccBal : {$sum:"$AccBal"} } } );
> db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id : "$custID",TotAccBal :
... {$sum:"$AccBal"} } } );
uncaught exception: SyntaxError: illegal character :
@(shell):1:43
> db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id :"$custID",TotAccBal :{$sum:"$AccBal"
"} } } );
> db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id : "$custID",TotAccBal :{$sum:"$AccBal
1"} } }, {$match:{TotAccBal:{$gt:1200}}});
>
```

3.b.MongoDB Lab Program 2 (CRUD Demonstration): -

1) Using MongoDB

i) Create a database for Students and Create a Student Collection (_id,Name, USN, Semester, Dept_Name, CGPA, Hobbies(Set)).

ii) Insert required documents to the collection.

iii) First Filter on “Dept_Name:CSE” and then group it on “Semester” and

compute the Average CGPA for that semester and filter those documents where the “Avg_CGPA” is greater than 7.5.

iv) Command used to export MongoDB JSON documents from “Student” Collection into the “Students” database into a CSV file “Output.txt”.

```
> db.createCollection("Student");
{ "ok" : 1 }
```

```
> db.Student.insert({_id:1,name:"ananya",USN:"1BM19CS095",Sem:6,Dept_Name:"CSE",CGPA:"8.1",Hobbies:"Badminton"});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:2,name:"bharath",USN:"1BM19CS002",Sem:6,Dept_Name:"CSE",CGPA:"8.3",Hobbies:"Swimming"});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:3,name:"chandana",USN:"1BM19CS006",Sem:6,Dept_Name:"CSE",CGPA:"7.1",Hobbies:"Cycling"});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:4,name:"hrithik",USN:"1BM19CS010",Sem:6,Dept_Name:"CSE",CGPA:"8.6",Hobbies:"Reading"});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:5,name:"kanika",USN:"1BM19CS090",Sem:6,Dept_Name:"CSE",CGPA:"9.2",Hobbies:"Cycling"});
WriteResult({ "nInserted" : 1 })
```

```
> db.Student.update({_id:1},{$set:{CGPA:9.0}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.update({_id:2},{$set:{CGPA:9.1}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.update({_id:3},{$set:{CGPA:8.1}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.update({_id:4},{$set:{CGPA:6.5}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.update({_id:5},{$set:{CGPA:8.6}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.students.aggregate([{$match:{Dept_Name:"CSE"}},{$group:{_id:"$Sem",AvgCGPA:{$avg:"$CGPA"}},{$match:{AvgCGPA:{$gt:7.5}}}}]);
> db.Student.aggregate([{$match:{Dept_Name:"CSE"}},{$group:{_id:"$Sem",AvgCGPA:{$avg:"$CGPA"}},{$match:{AvgCGPA:{$gt:7.5}}}}]);
{ "_id" : 6, "AvgCGPA" : 8.26 }
```

```
bmsce@bmsce-Precision-T1700:~$ mongoexport --host localhost --db nayana_db --collection Student --csv --out /home/bmsce/Desktop/output.txt
--fields "_id","Name","USN","Sem","Dept_Name","CGPA","Hobbies"
2022-04-20T15:13:53.933+0530    csv flag is deprecated; please use --type=csv instead
2022-04-20T15:13:53.935+0530    connected to: localhost
2022-04-20T15:13:53.935+0530    exported 5 records
```

```

1 | _id,Name,USN,Sem,Dept_Name,CGPA,Hobbies
2 | 1,,1BM19CS095,6,CSE,9,Badminton
3 | 2,,1BM19CS002,6,CSE,9.1,Swimming
4 | 3,,1BM19CS006,6,CSE,8.1,Cycling
5 | 4,,1BM19CS010,6,CSE,6.5,Reading
6 | 5,,1BM19CS090,6,CSE,8.6,Cycling

```

2) Create a mongodb collection Bank. Demonstrate the following by choosing fields of your choice.

1. Insert three documents
2. Use Arrays(Use Pull and Pop operation)
3. Use Index
4. Use Cursors
5. Updation

```

> db.createCollection("Bank");
{
  "ok" : 1
}
> db.insert([{"CustID":1, "Name":"Trivikram Hegde", "Type":"Savings", "Contact":["9945678231", "080-22364587"]});
uncaught exception: TypeError: db.insert is not a function
@shell>:1:1
> db.Bank.insert([{"CustID":1, "Name":"Trivikram Hegde", "Type":"Savings", "Contact":["9945678231", "080-22364587"]]);
WriteResult({ "nInserted" : 1 })
> db.Bank.insert([{"CustID":2, "Name":"Vishvesh Bhat", "Type":"Savings", "Contact":["6325985615", "080-23651452"]});
WriteResult({ "nInserted" : 1 })
> db.Bank.insert([{"CustID":3, "Name":"Vaishak Bhat", "Type":"Savings", "Contact":["8971456321", "080-33529458"]});
WriteResult({ "nInserted" : 1 })
> db.Bank.insert([{"CustID":4, "Name":"Pramod P Parande", "Type":"Current", "Contact":["9745236589", "080-56324587"]});
WriteResult({ "nInserted" : 1 })
> db.Bank.insert([{"CustID":4, "Name":"Shreyas R S", "Type":"Current", "Contact":["9445678321", "044-65611729", "080-25639856"]]);
WriteResult({ "nInserted" : 1 })
> db.Bank.find();
{
  "_id" : ObjectId("625d77809329139694f188a2"), "CustID" : 1, "Name" : "Trivikram Hegde", "Type" : "Savings", "Contact" : [ "9945678231", "080-22364587" ]
}
{
  "_id" : ObjectId("625d77bd9329139694f188a3"), "CustID" : 2, "Name" : "Vishvesh Bhat", "Type" : "Savings", "Contact" : [ "6325985615", "080-23651452" ]
}
{
  "_id" : ObjectId("625d77e69329139694f188a4"), "CustID" : 3, "Name" : "Vaishak Bhat", "Type" : "Savings", "Contact" : [ "8971456321", "080-33529458" ]
}
{
  "_id" : ObjectId("625d78229329139694f188a5"), "CustID" : 4, "Name" : "Pramod P Parande", "Type" : "Current", "Contact" : [ "9745236589", "080-56324587" ]
}
{
  "_id" : ObjectId("625d78659329139694f188a6"), "CustID" : 4, "Name" : "Shreyas R S", "Type" : "Current", "Contact" : [ "9445678321", "044-65611729", "080-25639856" ]
}
> db.Bank.updateMany({CustID:1},{ $pop:{Contact:1} });
{
  "acknowledged" : true, "matchedCount" : 1, "modifiedCount" : 1
}
> db.Bank.find();
{
  "_id" : ObjectId("625d77809329139694f188a2"), "CustID" : 1, "Name" : "Trivikram Hegde", "Type" : "Savings", "Contact" : [ "9945678231" ]
}
{
  "_id" : ObjectId("625d77bd9329139694f188a3"), "CustID" : 2, "Name" : "Vishvesh Bhat", "Type" : "Savings", "Contact" : [ "6325985615", "080-23651452" ]
}
{
  "_id" : ObjectId("625d77e69329139694f188a4"), "CustID" : 3, "Name" : "Vaishak Bhat", "Type" : "Savings", "Contact" : [ "8971456321", "080-33529458" ]
}
{
  "_id" : ObjectId("625d78229329139694f188a5"), "CustID" : 4, "Name" : "Pramod P Parande", "Type" : "Current", "Contact" : [ "9745236589", "080-56324587" ]
}
{
  "_id" : ObjectId("625d78659329139694f188a6"), "CustID" : 4, "Name" : "Shreyas R S", "Type" : "Current", "Contact" : [ "9445678321", "044-65611729", "080-25639856" ]
}

```

```

{
  "_id" : ObjectId("625d78659329139694f188a6"),
  "CustID" : 4,
  "Name" : "Shreyas R S",
  "Type" : "Current",
  "Contact" : [
    "9445678321",
    "044-65611729",
    "080-25639856"
  ]
}
> db.Bank.updateMany({},{spull:{Contact:"080-25639856"}})
{
  "acknowledged" : true,
  "matchedCount" : 5,
  "modifiedCount" : 1
}
> db.Bank.find({})
{
  "_id" : ObjectId("625d77809329139694f188a2"),
  "CustID" : 1,
  "Name" : "Trivikram Hegde",
  "Type" : "Savings",
  "Contact" : [
    "9945678231"
  ]
}
{
  "_id" : ObjectId("625d77bd9329139694f188a3"),
  "CustID" : 2,
  "Name" : "Vishvesh Bhat",
  "Type" : "Savings",
  "Contact" : [
    "6325985615",
    "080-23651452"
  ]
}
{
  "_id" : ObjectId("625d77e69329139694f188a4"),
  "CustID" : 3,
  "Name" : "Vaishak Bhat",
  "Type" : "Savings",
  "Contact" : [
    "8971456321",
    "080-33529458"
  ]
}
{
  "_id" : ObjectId("625d78229329139694f188a5"),
  "CustID" : 4,
  "Name" : "Pramod P Parande",
  "Type" : "Current",
  "Contact" : [
    "9745236589",
    "080-56324587"
  ]
}
{
  "_id" : ObjectId("625d78659329139694f188a6"),
  "CustID" : 4,
  "Name" : "Shreyas R S",
  "Type" : "Current",
  "Contact" : [
    "9445678321",
    "044-65611729"
  ]
}
> db.Bank.createIndex({Name:1, Type:1},{name:});
uncaught exception: SyntaxError: expected expression, got '}'
@shell:1:43
> db.Bank.createIndex({Name:1, Type:1},{name:"Find current account holders"});
{
  "createdCollectionAutomatically" : false,
  "numIndexesBefore" : 1,
  "numIndexesAfter" : 2,
  "ok" : 1
}
> db.Bank.find({})
{
  "_id" : ObjectId("625d77809329139694f188a2"),
  "CustID" : 1,
  "Name" : "Trivikram Hegde",
  "Type" : "Savings",
  "Contact" : [
    "9945678231"
  ]
}
{
  "_id" : ObjectId("625d77bd9329139694f188a3"),
  "CustID" : 2,
  "Name" : "Vishvesh Bhat",
  "Type" : "Savings",
  "Contact" : [
    "6325985615",
    "080-23651452"
  ]
}
{
  "_id" : ObjectId("625d77e69329139694f188a4"),
  "CustID" : 3,
  "Name" : "Vaishak Bhat",
  "Type" : "Savings",
  "Contact" : [
    "8971456321",
    "080-33529458"
  ]
}
{
  "_id" : ObjectId("625d78229329139694f188a5"),
  "CustID" : 4,
  "Name" : "Pramod P Parande",
  "Type" : "Current",
  "Contact" : [
    "9745236589",
    "080-56324587"
  ]
}
{
  "_id" : ObjectId("625d78659329139694f188a6"),
  "CustID" : 4,
  "Name" : "Shreyas R S",
  "Type" : "Current",
  "Contact" : [
    "9445678321",
    "044-65611729"
  ]
}
> db.Bank.getIndexes()
[
  {
    "v" : 2,
    "key": {
      "Name": 1,
      "Type": 1
    }
  }
]

```

```

@shell:1:20
> db.Bank.update({_id:625d78659329139694f188a6}, {$set: {CustID:5},{upsert:true}});
uncaught exception: SyntaxError: identifier starts immediately after numeric literal :
@shell:1:20
> db.Bank.update({_id:"625d78659329139694f188a6"}, {$set: {CustID:5},{upsert:true}});
WriteResult({
  "nMatched" : 0,
  "nUpserted" : 1,
  "nModified" : 0,
  "_id" : "625d78659329139694f188a6"
})
> db.Bank.find({})
{
  "_id" : ObjectId("625d77809329139694f188a2"),
  "CustID" : 1,
  "Name" : "Trivikram Hegde",
  "Type" : "Savings",
  "Contact" : [
    "9945678231"
  ]
}
{
  "_id" : ObjectId("625d77bd9329139694f188a3"),
  "CustID" : 2,
  "Name" : "Vishvesh Bhat",
  "Type" : "Savings",
  "Contact" : [
    "6325985615",
    "080-23651452"
  ]
}
{
  "_id" : ObjectId("625d77e69329139694f188a4"),
  "CustID" : 3,
  "Name" : "Vaishak Bhat",
  "Type" : "Savings",
  "Contact" : [
    "8971456321",
    "080-33529458"
  ]
}
{
  "_id" : ObjectId("625d78229329139694f188a5"),
  "CustID" : 4,
  "Name" : "Pramod P Parande",
  "Type" : "Current",
  "Contact" : [
    "9745236589",
    "080-56324587"
  ]
}
{
  "_id" : ObjectId("625d78659329139694f188a6"),
  "CustID" : 4,
  "Name" : "Shreyas R S",
  "Type" : "Current",
  "Contact" : [
    "9445678321",
    "044-65611729"
  ]
}
{
  "_id" : "625d78659329139694f188a6",
  "CustID" : 5
}
> db.Bank.update({_id:"625d78659329139694f188a6"}, CustID:5), {$set: {Name:"Sumantha K S", Type:"Savings", Contact:["9856321478","011-65897458"]},{upsert:true}};
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Bank.find({})
{
  "_id" : ObjectId("625d77809329139694f188a2"),
  "CustID" : 1,
  "Name" : "Trivikram Hegde",
  "Type" : "Savings",
  "Contact" : [
    "9945678231"
  ]
}
{
  "_id" : ObjectId("625d77bd9329139694f188a3"),
  "CustID" : 2,
  "Name" : "Vishvesh Bhat",
  "Type" : "Savings",
  "Contact" : [
    "6325985615",
    "080-23651452"
  ]
}
{
  "_id" : ObjectId("625d77e69329139694f188a4"),
  "CustID" : 3,
  "Name" : "Vaishak Bhat",
  "Type" : "Savings",
  "Contact" : [
    "8971456321",
    "080-33529458"
  ]
}
{
  "_id" : ObjectId("625d78229329139694f188a5"),
  "CustID" : 4,
  "Name" : "Pramod P Parande",
  "Type" : "Current",
  "Contact" : [
    "9745236589",
    "080-56324587"
  ]
}
{
  "_id" : ObjectId("625d78659329139694f188a6"),
  "CustID" : 4,
  "Name" : "Shreyas R S",
  "Type" : "Current",
  "Contact" : [
    "9445678321",
    "044-65611729"
  ]
}
{
  "_id" : "625d78659329139694f188a6",
  "CustID" : 5,
  "Contact" : [
    "9856321478",
    "011-65897458"
  ],
  "Name" : "Sumantha K S",
  "Type" : "Savings"
}
>

```

1) Using MongoDB,

i) Create a database for Faculty and Create a Faculty Collection(Faculty_id, Name, Designation ,Department, Age, Salary, Specialization(Set)).

ii) Insert required documents to the collection.

iii) First Filter on “Dept_Name:MECH” and then group it on “Designation” and

compute the Average Salary for that Designation and filter those documents where the “Avg_Sal” is greater than 650000. iv)

Demonstrate usage of import and export commands

Write MongoDB queries for the following:

1) To display only the product name from all the documents of the product collection.

2) To display only the Product ID, ExpiryDate as well as the quantity from the document of the product collection where the _id column is 1.

3) To find those documents where the price is not set to 15000.

4) To find those documents from the Product collection where the quantity is set to 9 and the product name is set to ‘monitor’.

5) To find documents from the Product collection where the Product name ends in ‘d’.

```
}

> db.createCollection("faculty");
{ "ok" : 1 }
> db.faculty.insert({_id:1,name:"Dr. Balaraman Ravindran",designation:"Professor",department:"CSE",age:45,salary:100000,specialization:['python','mysql','sklearn', 'tensorflow']});
WriteResult({ "nInserted" : 1 })
> db.faculty.insert({_id:2,name:"Dr. Mahadev Ghorki",designation:"Assistant Professor",department:"CSE",age:35,salary:80000,specialization:['python','numpy','sklearn', 'tensorflow', 'java']});
WriteResult({ "nInserted" : 1 })
> db.faculty.insert({_id:3,name:"Dr. Praveen Borade",designation:"Associate Professor",department:"ME",age:40,salary:75000,specialization:['autocad', 'aerodynamics', 'thermal physics']});
WriteResult({ "nInserted" : 1 })
> db.faculty.insert({_id:4,name:"Dr. Madhav Nayak",designation:"Assistant Professor",department:"ME",age:37,salary:95000,specialization:['autocad', 'flight-dynamics', 'Finite Element Analysis']});
WriteResult({ "nInserted" : 1 })
> db.faculty.aggregate ( { $match:{department:"ME"}}, { $group : { _id : "$designation", AverageSal :{$avg:"$salary"} } }, { $match:{AverageSal:{$gt:50000}}} );
{ "_id" : "Associate Professor", "AverageSal" : 75000 }
{ "_id" : "Assistant Professor", "AverageSal" : 95000 }
> db.createCollection("product");
{ "ok" : 1 }
> db.product.insert({pid:1,pname:"keyboard",mdate:2001,price:1800,quantity:2});
WriteResult({ "nInserted" : 1 })
> db.product.insert({pid:2,pname:"mouse",mdate:2005,price:1500,quantity:5});
WriteResult({ "nInserted" : 1 })
> db.product.insert({pid:3,pname:"monitor",mdate:2015,price:10000,quantity:9});
WriteResult({ "nInserted" : 1 })
> db.product.insert({pid:4,pname:"motherboard",mdate:2021,price:15000,quantity:4});
WriteResult({ "nInserted" : 1 })
> db.product.find({}, {pname:1,_id:0})
{ "pname" : "keyboard" }
{ "pname" : "mouse" }
{ "pname" : "monitor" }
{ "pname" : "motherboard" }
> db.product.find({pid:1},{pid:1,_id:0,mdate:1,quantity:1});
{ "pid" : 1, "mdate" : 2001, "quantity" : 2 }
> db.product.find({price:{$ne:15000}}, {pname:1,_id:0});
{ "pname" : "keyboard" }
```

3)Create a mongodb collection Hospital. Demonstrate the following by choosing fields of choice.

- 1 . Insert three documents
- 2 . Use Arrays(Use Pull and Pop operation)
- 3 . Use Index
- 4 . Use Cursors
- 5 Updation

```
{ "pname" : "motherboard" }
> db.product.find({pid:1},{pid:1,_id:0,mdate:1,quantity:1});
{ "pid" : 1, "mdate" : 2001, "quantity" : 2 }
> db.product.find({price:{$ne:15000}},{pname:1,_id:0});
{ "pname" : "keyboard" }
{ "pname" : "mouse" }
{ "pname" : "monitor" }
> db.product.find({$and:[{quantity:{$eq:9}},{pname:{$eq:"monitor"}]}]},{pname:1,_id:0})
{ "pname" : "monitor" }
> db.product.find({pname:/d$/},{pname:1,quantity:1,_id:0})
{ "pname" : "keyboard", "quantity" : 2 }
{ "pname" : "motherboard", "quantity" : 4 }
> db.createCollection("hospital");
{ "ok" : 1 }
> db.hospital.insert({_id:1, Name: "Anshuman Agarwal", age:23, diseases:["fever", "diarrhoea", "wheezing", "gastritis"]});
WriteResult({ "nInserted" : 1 })
> db.hospital.insert({_id:2, Name: "Pinky Chaubey", age:35, diseases:["fever", "nausea", "food infection", "indigestion", "kidney stones"]});
WriteResult({ "nInserted" : 1 })
> db.hospital.insert({_id:3, Name: "Amresh Chowpati", age:63, diseases:["hyperglycemia", "diabetes mellitus", "food poisoning", "cold"]});
WriteResult({ "nInserted" : 1 })
> db.hospital.updateMany({},{$pull:{diseases:"fever"}});
{ "acknowledged" : true, "matchedCount" : 3, "modifiedCount" : 2 }
> db.hospital.updateOne({_id:1},{$pop:{diseases:-1}});
{ "acknowledged" : true, "matchedCount" : 1, "modifiedCount" : 1 }
> db.hospital.find({"diseases.2":"nausea"});
> db.hospital.find({"diseases.1":"nausea"});
> d.hospital.find({});
uncaught exception: ReferenceError: d is not defined :
@(shell):1:1
> db.hospital.find();
{ "_id" : 1, "Name" : "Anshuman Agarwal", "age" : 23, "diseases" : [ "wheezing", "gastritis" ] }
{ "_id" : 2, "Name" : "Pinky Chaubey", "age" : 35, "diseases" : [ "nausea", "food infection", "indigestion", "kidney stones" ] }
{ "_id" : 3, "Name" : "Amresh Chowpati", "age" : 63, "diseases" : [ "hyperglycemia", "diabetes mellitus", "food poisoning", "cold" ] }
> db.hospital.find({"diseases.0":"nausea"});
{ "_id" : 2, "Name" : "Pinky Chaubey", "age" : 35, "diseases" : [ "nausea", "food infection", "indigestion", "kidney stones" ] }
> db.hospital.update({_id:3},{$set:{'diseases.1':'sarscov'}});
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> █
```

4. Hadoop Installation(screenshot)

The screenshot shows a Windows Command Prompt window titled "Administrator: Command Prompt". The command history is as follows:

```
Usage: hadoop fs [generic options] -put [-f] [-p] [-l] [-d] [-t <thread count>] <localsrc> ... <dst>
C:\WINDOWS\system32>start-all.sh
C:\WINDOWS\system32>jps
14736 DataNode
17008 SparkSubmit
8384 NameNode
17060 ResourceManager
2900 NodeManager
3476 Jps
C:\WINDOWS\system32>hdfs dfs -mkdir /sony
The filename, directory name, or volume label syntax is incorrect.
C:\WINDOWS\system32>hdfs dfs -mkdir sony
The filename, directory name, or volume label syntax is incorrect.
mkdir: `hdfs://localhost:9000/user/Admin': No such file or directory
C:\WINDOWS\system32>hadoop fs -ls /
The filename, directory name, or volume label syntax is incorrect.
Found 3 items
drwxr-xr-x  - root  hadoop          0 2022-06-23 19:47 /datasets
drwxrwxrwx  - jinoy  supergroup    0 2022-02-06 20:27 /jinoy
drwxr-xr-x  - Admin  supergroup    0 2022-06-23 20:01 /sony
C:\WINDOWS\system32>
```

5. Hadoop Commands

```
C:\hadoop_new\sbin>hdfs dfs -mkdir /lab1
```

```
C:\hadoop_new\sbin>hdfs dfs -ls /
```

```
Found 2 items
```

```
drwxr-xr-x - Admin supergroup 0 2021-04-19 14:47 /lab1  
drwxr-xr-x - Admin supergroup 0 2021-04-19 14:46 /sample
```

```
// create a file sample.txt in desktop
```

```
C:\hadoop_new\sbin>hdfs dfs -copyFromLocal E:\Desktop\sample.txt \lab1
```

```
C:\hadoop_new\sbin>hdfs dfs -ls /lab1
```

```
Found 1 items
```

```
-rw-r--r-- 1 Admin supergroup 19 2021-04-19 14:51 /lab1/sample.txt
```

```
C:\hadoop_new\sbin>hdfs dfs -cat \lab1\sample.txt
```

```
sample text for lab
```

```
//create a folder sample in desktop
```

```
C:\hadoop_new\sbin>hdfs dfs -get \lab1\sample.txt E:\Desktop\sample
```

```
C:\hadoop_new\sbin>hdfs dfs -put E:\Desktop\samplefolder \lab1
```

```
C:\hadoop_new\sbin>hdfs dfs -ls /lab1
```

```
Found 2 items
```

```
-rw-r--r-- 1 Admin supergroup 19 2021-04-19 14:51 /lab1/sample.txt  
drwxr-xr-x - Admin supergroup 0 2021-04-19 14:58 /lab1/samplefolder
```

```
C:\hadoop_new\sbin>hdfs dfs -mv /sample /lab1
```

```
C:\hadoop_new\sbin>hdfs dfs -ls /lab1
```

```
Found 3 items
```

```
drwxr-xr-x - Admin supergroup 0 2021-04-19 14:50 /lab1/sample  
-rw-r--r-- 1 Admin supergroup 19 2021-04-19 14:51 /lab1/sample.txt  
drwxr-xr-x - Admin supergroup 0 2021-04-19 14:58 /lab1/samplefolder
```

```
C:\hadoop_new\sbin>hdfs dfs -cp /lab1/sample /
```

```
C:\hadoop_new\sbin>hdfs dfs -ls /
```

```
Found 2 items
```

```
drwxr-xr-x - Admin supergroup 0 2021-04-19 15:00 /lab1  
drwxr-xr-x - Admin supergroup 0 2021-04-19 15:01 /sample
```

```
C:\hadoop_new\sbin>hdfs dfs -rm /lab1/sample.txt  
Deleted /lab1/sample.txt
```

```
C:\hadoop_new\sbin>hdfs dfs -ls /lab1  
Found 2 items  
drwxr-xr-x - Admin supergroup      0 2021-04-19 14:50 /lab1/sample  
drwxr-xr-x - Admin supergroup      0 2021-04-19 14:58 /lab1/samplefolder
```

```
C:\hadoop_new\sbin>hdfs dfs -copyFromLocal E:\Desktop\sample.txt \lab1
```

```
C:\hadoop_new\sbin>hdfs dfs -copyToLocal \lab1\sample.txt E:\Desktop\sample1.txt
```

6. Hadoop Programs: Word Count

Create Three Java Classes into the project. Name them WCDriver(having the main function), WCMapper, WCReducer.

```
// Importing libraries
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Mapper;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reporter;

public class WCMapper extends MapReduceBase implements Mapper<LongWritable, Text, Text, IntWritable> {

    // Map function
    public void map(LongWritable key, Text value, OutputCollector<Text, IntWritable> output, Reporter rep) throws IOException
    {

        String line = value.toString();

        // Splitting the line on spaces
        for (String word : line.split(" "))
        {
            if (word.length() > 0)
            {
                output.collect(new Text(word), new IntWritable(1));
            }
        }
    }
}
```

Reducer Code: You have to copy paste this program into the WCReducer Java Class file.

```
// Importing libraries
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer;
import org.apache.hadoop.mapred.Reporter;
```

```

public class WCReducer extends MapReduceBase implements Reducer<Text, IntWritable, Text,
IntWritable> {

    // Reduce function
    public void reduce(Text key, Iterator<IntWritable> value,
                       OutputCollector<Text, IntWritable> output,
                       Reporter rep) throws IOException
    {

        int count = 0;

        // Counting the frequency of each words
        while (value.hasNext())
        {
            IntWritable i = value.next();
            count += i.get();
        }

        output.collect(key, new IntWritable(count));
    }
}

```

Driver Code: You have to copy paste this program into the WCDriver Java Class file.

```

// Importing libraries
import java.io.IOException;
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.FileInputFormat;
import org.apache.hadoop.mapred.FileOutputFormat;
import org.apache.hadoop.mapred.JobClient;
import org.apache.hadoop.mapred.JobConf;
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;

```

```

public class WCDriver extends Configured implements Tool {

```

```

    public int run(String args[]) throws IOException
    {
        if (args.length < 2)
        {
            System.out.println("Please give valid inputs");
            return -1;
        }

        JobConf conf = new JobConf(WCDriver.class);
        FileInputFormat.setInputPaths(conf, new Path(args[0]));
        FileOutputFormat.setOutputPath(conf, new Path(args[1]));
    }
}

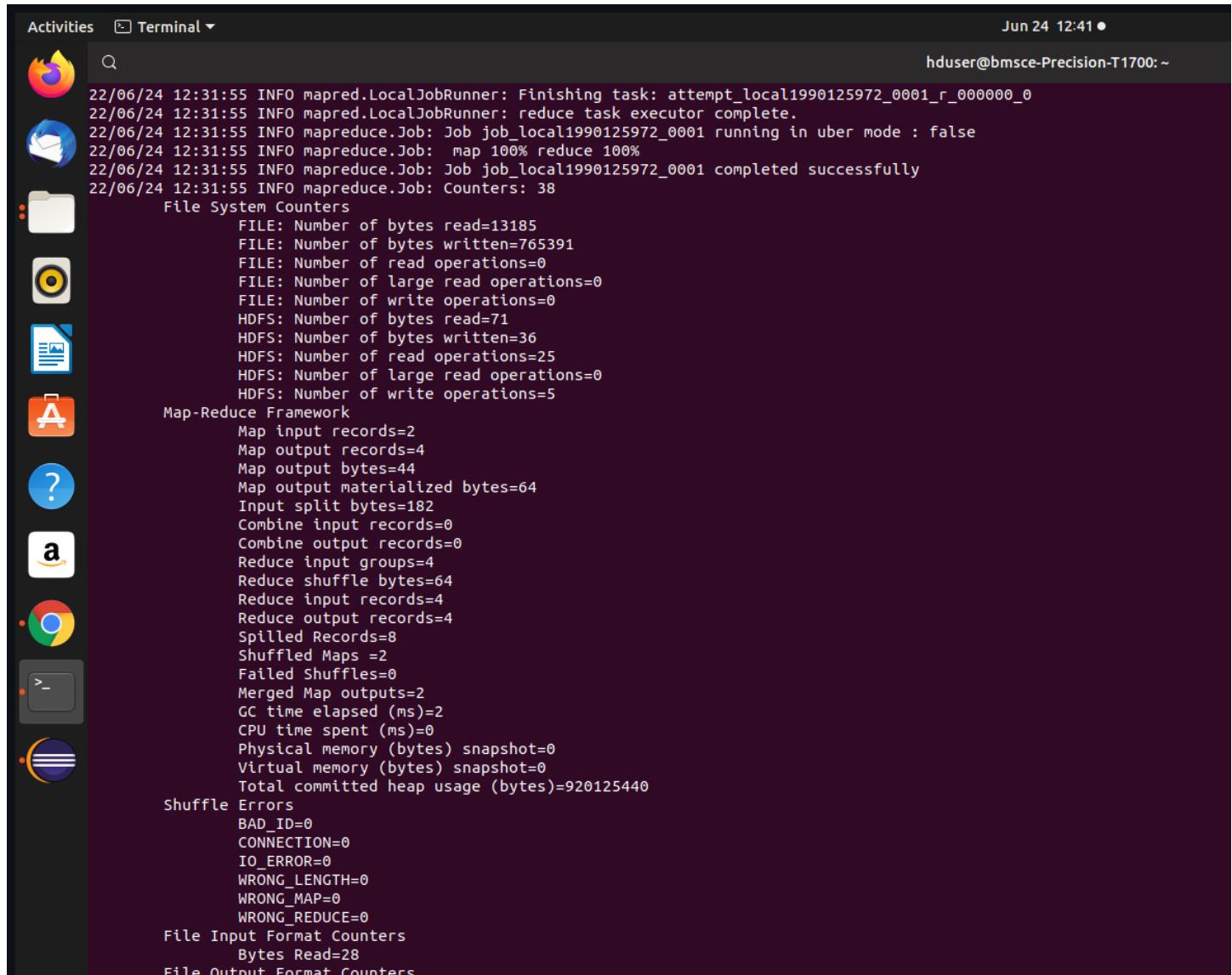
```

```

        conf.setMapperClass(WCMapper.class);
        conf.setReducerClass(WCReducer.class);
        conf.setMapOutputKeyClass(Text.class);
        conf.setMapOutputValueClass(IntWritable.class);
        conf.setOutputKeyClass(Text.class);
        conf.setOutputValueClass(IntWritable.class);
        JobClient.runJob(conf);
        return 0;
    }

// Main Method
public static void main(String args[]) throws Exception
{
    int exitCode = ToolRunner.run(new WCDriver(), args);
    System.out.println(exitCode);
}
}

```



The screenshot shows a terminal window on a Linux desktop. The terminal output displays the logs of a Hadoop MapReduce job. The logs indicate the job completed successfully with an exit code of 0. The output is as follows:

```

Activities Terminal Jun 24 12:41 ●
hduser@bmsce-Precision-T1700: ~
22/06/24 12:31:55 INFO mapred.LocalJobRunner: Finishing task: attempt_local1990125972_0001_r_000000_0
22/06/24 12:31:55 INFO mapred.LocalJobRunner: reduce task executor complete.
22/06/24 12:31:55 INFO mapreduce.Job: Job job_local1990125972_0001 running in uber mode : false
22/06/24 12:31:55 INFO mapreduce.Job: map 100% reduce 100%
22/06/24 12:31:55 INFO mapreduce.Job: Job job_local1990125972_0001 completed successfully
22/06/24 12:31:55 INFO mapreduce.Job: Counters: 38
  File System Counters
    FILE: Number of bytes read=13185
    FILE: Number of bytes written=765391
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=71
    HDFS: Number of bytes written=36
    HDFS: Number of read operations=25
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=5
  Map-Reduce Framework
    Map input records=2
    Map output records=4
    Map output bytes=44
    Map output materialized bytes=64
    Input split bytes=182
    Combine input records=0
    Combine output records=0
    Reduce input groups=4
    Reduce shuffle bytes=64
    Reduce input records=4
    Reduce output records=4
    Spilled Records=8
    Shuffled Maps =2
    Failed Shuffles=0
    Merged Map outputs=2
    GC time elapsed (ms)=2
    CPU time spent (ms)=0
    Physical memory (bytes) snapshot=0
    Virtual memory (bytes) snapshot=0
    Total committed heap usage (bytes)=920125440
  Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
    WRONG_MAP=0
    WRONG_REDUCE=0
  File Input Format Counters
    Bytes Read=28
  File Output Format Counters

```

```
Virtual memory (bytes) snapshot=0
      Total committed heap usage (bytes)=920125440
Shuffle Errors
  BAD_ID=0
  CONNECTION=0
  IO_ERROR=0
  WRONG_LENGTH=0
  WRONG_MAP=0
  WRONG_REDUCE=0
File Input Format Counters
  Bytes Read=28
File Output Format Counters
  Bytes Written=36
0
hduser@bmsce-Precision-T1700:~$ hdfs dfs -cat /output_dir1/part-00000
djfijfisdfijfi 1
game 1
gg 1
good 1
hduser@bmsce-Precision-T1700:~$
```

7. Hadoop Programs : Top N

Driver-TopN.class

```
package samples.topn;

import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.GenericOptionsParser;

public class TopN {
    public static void main(String[] args) throws Exception {
```

```

Configuration conf = new Configuration();
String[] otherArgs = (new GenericOptionsParser(conf,
args)).getRemainingArgs();
if (otherArgs.length != 2) {
    System.err.println("Usage: TopN <in> <out>");
    System.exit(2);
}
Job job = Job.getInstance(conf);
job.setJobName("Top N");
job.setJarByClass(TopN.class);
job.setMapperClass(TopNMapper.class);
job.setReducerClass(TopNReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
FileInputFormat.addInputPath(job, new Path(otherArgs[0]));
FileOutputFormat.setOutputPath(job, new Path(otherArgs[1]));
System.exit(job.waitForCompletion(true) ? 0 : 1);
}

public static class TopNMapper extends Mapper<Object, Text, Text,
IntWritable> {
    private static final IntWritable one = new IntWritable(1);

    private Text word = new Text();

    private String tokens = "[_|\$#<>\\^=\\[\\]\\*\\/\\\\\\;,;.\\\\-:( )?!\\''']";

    public void map(Object key, Text value, Mapper<Object, Text,
Text, IntWritable>.Context context) throws IOException,
InterruptedException {
        String cleanLine =
value.toString().toLowerCase().replaceAll(this.tokens, " ");
        StringTokenizer itr = new StringTokenizer(cleanLine);
        while (itr.hasMoreTokens()) {

```

```
        this.word.set(itr.nextToken().trim());
        context.write(this.word, one);
    }
}
}

}
```

TopNCombiner.class

```
package samples.topn;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class TopNCombiner extends Reducer<Text, IntWritable, Text,
IntWritable> {
    public void reduce(Text key, Iterable<IntWritable> values,
Reducer<Text, IntWritable, Text, IntWritable>.Context context) throws
IOException, InterruptedException {
        int sum = 0;
        for (IntWritable val : values)
            sum += val.get();
        context.write(key, new IntWritable(sum));
    }
}
```

TopNMapper.class

```
package samples.topn;
```

```

import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class TopNMapper extends Mapper<Object, Text, Text,
IntWritable> {
    private static final IntWritable one = new IntWritable(1);

    private Text word = new Text();

    private String tokens = "[_|$#<>\\^=\\\\[\\\\]\\*\\/\\\\\\\\,;,.\\\\:-()?!\\'']";

    public void map(Object key, Text value, Mapper<Object, Text,
Text, IntWritable>.Context context) throws IOException,
InterruptedException {
        String cleanLine =
value.toString().toLowerCase().replaceAll(this.tokens, " ");
        StringTokenizer itr = new StringTokenizer(cleanLine);
        while (itr.hasMoreTokens()) {
            this.word.set(itr.nextToken().trim());
            context.write(this.word, one);
        }
    }
}

```

TopNReducer.class

```

package samples.topn;

```

```
import java.io.IOException;
import java.util.HashMap;
import java.util.Map;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
import utils.MiscUtils;
```



```
public class TopNReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
    private Map<Text, IntWritable> countMap = new HashMap<>();

    public void reduce(Text key, Iterable<IntWritable> values,
Reducer<Text, IntWritable, Text, IntWritable>.Context context) throws
IOException, InterruptedException {
        int sum = 0;
        for (IntWritable val : values)
            sum += val.get();
        this.countMap.put(new Text(key), new IntWritable(sum));
    }

    protected void cleanup(Reducer<Text, IntWritable, Text,
IntWritable>.Context context) throws IOException,
InterruptedException {
        Map<Text, IntWritable> sortedMap =
MiscUtils.sortByValues(this.countMap);
        int counter = 0;
        for (Text key : sortedMap.keySet()) {
            if (counter++ == 20)
                break;
            context.write(key, sortedMap.get(key));
        }
    }
}
```

```
C:\hadoop-3.3.0\sbin>jps
11072 DataNode
20528 Jps
5620 ResourceManager
15532 NodeManager
6140 NameNode

C:\hadoop-3.3.0\sbin>hdfs dfs -mkdir /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /
Found 1 items
drwxr-xr-x  - Anusree supergroup          0 2021-05-08 19:46 /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -copyFromLocal C:\input.txt /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /input_dir
Found 1 items
-rw-r--r--  1 Anusree supergroup      36 2021-05-08 19:48 /input_dir/input.txt

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /input_dir/input.txt
hello
world
hello
hadoop
bye
```

```
C:\hadoop-3.3.0\sbin>hadoop jar C:\sort.jar samples.topn.TopN /input_dir/input.txt /output_dir
2021-05-08 19:54:54,582 INFO client.DefaultNoHARFFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-08 19:54:55,291 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1620483374279_0001
2021-05-08 19:54:55,821 INFO input.FileInputFormat: Total input files to process : 1
2021-05-08 19:54:56,261 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-08 19:54:56,552 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1620483374279_0001
2021-05-08 19:54:56,552 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-08 19:54:56,843 INFO conf.Configuration: resource-types.xml not found
2021-05-08 19:54:56,843 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-08 19:54:57,387 INFO impl.YarnClientImpl: Submitted application application_1620483374279_0001
2021-05-08 19:54:57,587 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG329ESD:8088/proxy/application_1620483374279_0001/
2021-05-08 19:54:57,588 INFO mapreduce.Job: Running job: job_1620483374279_0001
2021-05-08 19:55:13,792 INFO mapreduce.Job: Job job_1620483374279_0001 running in uber mode : false
2021-05-08 19:55:13,794 INFO mapreduce.Job: map 0% reduce 0%
2021-05-08 19:55:20,020 INFO mapreduce.Job: map 100% reduce 100%
2021-05-08 19:55:27,116 INFO mapreduce.Job: map 100% reduce 100%
2021-05-08 19:55:33,199 INFO mapreduce.Job: Job job_1620483374279_0001 completed successfully
2021-05-08 19:55:33,334 INFO mapreduce.Job: Counters: 54
File System Counters
  FILE: Number of bytes read=65
  FILE: Number of bytes written=530397
  FILE: Number of read operations=0
  FILE: Number of large read operations=0
  FILE: Number of write operations=0
  HDFS: Number of bytes read=142
  HDFS: Number of bytes written=31
  HDFS: Number of read operations=8
  HDFS: Number of large read operations=0
  HDFS: Number of write operations=2
  HDFS: Number of bytes read erasure-coded=0
```

```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /output_dir/*
hello    2
hadoop   1
world    1
bye      1
C:\hadoop-3.3.0\sbin>
```

8. Hadoop Programs : Avg Temperature and

A. Avg temp:

AverageDriver

```
package temp;

import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class AverageDriver {
    public static void main(String[] args) throws Exception {
        if (args.length != 2) {
            System.err.println("Please Enter the input and output
parameters");
            System.exit(-1);
        }
        Job job = new Job();
        job.setJarByClass(AverageDriver.class);
        job.setJobName("Max temperature");
```

```
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
job.setMapperClass(AverageMapper.class);
job.setReducerClass(AverageReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
System.exit(job.waitForCompletion(true) ? 0 : 1);

}

}
```

```
AverageMapper

package temp;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class AverageMapper extends Mapper<LongWritable, Text, Text,
IntWritable> {
    public static final int MISSING = 9999;

    public void map(LongWritable key, Text value, Mapper<LongWritable,
Text, Text, IntWritable>.Context context) throws IOException,
InterruptedException {
        int temperature;
        String line = value.toString();
        String year = line.substring(15, 19);
        if (line.charAt(87) == '+') {
            temperature = Integer.parseInt(line.substring(88, 92));
        } else {
            temperature = Integer.parseInt(line.substring(87, 92));
        }
    }
}
```

```

    }

    String quality = line.substring(92, 93);

    if (temperature != 9999 && quality.matches("[01459]"))
        context.write(new Text(year), new IntWritable(temperature));
    }
}

```

AverageReducer

```

package temp;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class AverageReducer extends Reducer<Text, IntWritable, Text,
IntWritable> {

    public void reduce(Text key, Iterable<IntWritable> values,
Reducer<Text, IntWritable, Text, IntWritable>.Context context) throws
IOException, InterruptedException {

        int max_temp = 0;
        int count = 0;
        for (IntWritable value : values) {
            max_temp += value.get();
            count++;
        }
        context.write(key, new IntWritable(max_temp / count));
    }
}

```

}

```
C:\hadoop-3.3.0\sbin>hadoop jar C:\avgtemp.jar temp.AverageDriver /input_dir/temp.txt /avgtemp_outputdir
2021-05-15 14:52:50,635 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-15 14:52:51,005 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2021-05-15 14:52:51,111 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1621060230696_0005
2021-05-15 14:52:51,735 INFO input.FileInputFormat: Total input files to process : 1
2021-05-15 14:52:52,751 INFO mapreduce.JobSubmitter: number of splits: 1
2021-05-15 14:52:53,073 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1621060230696_0005
2021-05-15 14:52:53,073 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-15 14:52:53,237 INFO conf.Configuration: resource-types.xml not found
2021-05-15 14:52:53,238 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-15 14:52:53,312 INFO impl.YarnClientImpl: Submitted application application_1621060230696_0005
2021-05-15 14:52:53,352 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG329ESD:8088/proxy/application_1621060230696_0005/
2021-05-15 14:52:53,353 INFO mapreduce.Job: Running job: job_1621060230696_0005
2021-05-15 14:53:06,640 INFO mapreduce.Job: Job job_1621060230696_0005 running in uber mode : false
2021-05-15 14:53:06,643 INFO mapreduce.Job: map 0% reduce 0%
2021-05-15 14:53:12,758 INFO mapreduce.Job: map 100% reduce 0%
2021-05-15 14:53:19,860 INFO mapreduce.Job: map 100% reduce 100%
2021-05-15 14:53:25,967 INFO mapreduce.Job: Job job_1621060230696_0005 completed successfully
2021-05-15 14:53:26,096 INFO mapreduce.Job: Counters: 54
    File System Counters
        FILE: Number of bytes read=72210
        FILE: Number of bytes written=674341
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=894860
        HDFS: Number of bytes written=8
        HDFS: Number of read operations=8
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=2
        HDFS: Number of bytes read erasure-coded=0
    Job Counters
        Launched map tasks=1
        Launched reduce tasks=1
        Data-local map tasks=1
        Total time spent by all maps in occupied slots (ms)=3782
```

```
C:\hadoop-3.3.0\sbin>hdfs dfs -ls /avgtemp_outputdir
Found 2 items
-rw-r--r--  1 Anusree  supergroup          0 2021-05-15 14:53 /avgtemp_outputdir/_SUCCESS
-rw-r--r--  1 Anusree  supergroup          8 2021-05-15 14:53 /avgtemp_outputdir/part-r-00000

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /avgtemp_outputdir/part-r-00000
1901      46

C:\hadoop-3.3.0\sbin>
```

B. Mean max temp:

MeanMax

MeanMaxDriver.class

```
package meanmax;
```

```

import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class MeanMaxDriver {
    public static void main(String[] args) throws Exception {
        if (args.length != 2) {
            System.err.println("Please Enter the input and output
parameters");
            System.exit(-1);
        }
        Job job = new Job();
        job.setJarByClass(MeanMaxDriver.class);
        job.setJobName("Max temperature");
        FileInputFormat.addInputPath(job, new Path(args[0]));
        FileOutputFormat.setOutputPath(job, new Path(args[1]));
        job.setMapperClass(MeanMaxMapper.class);
        job.setReducerClass(MeanMaxReducer.class);
        job.setOutputKeyClass(Text.class);
        job.setOutputValueClass(IntWritable.class);
        System.exit(job.waitForCompletion(true) ? 0 : 1);
    }
}

```

MeanMaxMapper.class

```

package meanmax;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;

```

```

import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class MeanMaxMapper extends Mapper<LongWritable, Text, Text,
IntWritable> {
    public static final int MISSING = 9999;

    public void map(LongWritable key, Text value, Mapper<LongWritable,
Text, Text, IntWritable>.Context context) throws IOException,
InterruptedException {
        int temperature;
        String line = value.toString();
        String month = line.substring(19, 21);
        if (line.charAt(87) == '+') {
            temperature = Integer.parseInt(line.substring(88, 92));
        } else {
            temperature = Integer.parseInt(line.substring(87, 92));
        }
        String quality = line.substring(92, 93);
        if (temperature != 9999 && quality.matches("[01459]"))
            context.write(new Text(month), new IntWritable(temperature));
    }
}

```

MeanMaxReducer.class

```

package meanmax;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class MeanMaxReducer extends Reducer<Text, IntWritable, Text,
IntWritable> {

```

```
public void reduce(Text key, Iterable<IntWritable> values,
Reducer<Text, IntWritable, Text, IntWritable>.Context context) throws
IOException, InterruptedException {
    int max_temp = 0;
    int total_temp = 0;
    int count = 0;
    int days = 0;
    for (IntWritable value : values) {
        int temp = value.get();
        if (temp > max_temp)
            max_temp = temp;
        count++;
        if (count == 3) {
            total_temp += max_temp;
            max_temp = 0;
            count = 0;
            days++;
        }
    }
    context.write(key, new IntWritable(total_temp / days));
}
```

```
C:\hadoop-3.3.0\bin>hadoop jar C:\meanmax.jar meanmax.MeanMaxDriver /input_dir/temp.txt /meanmax_output
2021-05-21 20:28:05,250 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-21 20:28:06,662 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2021-05-21 20:28:06,916 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1621608943095_0001
2021-05-21 20:28:08,426 INFO input.FileInputFormat: Total input files to process : 1
2021-05-21 20:28:09,107 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-21 20:28:09,741 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1621608943095_0001
2021-05-21 20:28:09,741 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-21 20:28:10,029 INFO conf.Configuration: resource-types.xml not found
2021-05-21 20:28:10,038 INFO resource.ResourcesUtil: Unable to find 'resource-types.xml'.
2021-05-21 20:28:10,676 INFO impl.YarnClientImpl: Submitted application application_1621608943095_0001
2021-05-21 20:28:11,005 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG329E5D:8088/proxy/application_1621608943095_0001
2021-05-21 20:28:11,006 INFO mapreduce.Job: Running job: job_1621608943095_0001
2021-05-21 20:28:29,385 INFO mapreduce.Job: Job job_1621608943095_0001 running in uber mode : false
2021-05-21 20:28:29,389 INFO mapreduce.Job: map 0% reduce 0%
2021-05-21 20:28:40,664 INFO mapreduce.Job: map 100% reduce 0%
2021-05-21 20:28:50,832 INFO mapreduce.Job: map 100% reduce 100%
2021-05-21 20:28:58,965 INFO mapreduce.Job: Job job_1621608943095_0001 completed successfully
2021-05-21 20:28:59,178 INFO mapreduce.Job: Counters: 54
  File System Counters
    FILE: Number of bytes read=59082
    FILE: Number of bytes written=648891
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=894860
    HDFS: Number of bytes written=74
    HDFS: Number of read operations=8
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=2
    HDFS: Number of bytes read erasure-coded=0
  Job Counters
    Launched map tasks=1
    Launched reduce tasks=1
    Data-local map tasks=1
    Total time spent by all maps in occupied slots (ms)=8077
    Total time spent by all reduces in occupied slots (ms)=7511
    Total time spent by all map tasks (ms)=8077
    Total time spent by all reduce tasks (ms)=7511
    Total vcore-milliseconds taken by all map tasks=8077
    Total vcore-milliseconds taken by all reduce tasks=7511
    Total megabyte-milliseconds taken by all map tasks=8270848
    Total megabyte-milliseconds taken by all reduce tasks=7691264
```

```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /meanmax_output/*
01      4
02      0
03      7
04     44
05    100
06   168
07   219
08   198
09   141
10   100
11    19
12     3

C:\hadoop-3.3.0\sbin>
```

9. Hadoop Programs : Join

```
// JoinDriver.java

import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.*;
import org.apache.hadoop.mapred.lib.MultipleInputs;
import org.apache.hadoop.util.*;

public class JoinDriver extends Configured implements Tool {

    public static class KeyPartitioner implements Partitioner<TextPair, Text> {
        @Override
        public void configure(JobConf job) {}

        @Override
        public int getPartition(TextPair key, Text value, int numPartitions) {
            return (key.getFirst().hashCode() & Integer.MAX_VALUE) %
                numPartitions;
        }
    }

    @Override
    public int run(String[] args) throws Exception {
```

```
if (args.length != 3) {  
    System.out.println("Usage: <Department Emp Strength input>  
    <Department Name input> <output>");  
    return -1;  
}  
  
JobConf conf = new JobConf(getConf(), getClass());  
  
conf.setJobName("Join 'Department Emp Strength input' with 'Department Name  
input'");  
  
Path AInputPath = new Path(args[0]);  
Path BInputPath = new Path(args[1]);  
Path outputPath = new Path(args[2]);  
  
MultipleInputs.addInputPath(conf, AInputPath, TextInputFormat.class,  
    Posts.class);  
  
MultipleInputs.addInputPath(conf, BInputPath, TextInputFormat.class,  
    User.class);
```

```
FileOutputFormat.setOutputPath(conf, outputPath);

conf.setPartitionerClass(KeyPartitioner.class);

conf.setOutputValueGroupingComparator(TextPair.FirstComparator.class);

conf.setMapOutputKeyClass(TextPair.class);

conf.setReducerClass(JoinReducer.class);

conf.setOutputKeyClass(Text.class);

JobClient.runJob(conf);

return 0;
}

public static void main(String[] args) throws Exception {

int exitCode = ToolRunner.run(new JoinDriver(), args);

System.exit(exitCode);

}

// JoinReducer.java
```

```
import java.io.IOException;
import java.util.Iterator;

import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.*;

public class JoinReducer extends MapReduceBase implements Reducer<TextPair,
Text, Text,
Text> {

@Override
public void reduce (TextPair key, Iterator<Text> values, OutputCollector<Text, Text>
output, Reporter reporter)

throws IOException
{

Text nodeId = new Text(values.next());
while (values.hasNext()) {

Text node = values.next();
Text outValue = new Text(nodeId.toString() + "\t\t" + node.toString());
output.collect(key.getFirst(), outValue);
}
}
```

```
}
```

```
// User.java

import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.FSDataInputStream;
import org.apache.hadoop.fs.FSDataOutputStream;
import org.apache.hadoop.fs.FileSystem;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.*;

import org.apache.hadoop.io.IntWritable;

public class User extends MapReduceBase implements Mapper<LongWritable,
Text, TextPair,
Text> {

    @Override

    public void map(LongWritable key, Text value, OutputCollector<TextPair, Text>
output,
    Reporter reporter)
```

```
throws IOException

{

String valueString = value.toString();

String[] SingleNodeData = valueString.split("\t");

output.collect(new TextPair(SingleNodeData[0], "1"), new

Text(SingleNodeData[1]));

}

}

//Posts.java

import java.io.IOException;

import org.apache.hadoop.io.*;

import org.apache.hadoop.mapred.*;

public class Posts extends MapReduceBase implements Mapper<LongWritable,
Text, TextPair,
Text> {

@Override
```

```
public void map(LongWritable key, Text value, OutputCollector<TextPair, Text>
output,
Reporter reporter)
throws IOException
{
String valueString = value.toString();
String[] SingleNodeData = valueString.split("\t");
output.collect(new TextPair(SingleNodeData[3], "0"), new
Text(SingleNodeData[9]));
}
```

```
// TextPair.java
```

```
import java.io.*;
```

```
import org.apache.hadoop.io.*;
```

```
public class TextPair implements WritableComparable<TextPair> {
```

```
private Text first;
```

```
private Text second;
```

```
public TextPair() {
```

```
set(new Text(), new Text());
```

```
}
```

```
public TextPair(String first, String second) {  
    set(new Text(first), new Text(second));  
}
```

```
public TextPair(Text first, Text second) {  
    set(first, second);  
}
```

```
public void set(Text first, Text second) {  
    this.first = first;  
    this.second = second;  
}
```

```
public Text getFirst() {  
    return first;  
}
```

```
public Text getSecond() {  
    return second;  
}
```

```
@Override
```

```
public void write(DataOutput out) throws IOException {
```

```
first.write(out);
second.write(out);
}

@Override
public void readFields(DataInput in) throws IOException {
first.readFields(in);
second.readFields(in);
}
```

```
@Override
public int hashCode() {
return first.hashCode() * 163 + second.hashCode();
}
```

```
@Override
public boolean equals(Object o) {
if (o instanceof TextPair) {
TextPair tp = (TextPair) o;
return first.equals(tp.first) && second.equals(tp.second);
}
return false;
}
```

```
@Override
```

```
public String toString() {
    return first + "\t" + second;
}

@Override
public int compareTo(TextPair tp) {
    int cmp = first.compareTo(tp.first);
    if (cmp != 0) {
        return cmp;
    }
    return second.compareTo(tp.second);
}
// ^^ TextPair

// vv TextPairComparator
public static class Comparator extends WritableComparator {

    private static final Text.Comparator TEXT_COMPARATOR = new Text.Comparator();

    public Comparator() {
        super(TextPair.class);
    }

    @Override
    public int compare(byte[] b1, int s1, int l1,
```

```
byte[] b2, int s2, int l2) {  
  
    try {  
  
        int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1);  
        int firstL2 = WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2);  
        int cmp = TEXT_COMPARATOR.compare(b1, s1, firstL1, b2, s2, firstL2);  
        if (cmp != 0) {  
            return cmp;  
        }  
        return TEXT_COMPARATOR.compare(b1, s1 + firstL1, l1 - firstL1,  
            b2, s2 + firstL2, l2 - firstL2);  
    } catch (IOException e) {  
        throw new IllegalArgumentException(e);  
    }  
}  
  
}  
  
}  
  
static {  
    WritableComparator.define(TextPair.class, new Comparator());  
}  
public static class FirstComparator extends WritableComparator {  
  
    private static final Text.Comparator TEXT_COMPARATOR = new Text.Comparator();
```

```
public FirstComparator() {
    super(TextPair.class);
}

@Override
public int compare(byte[] b1, int s1, int l1,
byte[] b2, int s2, int l2) {

try {
    int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1);
    int firstL2 = WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2);
    return TEXT_COMPARATOR.compare(b1, s1, firstL1, b2, s2, firstL2);
} catch (IOException e) {
    throw new IllegalArgumentException(e);
}
}
```

```
@Override
public int compare(WritableComparable a, WritableComparable b) {
    if (a instanceof TextPair && b instanceof TextPair) {
        return ((TextPair) a).first.compareTo(((TextPair) b).first);
    }
    return super.compare(a, b);
}
}
```

```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /input_dir/sampleposts.tsv
"2312" "Feedback on Audio Quality" "cs101 production audio" "100005361" "<p>We are looking for feedback on the audio in our videos. Tell us what you think and try to be as <em>specific</em> as possible.</p>" "question" "\W" "\N" "2012-02-23 00:28:02.321344+00" "2" "" "\W" "201398145" "2014-01-14 17:18:35.613939+00" "2960" "\W" "\W" "524" "f"
"2014856" "" "cs101" "100022094" "<p>I also would like to know the answer to this question. An 'open exam' sounds great, but on the other hand it also seems pretty easy to cheat now: solutions have been posted and anybody only interested in a certificate wouldn't have much of a problem getting the highest distinction. So where is the catch??</p>" "answer" "2014706" "2014706"
"2012-07-01 10:32:36.302782+00" "0" "" "\W" "100022094" "2012-07-01 10:32:36.302782+00" "2020591" "\W" "\W" "0" "f"
"2004004" "" "cs101" "100018705" "<p>But then why even the new variable q? Why not just modify the variable p?</p>" "comment" "2003997" "2003993" "2012-05-03 21:07:5
2.028935+00" "2" "" "\W" "100018705" "2012-05-03 21:07:52.028935+00" "2005150" "\W" "\W" "0" "f"
```

```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /input_dir/sampleusers.tsv
"100006402" "18" "0" "0" "0"
"100022094" "634" "4" "12" "50"
"100018705" "76" "0" "3" "4"
"100005361" "36134" "73" "220" "333"
```

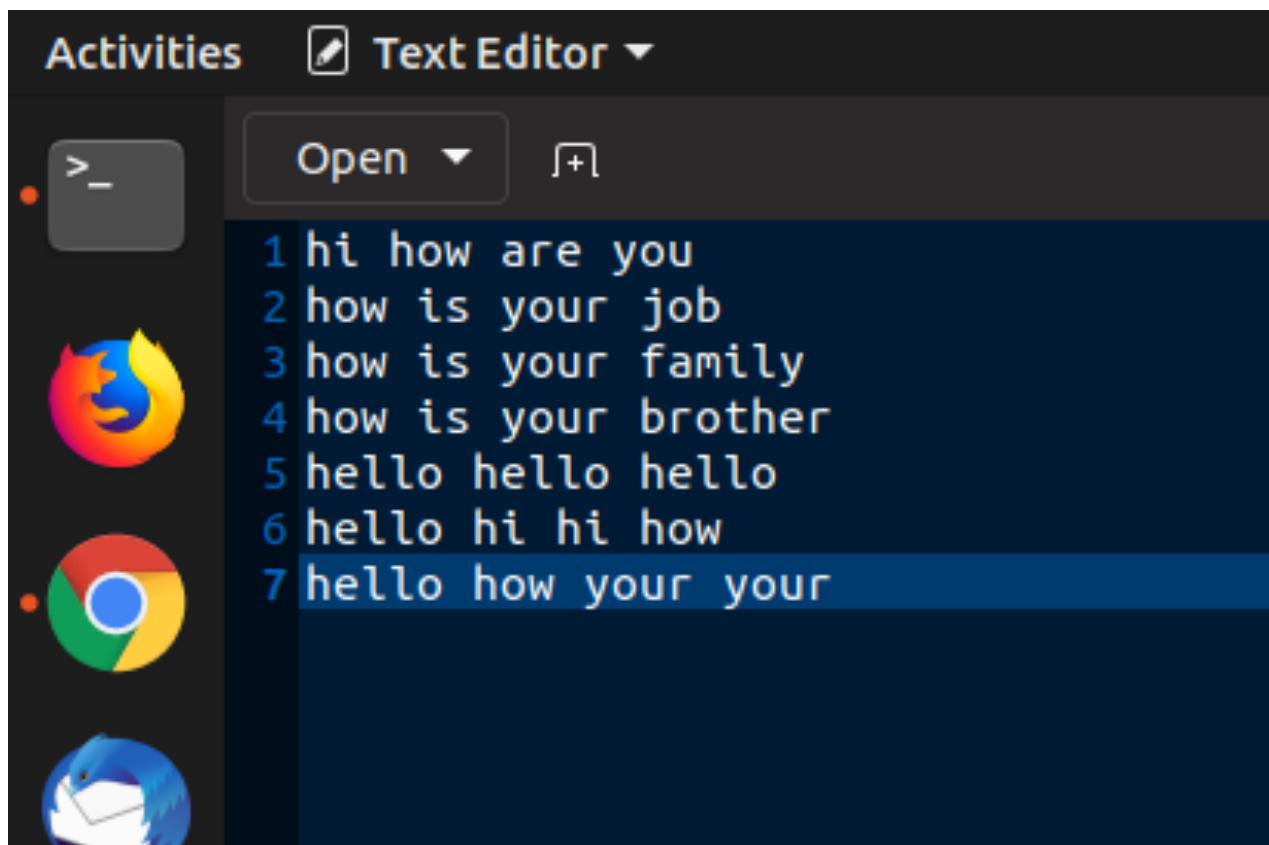
LAB8/Department_Employee_join_example/DeptName.txt

```
C:\hadoop-3.3.0\sbin>hdfs dfs -ls /join8_output/
Found 2 items
-rw-r--r-- 1 Anusree supergroup 0 2021-06-13 12:16 /join8_output/_SUCCESS
-rw-r--r-- 1 Anusree supergroup 71 2021-06-13 12:16 /join8_output/part-00000

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /join8_output/part-00000
"100005361" "2" "36134"
"100018705" "2" "76"
"100022094" "0" "634"
```

10. Scala Programs: Word Count and hello world

```
val data=sc.textFile("sparkdata.txt")
data.collect;
val splitdata = data.flatMap(line => line.split(" "));
splitdata.collect;
val mapdata = splitdata.map(word => (word,1));
mapdata.collect;
val reducedata = mapdata.reduceByKey(_+_);
reducedata.collect;
```



The screenshot shows a terminal window titled "Terminal" with the command "Jul 1 12:25" and the host "bmsce@bmsce-Precision-T1700:~". The terminal contains the following Scala code:

```
at org.apache.spark.rdd.RDD$anonfun$partitions2.apply(RDD.scala:273)
at org.apache.spark.rdd.RDD$anonfun$partitions2.apply(RDD.scala:269)
at scala.Option.getOrElse(Option.scala:121)
at org.apache.spark.rdd.RDD.partitions(RDD.scala:269)
at org.apache.spark.rdd.MapPartitionsRDD.getPartitions(MapPartitionsRDD.scala:49)
at org.apache.spark.rdd.RDD$anonfun$partitions2.apply(RDD.scala:273)
at org.apache.spark.rdd.RDD$anonfun$partitions2.apply(RDD.scala:269)
at scala.Option.getOrElse(Option.scala:121)
at org.apache.spark.rdd.RDD.partitions(RDD.scala:269)
at org.apache.spark.Partitioner$$anonfun$apply(Partitioner.scala:78)
at org.apache.spark.Partitioner$$anonfun$apply(Partitioner.scala:78)
at scala.collection.TraversableLike$$anonfun$map$1.apply(TraversableLike.scala:234)
at scala.collection.TraversableLike$$anonfun$map$1.apply(TraversableLike.scala:234)
at scala.collection.immutable.List.foreach(List.scala:392)
at scala.collection.TraversableLike$class.map(TraversableLike.scala:234)
at scala.collection.immutable.List.map(List.scala:296)
at org.apache.spark.Partitioner$.defaultPartitioner(Partitioner.scala:78)
at org.apache.spark.rdd.PairRDDFunctions$$anonfun$reduceByKey$3.apply(PairRDDFunctions.scala:326)
at org.apache.spark.rdd.PairRDDFunctions$$anonfun$reduceByKey$3.apply(PairRDDFunctions.scala:326)
at org.apache.spark.rdd.RDDOperationsScope$.withScope(RDDOperationsScope.scala:151)
at org.apache.spark.rdd.RDDOperationsScope$.withScope(RDDOperationsScope.scala:112)
at org.apache.spark.rdd.RDD.withScope(RDD.scala:385)
at org.apache.spark.rdd.PairRDDFunctions.reduceByKey(PairRDDFunctions.scala:325)
... 49 elided
```

scala> reducedata.collect;
<console>:24: error: not found: value reducedata
 reducedata.collect;
 ^

scala> val data=sc.textFile("/home/bmsce/Desktop/sample.txt")
data: org.apache.spark.rdd.RDD[String] = /home/bmsce/Desktop/sample.txt MapPartitionsRDD[5] at textFile at <console>:24

scala> data.collect;
res4: Array[String] = Array(ht how are you, how is your job, how is your family, how is your brother, hello hello hello, hello hi ht how, hello how your your)

scala> val splitdata = data.flatMap(line => line.split(" "));
splitdata: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[6] at flatMap at <console>:25

scala> splitdata.collect;
res5: Array[String] = Array(ht, how, are, you, how, is, your, job, how, is, your, family, how, is, your, brother, hello, hello, hello, hello, hello, hi, hi, how, hello, how, your, your)

scala> val mapdata = splitdata.map(word => (word,1));
mapdata: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[7] at map at <console>:25

scala> mapdata.collect;
res6: Array[(String, Int)] = Array((ht,1), (how,1), (are,1), (you,1), (how,1), (is,1), (your,1), (job,1), (how,1), (is,1), (your,1), (family,1), (how,1), (is,1), (your,1), (brother,1), (hello,1), (hello,1), (hello,1), (ht,1), (hi,1), (how,1), (hello,1), (how,1), (your,1), (your,1))

scala> val reducedata = mapdata.reduceByKey(_+_);
reducedata: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[8] at reduceByKey at <console>:25

scala> reducedata.collect;
res7: Array[(String, Int)] = Array((are,1), (brother,1), (is,3), (family,1), (how,6), (hello,5), (job,1), (you,1), (hi,3), (your,5))

scala> []

\$scala

scala> println("Hello World!");
Hello World!

11. Scala Programs: Word Count Greater Than 4

```
val textFile = sc.textFile("/home/admin/Desktop/wc.txt")
val counts = textFile.flatMap(line => line.split(" ")).map(word => (word, 1)).reduceByKey(_ + _)
import scala.collection.immutable.ListMap
val sorted=ListMap(counts.collect.sortWith(_._2 > _._2):_*)// sort in descending order based on
values
println(sorted)
for((k,v)<-sorted)
{
  if(v>4)
  {
    print(k+",")
    print(v)
    println()
  }
}
```

```
scala> val filerdd = sc.textFile("input.txt");
filerdd: org.apache.spark.rdd.RDD[String] = input.txt MapPartitionsRDD[13] at textFile at <console>:24

scala> val counts = filerdd.flatMap(line=>line.split(" ")).map(word=>(word,1)).reduceByKey(_+_);
counts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[16] at reduceByKey at <console>:24

scala> import scala.collection.immutable.ListMap
import scala.collection.immutable.ListMap

scala> val sorted = ListMap(counts.collect.sortWith(_.value > _.value): _*)
sorted: scala.collection.immutable.ListMap[String,Int] = ListMap(im -> 2, is -> 1, here -> 1, there -> 1
, better -> 1, khushil -> 1, lets -> 1, spark -> 1, run -> 1, hadoop -> 1, hi -> 1, to -> 1, see -> 1, w
hich -> 1, and -> 1)

scala> println(sorted);
ListMap(im -> 2, is -> 1, here -> 1, there -> 1, better -> 1, khushil -> 1, lets -> 1, spark -> 1, run -
> 1, hadoop -> 1, hi -> 1, to -> 1, see -> 1, which -> 1, and -> 1)

scala> for((k,v)<-sorted)
| {
| if(v>4)
| {
| print(k+",")
| print(v)
| println()
| }
| }

scala> for((k,v)<-sorted)
| {
| println(k+",")
| println(v)
| println()
| }
im,
2

is,
1

here,
1

there,
1

better,
1

khushil,
1

lets,
1

spark,
1
```