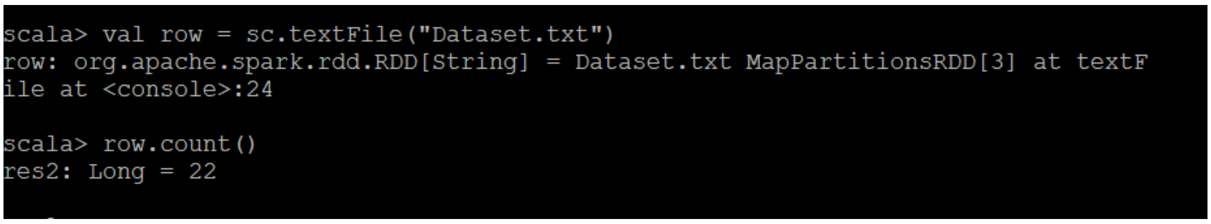
ASSIGNMENT

Task 1

1. Write a program to read a text file and print the number of rows of data in the document.

-> command used: val row = sc.textFile("Dataset.txt")

-> row.count()



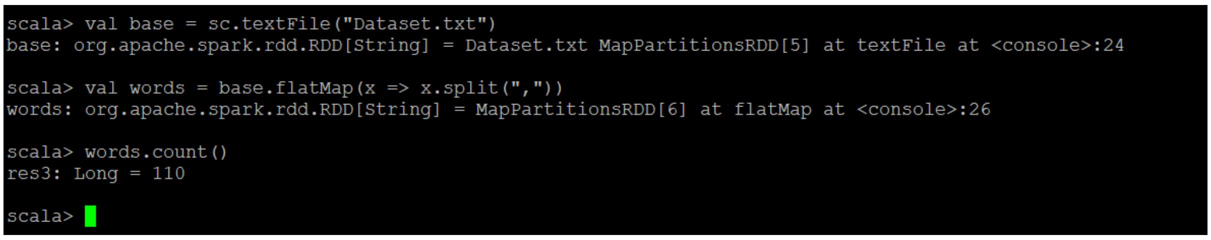
```
scala> val row = sc.textFile("Dataset.txt")
row: org.apache.spark.rdd.RDD[String] = Dataset.txt MapPartitionsRDD[3] at textF
ile at <console>:24

scala> row.count()
res2: Long = 22
```

2. Write a program to read a text file and print the number of words in the document.

-> val base = sc.textFile("Dataset.txt")

-> val words = base.flatMap(x => x.split(","))

-> words.count()



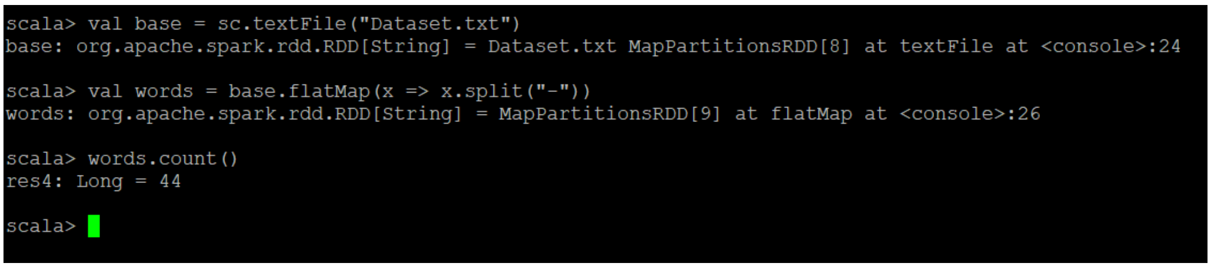
```
scala> val base = sc.textFile("Dataset.txt")
base: org.apache.spark.rdd.RDD[String] = Dataset.txt MapPartitionsRDD[5] at textFile at <console>:24

scala> val words = base.flatMap(x => x.split(","))
words: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[6] at flatMap at <console>:26

scala> words.count()
res3: Long = 110

scala>
```

3. We have a document where the word separator is -, instead of space. Write a spark code, to obtain the count of the total number of words present in the document.

-> val base = sc.textFile("Dataset.txt")

-> val words = base.flatMap(x => x.split("-"))

-> words.count()



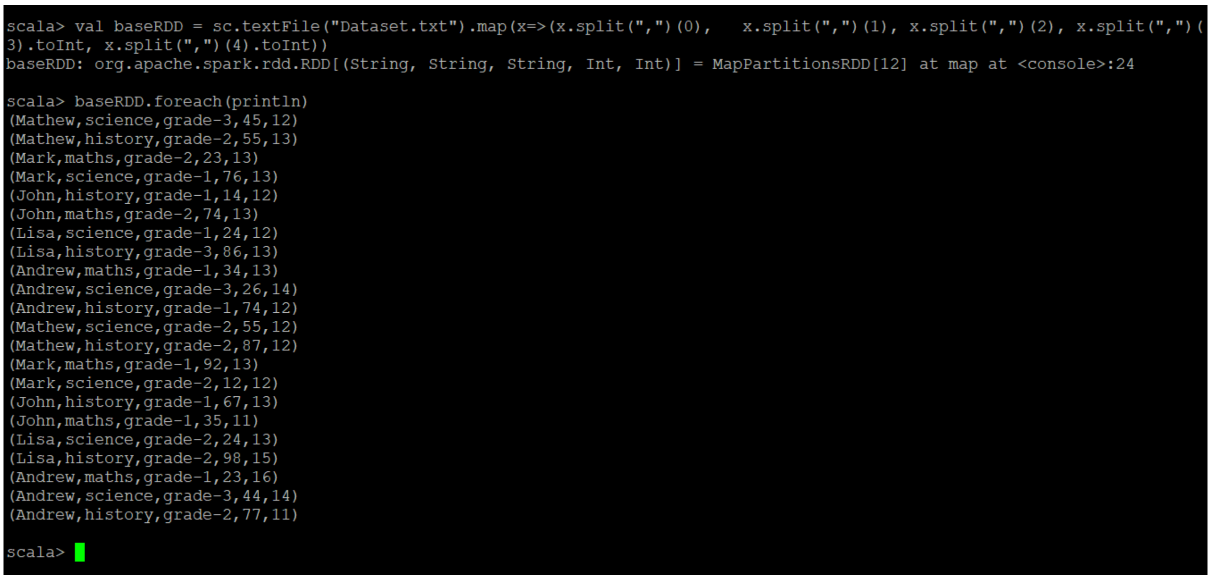
```
scala> val base = sc.textFile("Dataset.txt")
base: org.apache.spark.rdd.RDD[String] = Dataset.txt MapPartitionsRDD[8] at textFile at <console>:24

scala> val words = base.flatMap(x => x.split("-"))
words: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[9] at flatMap at <console>:26

scala> words.count()
res4: Long = 44

scala> 
```

Task 2

Problem Statement 1: 1. Read the text file, and create a tupled rdd.

-> val baseRDD = sc.textFile(“Dataset.txt”).map(x=>(x.split(“,”)(0), x.split(“,”)(1), x.split(“,”)(2), x.split(“,”)(3).toInt, x.split(“,”)(4).toInt))

-> baseRDD.foreach(println)

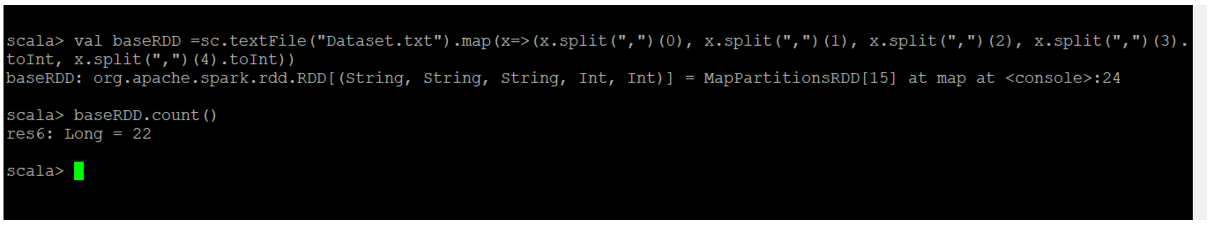


```
scala> val baseRDD = sc.textFile("Dataset.txt").map(x=>(x.split(",")(0),   x.split(",")(1), x.split(",")(2), x.split(",")(
3).toInt, x.split(",")(4).toInt))
baseRDD: org.apache.spark.rdd.RDD[(String, String, String, Int, Int)] = MapPartitionsRDD[12] at map at <console>:24

scala> baseRDD.foreach(println)
(Mathew,science,grade-3,45,12)
(Mathew,history,grade-2,55,13)
(Mark,maths,grade-2,23,13)
(Mark,science,grade-1,76,13)
(John,history,grade-1,14,12)
(John,maths,grade-2,74,13)
(Lisa,science,grade-1,24,12)
(Lisa,history,grade-3,86,13)
(Andrew,maths,grade-1,34,13)
(Andrew,science,grade-3,26,14)
(Andrew,history,grade-1,74,12)
(Mathew,science,grade-2,55,12)
(Mathew,history,grade-2,87,12)
(Mark,maths,grade-1,92,13)
(Mark,science,grade-2,12,12)
(John,history,grade-1,67,13)
(John,maths,grade-1,35,11)
(Lisa,science,grade-2,24,13)
(Lisa,history,grade-2,98,15)
(Andrew,maths,grade-1,23,16)
(Andrew,science,grade-3,44,14)
(Andrew,history,grade-2,77,11)

scala> 
```

2. Find the count of total number of rows present.

-> val baseRDD =sc.textFile(“Dataset.txt”).map(x=>(x.split(“,”)(0), x.split(“,”)(1), x.split(“,”)(2), x.split(“,”)(3).toInt, x.split(“,”)(4).toInt)))

-> baseRDD.count()



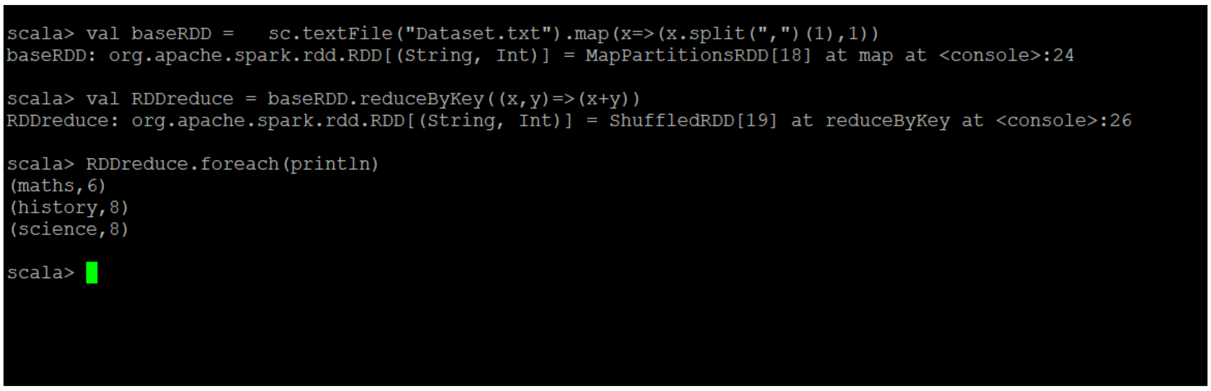
```
scala> val baseRDD =sc.textFile("Dataset.txt").map(x=>(x.split(",")(0), x.split(",")(1), x.split(",")(2), x.split(",")(3).
toInt, x.split(",")(4).toInt))
baseRDD: org.apache.spark.rdd.RDD[(String, String, String, Int, Int)] = MapPartitionsRDD[15] at map at <console>:24

scala> baseRDD.count()
res6: Long = 22

scala> 
```

3.What is the distinct number of subjects present in the entire school

-> val baseRDD = sc.textFile("Dataset.txt").map(x=>(x.split(",")(1),1))

-> val RDDreduce = baseRDD.reduceByKey((x,y)=>(x+y))

-> RDDreduce.foreach(println)



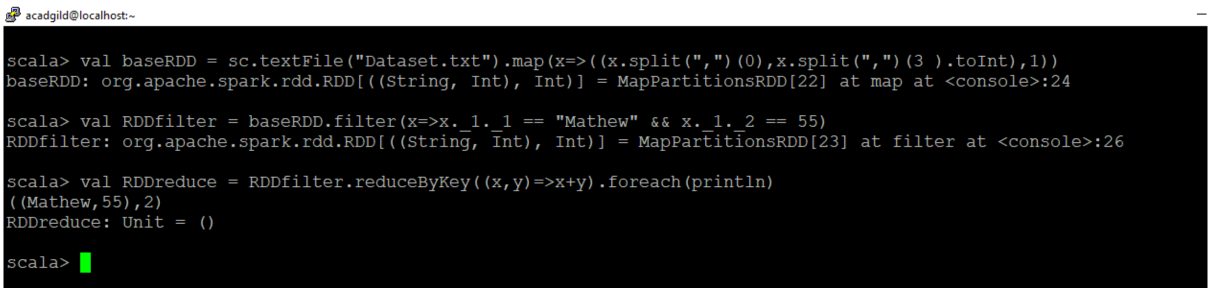
```
scala> val baseRDD =   sc.textFile("Dataset.txt").map(x=>(x.split(",")(1),1))
baseRDD: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[18] at map at <console>:24

scala> val RDDreduce = baseRDD.reduceByKey((x,y)=>(x+y))
RDDreduce: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[19] at reduceByKey at <console>:26

scala> RDDreduce.foreach(println)
(maths,6)
(history,8)
(science,8)

scala>
```

4. What is the count of the number of students in the school, whose name is Mathew and marks is 55

-> val baseRDD = sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split(",")(3).toInt),1))

-> val RDDfilter = baseRDD.filter(x=>x._1._1 == "Mathew" && x._1._2 == 55)

-> val RDDreduce = RDDfilter.reduceByKey((x,y)=>x+y).foreach(println)

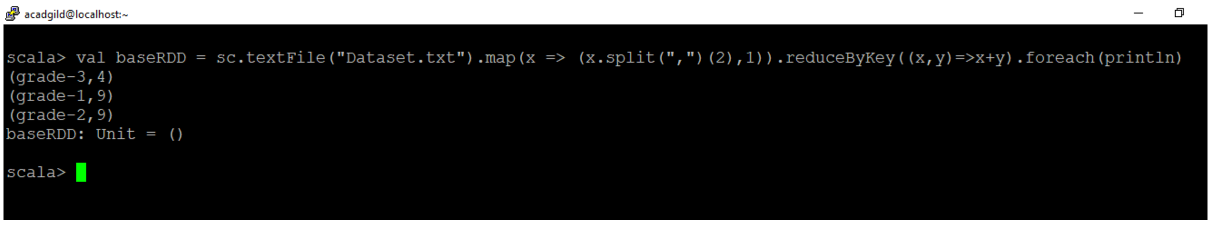


acadgild@localhost:~

```
scala> val baseRDD = sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split(",")(3 ).toInt),1))
baseRDD: org.apache.spark.rdd.RDD[((String, Int), Int)] = MapPartitionsRDD[22] at map at <console>:24

scala> val RDDfilter = baseRDD.filter(x=>x._1._1 == "Mathew" && x._1._2 == 55)
RDDfilter: org.apache.spark.rdd.RDD[((String, Int), Int)] = MapPartitionsRDD[23] at filter at <console>:26

scala> val RDDreduce = RDDfilter.reduceByKey((x,y)=>x+y).foreach(println)
((Mathew,55),2)
RDDreduce: Unit = ()

scala>
```

Problem Statement 2: 1. What is the count of students per grade in the school?

-> val baseRDD = sc.textFile("Dataset.txt ").map(x => (x.split(",")(2),1)).reduceByKey((x,y)=>x+y).foreach(println)



```
scala> val baseRDD = sc.textFile("Dataset.txt").map(x => (x.split(",")(2),1)).reduceByKey((x,y)=>x+y).foreach(println)
(grade-3,4)
(grade-1,9)
(grade-2,9)
baseRDD: Unit = ()

scala>
```

2. Find the average of each student (Note - Mathew is grade-1, is different from Mathew in some other grade!)

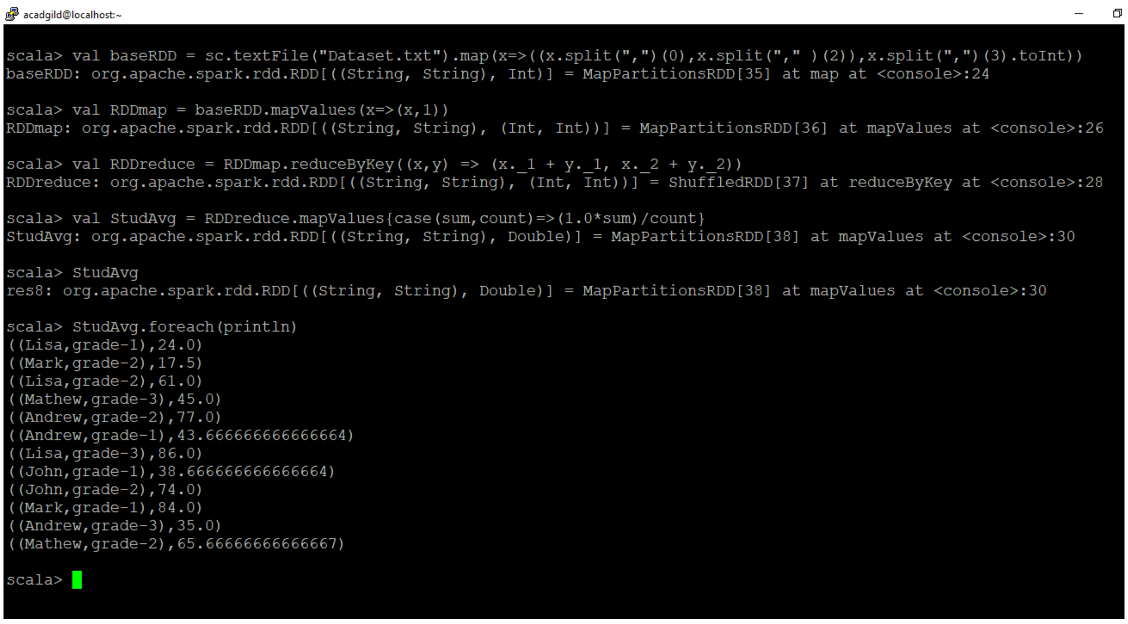
-> val baseRDD = sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split(",")(2)),x.split(",")(3).toInt))

-> val RDDmap = baseRDD.mapValues(x=>(x,1))

-> val RDDreduce = RDDmap.reduceByKey((x,y) => (x._1 + y._1, x._2 + y._2))

-> val StudAvg = RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}

-> StudAvg.foreach(println)



```
scala> val baseRDD = sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split("," )(2)),x.split(",")(3).toInt))
baseRDD: org.apache.spark.rdd.RDD[((String, String), Int)] = MapPartitionsRDD[35] at map at <console>:24

scala> val RDDmap = baseRDD.mapValues(x=>(x,1))
RDDmap: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = MapPartitionsRDD[36] at mapValues at <console>:26

scala> val RDDreduce = RDDmap.reduceByKey((x,y) => (x._1 + y._1, x._2 + y._2))
RDDreduce: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = ShuffledRDD[37] at reduceByKey at <console>:28

scala> val StudAvg = RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}
StudAvg: org.apache.spark.rdd.RDD[((String, String), Double)] = MapPartitionsRDD[38] at mapValues at <console>:30

scala> StudAvg
res8: org.apache.spark.rdd.RDD[((String, String), Double)] = MapPartitionsRDD[38] at mapValues at <console>:30

scala> StudAvg.foreach(println)
((Lisa,grade-1),24.0)
((Mark,grade-2),17.5)
((Lisa,grade-2),61.0)
((Mathew,grade-3),45.0)
((Andrew,grade-2),77.0)
((Andrew,grade-1),43.666666666666664)
((Lisa,grade-3),86.0)
((John,grade-1),38.666666666666664)
((John,grade-2),74.0)
((Mark,grade-1),84.0)
((Andrew,grade-3),35.0)
((Mathew,grade-2),65.66666666666667)

scala>
```

3. What is the average score of students in each subject across all grades?

-> val baseRDD =

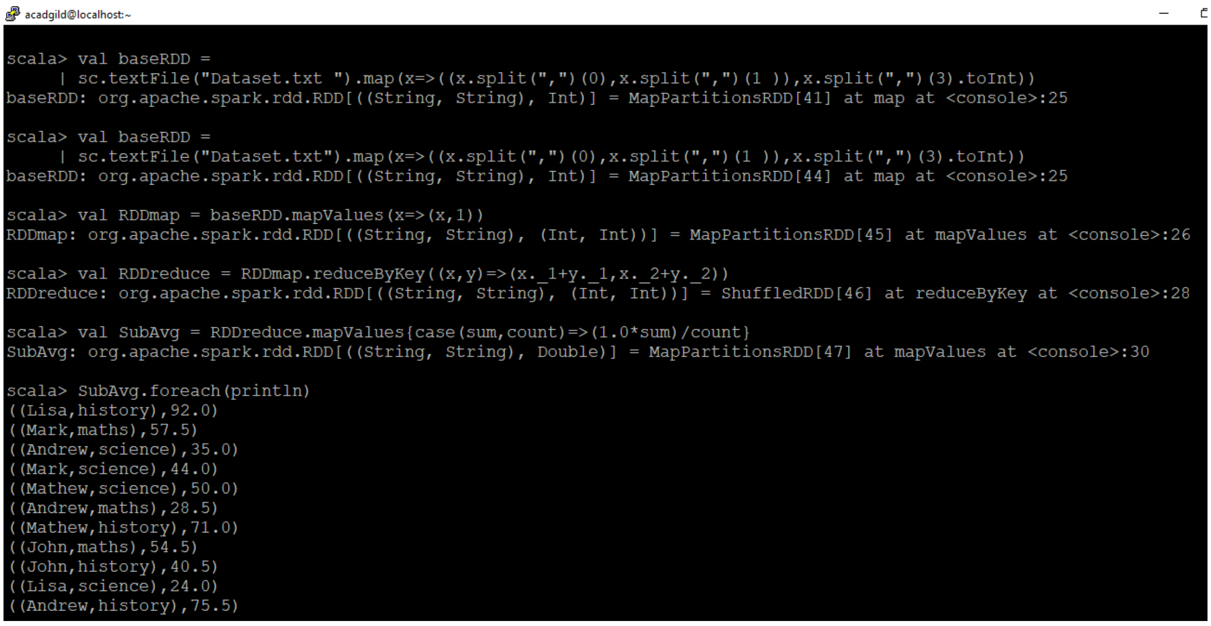
sc.textFile("Dataset.txt ").map(x=>((x.split(",")(0),x.split(",")(1
)),x.split(",")(3).toInt))

-> val RDDmap = baseRDD.mapValues(x=>(x,1))

-> val RDDreduce = RDDmap.reduceByKey((x,y)=>(x._1+y._1,x._2+y._2))

-> val SubAvg =
RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}

-> SubAvg.forach(println)


acadgild@localhost:~

```
scala> val baseRDD =
     | sc.textFile("Dataset.txt ").map(x=>((x.split(",")(0),x.split(",")(1 )),x.split(",")(3).toInt))
baseRDD: org.apache.spark.rdd.RDD[((String, String), Int)] = MapPartitionsRDD[41] at map at <console>:25

scala> val baseRDD =
     | sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split(",")(1 )),x.split(",")(3).toInt))
baseRDD: org.apache.spark.rdd.RDD[((String, String), Int)] = MapPartitionsRDD[44] at map at <console>:25

scala> val RDDmap = baseRDD.mapValues(x=>(x,1))
RDDmap: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = MapPartitionsRDD[45] at mapValues at <console>:26

scala> val RDDreduce = RDDmap.reduceByKey((x,y)=>(x._1+y._1,x._2+y._2))
RDDreduce: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = ShuffledRDD[46] at reduceByKey at <console>:28

scala> val SubAvg = RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}
SubAvg: org.apache.spark.rdd.RDD[((String, String), Double)] = MapPartitionsRDD[47] at mapValues at <console>:30

scala> SubAvg.foreach(println)
((Lisa,history),92.0)
((Mark,maths),57.5)
((Andrew,science),35.0)
((Mark,science),44.0)
((Mathew,science),50.0)
((Andrew,maths),28.5)
((Mathew,history),71.0)
((John,maths),54.5)
((John,history),40.5)
((Lisa,science),24.0)
((Andrew,history),75.5)
```

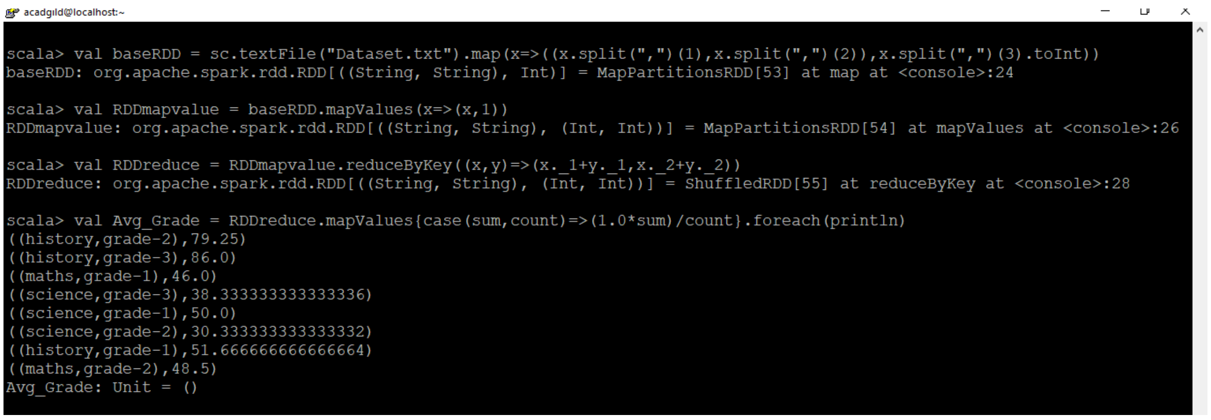
4. What is the average score of students in each subject per grade?

-> val baseRDD = sc.textFile("Dataset.txt").map(x=>((x.split(",")(1),x.split(",”
)(2)),x.split(",")(3).toInt))

-> val RDDmapvalue = baseRDD.mapValues(x=>(x,1))

-> val RDDreduce =
RDDmapvalue.reduceByKey((x,y)=>(x._1+y._1,x._2+y._2))

-> val Avg_Grade =
RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}.foreach(print ln)



```
scala> val baseRDD = sc.textFile("Dataset.txt").map(x=>((x.split(",")(1),x.split(",")(2)),x.split(",")(3).toInt))
baseRDD: org.apache.spark.rdd.RDD[((String, String), Int)] = MapPartitionsRDD[53] at map at <console>:24

scala> val RDDmapvalue = baseRDD.mapValues(x=>(x,1))
RDDmapvalue: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = MapPartitionsRDD[54] at mapValues at <console>:26

scala> val RDDreduce = RDDmapvalue.reduceByKey((x,y)=>(x._1+y._1,x._2+y._2))
RDDreduce: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = ShuffledRDD[55] at reduceByKey at <console>:28

scala> val Avg_Grade = RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}.foreach(println)
((history,grade-2),79.25)
((history,grade-3),86.0)
((maths,grade-1),46.0)
((science,grade-3),38.333333333333336)
((science,grade-1),50.0)
((science,grade-2),30.333333333333332)
((history,grade-1),51.666666666666664)
((maths,grade-2),48.5)
Avg_Grade: Unit = ()
```

5. For all students in grade-2, how many have average score greater than 50?

-> val baseRDD =

sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split(","
)(2)),x.split(",")(3).toInt))

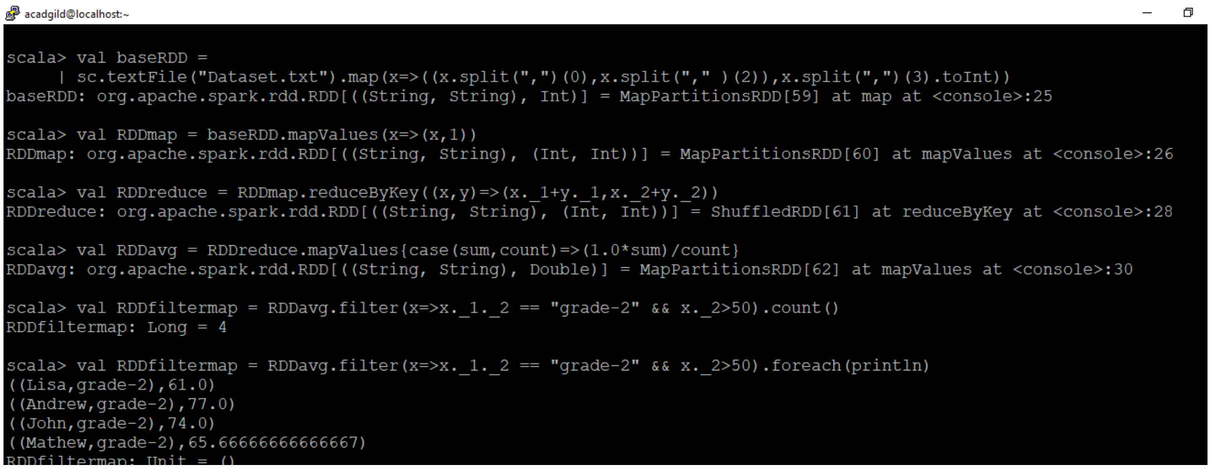
-> val RDDmap = baseRDD.mapValues(x=>(x,1))

-> val RDDreduce = RDDmap.reduceByKey((x,y)=>(x._1+y._1,x._2+y._2))

-> val RDDavg =
RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}

-> val RDDfiltermap = RDDavg.filter(x=>x._1._2 == "grade-2" &&
x._2>50).count()

-> val RDDfiltermap = RDDavg.filter(x=>x._1._2 == "grade-2" &&
x._2>50).foreach(println)



```
scala> val baseRDD =
     | sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split("," )(2)),x.split(",")(3).toInt))
baseRDD: org.apache.spark.rdd.RDD[((String, String), Int)] = MapPartitionsRDD[59] at map at <console>:25

scala> val RDDmap = baseRDD.mapValues(x=>(x,1))
RDDmap: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = MapPartitionsRDD[60] at mapValues at <console>:26

scala> val RDDreduce = RDDmap.reduceByKey((x,y)=>(x._1+y._1,x._2+y._2))
RDDreduce: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = ShuffledRDD[61] at reduceByKey at <console>:28

scala> val RDDavg = RDDreduce.mapValues{case(sum,count)=>(1.0*sum)/count}
RDDavg: org.apache.spark.rdd.RDD[((String, String), Double)] = MapPartitionsRDD[62] at mapValues at <console>:30

scala> val RDDfiltermap = RDDavg.filter(x=>x._1._2 == "grade-2" && x._2>50).count()
RDDfiltermap: Long = 4

scala> val RDDfiltermap = RDDavg.filter(x=>x._1._2 == "grade-2" && x._2>50).foreach(println)
((Lisa,grade-2),61.0)
((Andrew,grade-2),77.0)
((John,grade-2),74.0)
((Mathew,grade-2),65.66666666666667)
RDDfiltermap: Unit = ()
```

Problem Statement 3:

Are there any students in the college that satisfy the below criteria:

1. Average score per student_name across all grades is same as average score per student_name per grade

Hint - Use Intersection Property

We created a paired RDD named as baseRDD1 by extracting only name and marks

> val baseRDD1 =

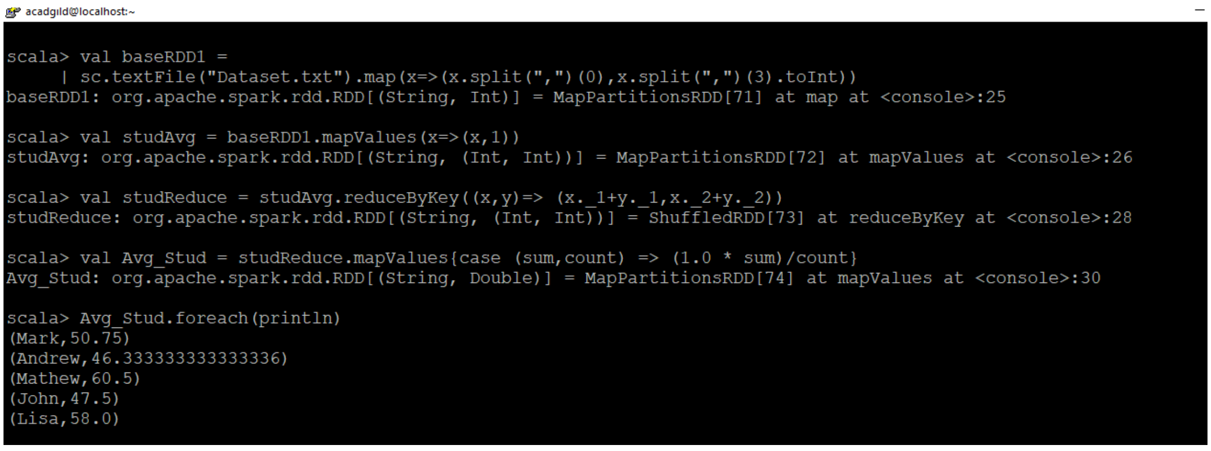
sc.textFile("Dataset.txt").map(x=>(x.split(",")(0),x.split(",") (3).toInt))

-> val studAvg = baseRDD1.mapValues(x=>(x,1))

-> val studReduce = studAvg.reduceByKey((x,y)=> (x._1+y._1,x._2+y._2))

-> val Avg_Stud = studReduce.mapValues{case (sum,count) => (1.0 * sum)/count}

-> Avg_Stud.foreach(println)


acadgild@localhost:~

```
scala> val baseRDD1 =
     | sc.textFile("Dataset.txt").map(x=>(x.split(",")(0),x.split(",")(3).toInt))
baseRDD1: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[71] at map at <console>:25

scala> val studAvg = baseRDD1.mapValues(x=>(x,1))
studAvg: org.apache.spark.rdd.RDD[(String, (Int, Int))] = MapPartitionsRDD[72] at mapValues at <console>:26

scala> val studReduce = studAvg.reduceByKey((x,y)=> (x._1+y._1,x._2+y._2))
studReduce: org.apache.spark.rdd.RDD[(String, (Int, Int))] = ShuffledRDD[73] at reduceByKey at <console>:28

scala> val Avg_Stud = studReduce.mapValues{case (sum,count) => (1.0 * sum)/count}
Avg_Stud: org.apache.spark.rdd.RDD[(String, Double)] = MapPartitionsRDD[74] at mapValues at <console>:30

scala> Avg_Stud.foreach(println)
(Mark,50.75)
(Andrew,46.333333333333336)
(Mathew,60.5)
(John,47.5)
(Lisa,58.0)
```

we are creating another paired RDD named as baseRDD2 by extracting name and grade as key and marks as value from the input file,

->val baseRDD2 =

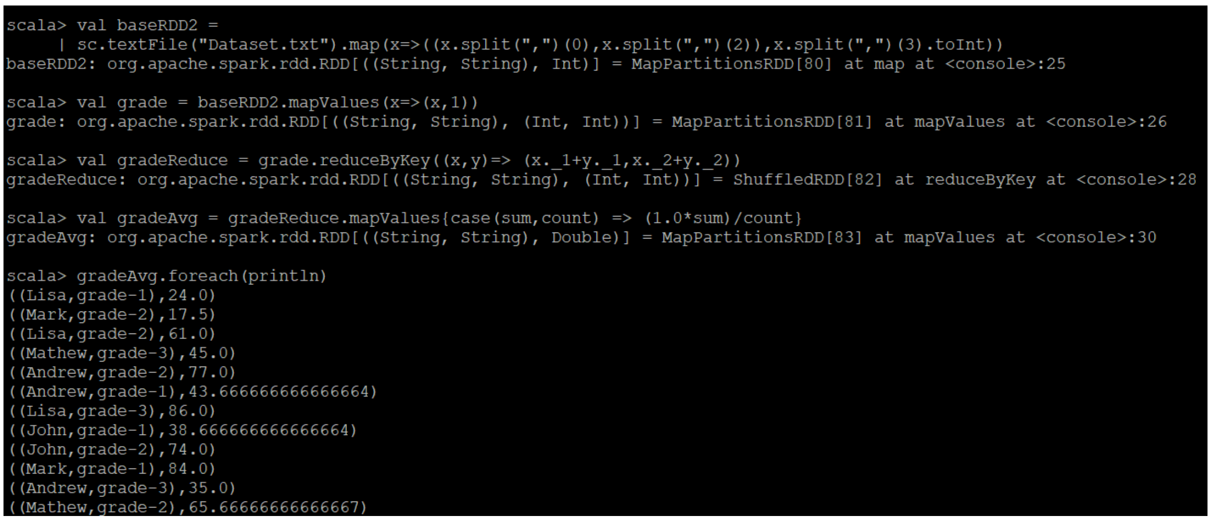
sc.textFile("Dataset.txt ").map(x=>((x.split(",")(0),x.split(","
)(2)),x.split(",")(3).toInt))

-> val grade = baseRDD2.mapValues(x=>(x,1))

-> val gradeReduce = grade.reduceByKey((x,y)=> (x._1+y._1,x._2+y._2))

-> val gradeAvg = gradeReduce.mapValues{case(sum,count) =>
(1.0*sum)/count}

-> gradeAvg.foreach(println)



```
scala> val baseRDD2 =
     | sc.textFile("Dataset.txt").map(x=>((x.split(",")(0),x.split(",")(2)),x.split(",")(3).toInt))
baseRDD2: org.apache.spark.rdd.RDD[((String, String), Int)] = MapPartitionsRDD[80] at map at <console>:25

scala> val grade = baseRDD2.mapValues(x=>(x,1))
grade: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = MapPartitionsRDD[81] at mapValues at <console>:26

scala> val gradeReduce = grade.reduceByKey((x,y)=> (x._1+y._1,x._2+y._2))
gradeReduce: org.apache.spark.rdd.RDD[((String, String), (Int, Int))] = ShuffledRDD[82] at reduceByKey at <console>:28

scala> val gradeAvg = gradeReduce.mapValues{case(sum,count) => (1.0*sum)/count}
gradeAvg: org.apache.spark.rdd.RDD[((String, String), Double)] = MapPartitionsRDD[83] at mapValues at <console>:30

scala> gradeAvg.foreach(println)
((Lisa,grade-1),24.0)
((Mark,grade-2),17.5)
((Lisa,grade-2),61.0)
((Mathew,grade-3),45.0)
((Andrew,grade-2),77.0)
((Andrew,grade-1),43.666666666666664)
((Lisa,grade-3),86.0)
((John,grade-1),38.666666666666664)
((John,grade-2),74.0)
((Mark,grade-1),84.0)
((Andrew,grade-3),35.0)
((Mathew,grade-2),65.66666666666667)
```

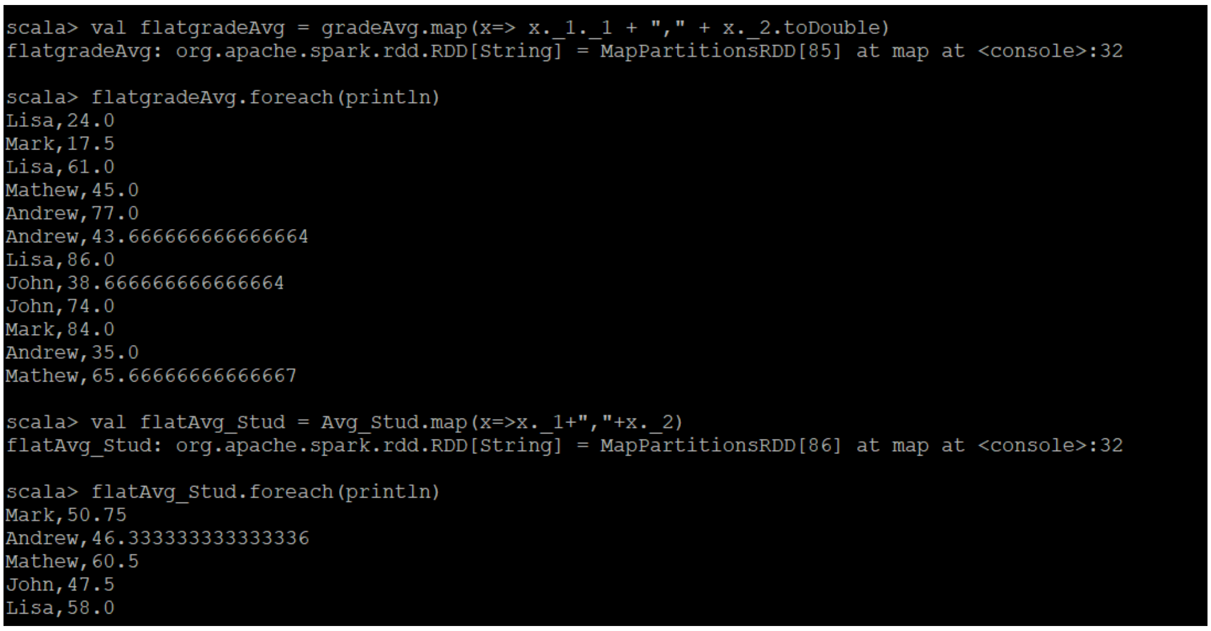
In below step we are using intersection function between flatgradeAvg and flatnameAvg rdd's to find whether any common student is there.

-> val flatgradeAvg = gradeAvg.map(x=> x._1._1 + "," + x._2.toDouble)

-> flatgradeAvg.foreach(println)

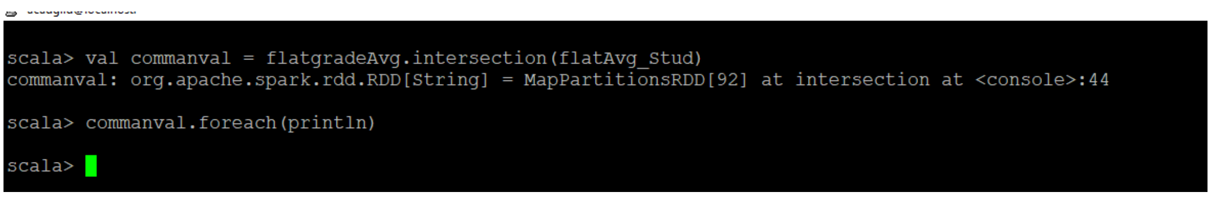
-> val flatAvg_Stud = Avg_Stud.map(x=>x._1+","+x._2)

-> flatAvg_Stud.foreach(println)


```
scala> val flatgradeAvg = gradeAvg.map(x=> x._1._1 + "," + x._2.toDouble)
flatgradeAvg: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[85] at map at <console>:32

scala> flatgradeAvg.foreach(println)
Lisa,24.0
Mark,17.5
Lisa,61.0
Mathew,45.0
Andrew,77.0
Andrew,43.666666666666664
Lisa,86.0
John,38.666666666666664
John,74.0
Mark,84.0
Andrew,35.0
Mathew,65.66666666666667

scala> val flatAvg_Stud = Avg_Stud.map(x=>x._1+","+x._2)
flatAvg_Stud: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[86] at map at <console>:32

scala> flatAvg_Stud.foreach(println)
Mark,50.75
Andrew,46.333333333333336
Mathew,60.5
John,47.5
Lisa,58.0
```

-> val commanval = flatgradeAvg.intersection(flatAvg_Stud)

-> commanval.foreach(println)


```
scala> val commanval = flatgradeAvg.intersection(flatAvg_Stud)
commanval: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[92] at intersection at <console>:44

scala> commanval.foreach(println)

scala>
```