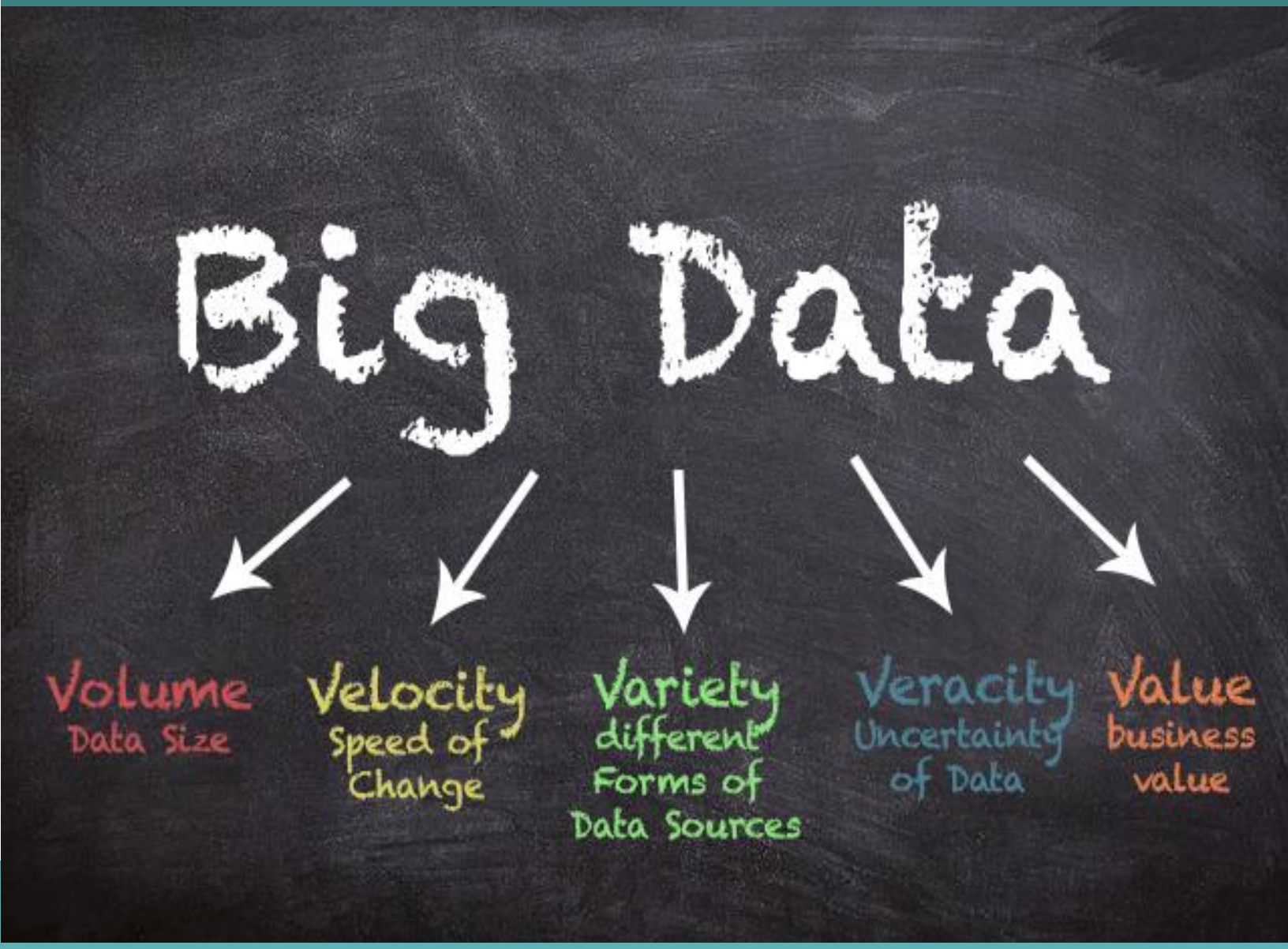
08/21/2018 | By: Ajit K Prasad



Big Data Engineering with Hadoop & Spark

Assignment on Scala Basics

Scala

APACHE Spark™

Acadgild

Session 16: Assignment 16.1

This assignment is aimed at consolidating the concepts that was learnt during the Scala Basics session of the course.

Problem Statement

Task 1:

Create a calculator to work with rational numbers.

Requirements:

- It should provide capability to add, subtract, divide and multiply rational numbers
- Create a method to compute GCD (this will come in handy during operations on rational)
- Add option to work with whole numbers which are also rational numbers i.e. (n/1)

Note:

- Achieve the above using auxiliary constructors
- Enable method overloading to enable each function to work with numbers and rational

Solution:

Code Explanation:

The class for the Calculator is made of two integral parts:

- The function to find the GCD of the number
  - This is possible as the number is divided into two parts, the numerator and denominator.
    Ex: Rational: 3/7 and Number: 4 or can be written as 4/1
  - Finding the GCD of the numbers and dividing the numbers with their GCD brings them down to their least multiple and makes it easier to perform the arithmetic calculations.
    Ex: 12/4 will become 3/1
- The Auxiliary constructor and the Overloaded Methods for rationales and intergers
  - The Auxiliary constructor helps with constructor overloading and directs the compiler on which method to execute from the list of overloaded methods.
- The Overloaded methods are of two types:
  - Methods for the rational operations (Add, Subtract, Multiply and Divide). These methods take an argument as that of the return of the class "***appRationalCalculator***" (i.e. a rational) and performs the necessary calculation

  - Methods for the number operations (Add, Subtract, Multiply and Divide). These methods take an integer value as argument and performs the necessary calculation
- Finally, there is an override for the ***"toString"*** method that returns the result of the numerator and denominator separated by a ***'/'*** making it a rational.
- To implement the functionalities of the ***appRationalCalc*** class, I have created an Object called ***appRatlCalc***. This object contains the below methods:
  - A method that holds the different calculation options for the Calculator that will be displayed to the user.
  - A method that processes the option chosen by the user and the input provided by the user and uses the match case to call the appropriate overloaded method from the class above and provide the input from the user to that overloaded method.
  - Finally, we have the driver function that calls the above methods and displays the results of these methods to the user.

Code for Scala Calculator:

```
class appRationalCalc (inp1: Int, inp2: Int) {

  require(inp2 != 0)
  var numerator = 0
  var denominator = 0

  /***Find GCD of input provided.
 This gives us numerator & denominator.***/
  private def findGCD(a:Int, b:Int): Int =
    if(b == 0) a
    else findGCD(b, a % b)

  if (inp2 != 0) {
    val getGCD = findGCD (inp1.abs, inp2.abs)
    numerator = inp1 / getGCD
    denominator = inp2 / getGCD
  }

  /***Auxiliary construct***/
  def this(n: Int) = this(n, 1)

  /***Addition operations on Rational and Whole Numbers***/
  def + (that: appRationalCalc): appRationalCalc =
    new appRationalCalc(numerator * that.denominator + that.numerator * denominator,
denominator * that.denominator)

  /***Method overloading for "+" in order to perform a addition***/
  def + (i: Int): appRationalCalc =
    new appRationalCalc(numerator + i * denominator, denominator)

  /***Subtraction operations on Rational and Whole Numbers***/
  def - (that: appRationalCalc): appRationalCalc =
    new appRationalCalc( numerator * that.denominator - that.numerator * denominator,
denominator * that.denominator)

  /***Method overloading for "-" in order to perform a subtraction***/
```

```
  def - (i: Int): appRationalCalc =
    new appRationalCalc(numerator - i * denominator, denominator)

  /***Multiplication operations on Rational and Whole Numbers***/
  def * (that: appRationalCalc): appRationalCalc =
    new appRationalCalc(numerator * that.numerator, denominator * that.denominator)

  /***Method overloading for "*" in order to perform a multiplication***/
  def * (i: Int): appRationalCalc =
    new appRationalCalc(numerator * i, denominator)

  /***Division operations on Rational and Whole Numbers***/
  def / (that: appRationalCalc): appRationalCalc =
    new appRationalCalc(numerator * that.denominator, denominator * that.numerator)

  /***Method overloading for "/" in order to perform a division***/
  def / (i: Int): appRationalCalc =
    new appRationalCalc(numerator, denominator * i)

  /***To display the output in the format "n/d"
 we have to override as we are overloading functions using auxiliary constructor***/
  override def toString = numerator + "/" + denominator
}

object appRatlCalc {

  /***Display list of operations that can be performed by the user***/
  private def OperationsList() = {

    println("Rational Calculator")
    println("____________________")

    println("Pick an operation to perform")
    println("1. Addition")
    println("2. Subtraction")
    println("3. Multiplication")
    println("4. Division")
    println("5. Add a Rational number with an Integer")
    println("6. Subtract a Rational number with an Integer")
    println("7. Multiply a Rational number with an Integer")
    println("8. Divide a Rational number with an Integer")
    println("9. Exit")
  }

  /***Get input and call appropriate overloaded method in class based on user's
choice***/
  def Compute(rational: appRationalCalc, number: Int): appRationalCalc = {

    number match {
    case  1  =>
    val n = scala.io.StdIn.readInt()
    val d = scala.io.StdIn.readInt()
    rational.+(new appRationalCalc(n, d))

    case  2  =>
    val n = scala.io.StdIn.readInt()
    val d = scala.io.StdIn.readInt()
    rational.-(new appRationalCalc(n, d))

    case  3  =>
    val n = scala.io.StdIn.readInt()
    val d = scala.io.StdIn.readInt()
    rational.*(new appRationalCalc(n, d))

    case  4  =>
    val n = scala.io.StdIn.readInt()
```

```
    val d = scala.io.StdIn.readInt()
    rational./(new appRationalCalc(n, d))

    case  5  =>
    val n = scala.io.StdIn.readInt()
    rational.+(new appRationalCalc(n))

    case  6  =>
    val n = scala.io.StdIn.readInt()
    rational.-(new appRationalCalc(n))

    case  7  =>
    val n = scala.io.StdIn.readInt()
    rational.*(new appRationalCalc(n))

    case  8  =>
    val n = scala.io.StdIn.readInt()
    rational./(new appRationalCalc(n))

    case  _  => rational
    }
  }

  /***Driver Method***/
  def main(args: Array[String]): Unit = {

    /***Create instance of class***/
    var ratlNumb: appRationalCalc = new appRationalCalc(0)

    var input = 0

    do {
      OperationsList()
      input = scala.io.StdIn.readInt()

      ratlNumb = Compute(ratlNumb, input)

      println("____________________")
      println("OUTPUT: " + ratlNumb.toString) /***Result of the Calculation***/
      println("____________________\n")
    }
    while (input != 9)
  }
}
```

Output:

1. Addition

```
Rational Calculator
____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
1
5
4

____________________
OUTPUT: 5/4
____________________
```

2. Subtraction

```
Rational Calculator
_____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
2
3
4

_____________________
OUTPUT: 1/2
_____________________
```

3. Multiplication

```
Rational Calculator
_____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
3
6
7

_____________________
OUTPUT: 3/7
_____________________
```

4. Division

```
Rational Calculator
_____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
4
23
47

_____________________
OUTPUT: 141/161
_____________________
```

5. **Add a Rational number with an Integer**

```
Rational Calculator
____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
5
7

____________________
OUTPUT: 1268/161
____________________
```

6. **Subtract a Rational number with an Integer**

```
Rational Calculator
____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
6
9

____________________
OUTPUT: -181/161
____________________
```

7. **Multiply a Rational number with an Integer**

```
Rational Calculator
____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
7
13

____________________
OUTPUT: -2353/161
____________________
```

8. **Divide a Rational number with an Integer**

```
Rational Calculator
____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
8
31

____________________
OUTPUT: -2353/4991
____________________
```

9. **Exit** (Also, returns final answer)

```
Rational Calculator
____________________
Pick an operation to perform
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Add a Rational number with an Integer
6. Subtarct a Rational number with an Integer
7. Multiply a Rational number with an Integer
8. Divide a Rational number with an Integer
9. Exit
9

____________________
OUTPUT: -2353/4991
____________________


Process finished with exit code 0
```

Note:

Scala code files for each application has been provided separately along with this assignment report.