ASSIGNMENT ON SCALA - 3

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)

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

EXPLANATION : CREATED A SIMPLE CALCULATOR TO PROCESS ON RATIONAL NUMBERS AND WHOLE NUMBER WITH RATIONAL NUMBERS. FIRST CREATED A CLASS CALLED "calculator" IN WHICH USED THE LOGIC OF GCD USED FOR REDUCING THE MAGNITUDE OF THE NUMERATOR AND DENOMINATOR OF THE RATIONAL NUMBER BY DIVIDING BOTH BY THEIR GREATEST COMMON DIVISOR(GCD). THEN CREATED METHODS FOR ADDITION, SUBSTRACTION, MULTIPLICATION AND DIVISON.

1) FOR ADDITION

CODE:

```
//METHOD FOR ADDING TWO RATIONAL NUMBERS

        def + (that: calculator): calculator =
      new calculator(
       numer * that.denom + that.numer * denom,
       denom * that.denom
      )
//METHOD FOR ADDING RATIONAL NUMBER WITH A WHOLE NUMBER

        def + (i: Int): calculator =
      new calculator(numer + i * denom, denom)
```

EXPLANATION : HERE "that" IS USED AS "this + that" FOR ADDING TWO NUMBERS. THIS METHOD WILL ENABLE TO DO ADD OPERATIONS ON TWO DIFFERENT RATIONAL NUMBERS AND SAME LOGIC IS APPLIED FOR THE WHOLE NUMBER OPERATION WITH "this + i)

2) FOR SUBTRACTION

CODE:

```
//METHOD FOR SUBTRACTING TWO RATIONAL NUMBERS
```

```
        def - (that: calculator): calculator =
      new calculator(
       numer * that.denom - that.numer * denom,
       denom * that.denom
      )
```

//METHOD FOR SUBTRACTING RATIONAL NUMBER WITH A WHOLE NUMBER

```
        def - (i: Int): calculator =
      new calculator(numer - i * denom, denom)
```

EXPLANATION : HERE "that" IS USED AS "this - that" FOR SUBTRACTING TWO NUMBERS. THIS METHOD WILL ENABLE TO DO SUBTRACT OPERATIONS ON TWO DIFFERENT RATIONAL NUMBERS AND SAME LOGIC IS APPLIED FOR THE WHOLE NUMBER OPERATION WITH "this - i)

3) FOR MULTIPLICATION

CODE:
//METHOD FOR MULTIPYING TWO RATIONAL NUMBER

```
         def * (that: calculator): calculator =
       new calculator(numer * that.numer, denom * that.denom)
```

//METHOD FOR MULTIPLYING NUMBER WITH A WHOLE NUMBER

```
         def * (i: Int): calculator =
       new calculator(numer * i, denom)
```

EXPLANATION : HERE "that" IS USED AS "this * that" FOR MULTIPLYING TWO NUMBERS. THIS METHOD WILL ENABLE TO DO MULTIPLYING OPERATIONS ON TWO DIFFERENT RATIONAL NUMBERS AND SAME LOGIC IS APPLIED FOR THE WHOLE NUMBER OPERATION WITH "this * i)

4) FOR DIVISON

CODE:
//METHOD FOR DIVIDING TWO RATIONAL NUMBERS

```
         def / (that: calculator): calculator =
       new calculator(numer * that.denom, denom * that.numer)
```

//METHOD FOR DIVIDING RATIONAL NUMBER WITH A WHOLE NUMBER

```
         def / (i: Int): calculator =
       new calculator(numer, denom * i)
```

EXPLANATION : HERE "that" IS USED AS "this / that" FOR DIVIDING TWO NUMBERS. THIS METHOD WILL ENABLE TO DO DIVIDE OPERATIONS ON TWO DIFFERENT RATIONAL NUMBERS AND SAME LOGIC IS APPLIED FOR THE WHOLE NUMBER OPERATION WITH "this / i)

CODE: override def toString = numer +"/"+ denom

EXPLANATION : THIS METHOD WILL CONVERT THE RATIONAL NUMBER INTO STRING IN THE FORM "NUMERATOR/DENOMINATOR"

SOLUTION REPORT:

```
package scala_assignment

class calculator (n: Int, d: Int) {

    require(d != 0) //Statement used for detecting any null value in
denominator

    private val g = gcd(n.abs, d.abs)
    val numer = n / g
    val denom = d / g

    def this(n: Int) = this(n, 1) //Auxillary Constructor

    def + (that: calculator): calculator =          //METHOD FOR ADDING
TWO RATIONAL NUMBERS
      new calculator(
        numer * that.denom + that.numer * denom,
        denom * that.denom
      )

//Method Overloading
    def + (i: Int): calculator =
      new calculator(numer + i * denom, denom)      //METHOD FOR ADDING
RATIONAL NUMBER WITH A WHOLE NUMBER

    def - (that: calculator): calculator =           //METHOD FOR
SUBTRACTING TWO RATIONAL NUMBERS
      new calculator(
        numer * that.denom - that.numer * denom,
        denom * that.denom
      )

//Method Overloading
    def - (i: Int): calculator =                     //METHOD FOR
SUBTRACTING RATIONAL NUMBER WITH A WHOLE NUMBER
      new calculator(numer - i * denom, denom)


    def * (that: calculator): calculator =           //METHOD FOR
MULTIPYING TWO RATIONAL NUMBERS
     new calculator(numer * that.numer, denom * that.denom)

//Method Overloading
    def * (i: Int): calculator =                     //METHOD FOR
MULTIPLYING NUMBER WITH A WHOLE NUMBER
```

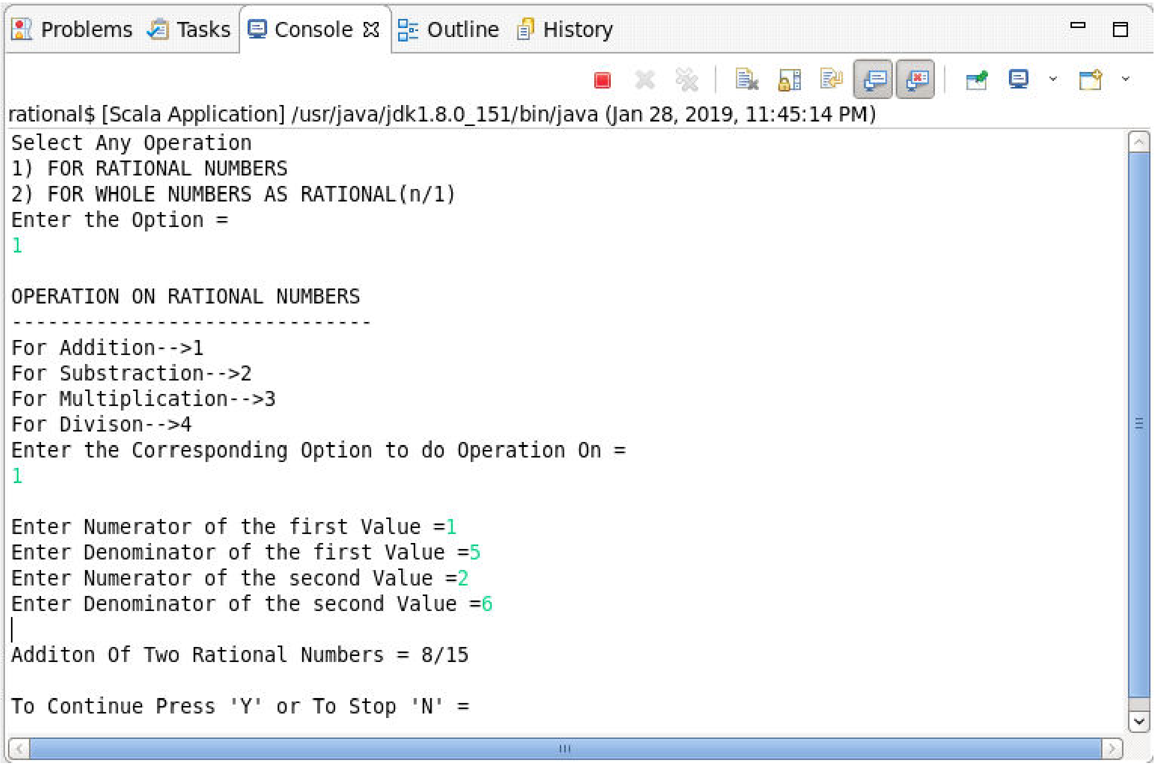
```
      new calculator(numer * i, denom)

    def / (that: calculator): calculator =           //METHOD FOR DIVIDING
TWO RATIONAL NUMBERS
      new calculator(numer * that.denom, denom * that.numer)


//Method Overloading
    def / (i: Int): calculator =                //METHOD FOR DIVIDING
RATIONAL NUMBER WITH A WHOLE NUMBER
      new calculator(numer, denom * i)

    override def toString = numer +"/"+ denom          //METHOD USED FOR
RETURNING OUTPUT AS FRACTIONS

    private def gcd(a: Int, b: Int): Int =
      if (b == 0) a else gcd(b, a % b)
}
object  rational {

  def main (args : Array[String])  {
  var continue = ""
  do
  {
    println("Select Any Operation\n1) FOR RATIONAL NUMBERS\n2) FOR WHOLE
NUMBERS AS RATIONAL(n/1)\nEnter the Option =")
    var value = scala.io.StdIn.readLine().toInt      //Gets the input from
the user and reads it as Integer

//if-else for choosing the Operation
    if(value == 1) // For choosing options
    {
      println("\nOPERATION ON RATIONAL NUMBERS")
      println("------------------------------")

      println("For Addition-->1\nFor Substraction-->2\nFor
Multiplication-->3\nFor Divison-->4\nEnter the Corresponding Option to do
Operation On =")
      var option: Int = scala.io.StdIn.readLine().toInt  //Gets the input
from the user and reads it as Integer

      printf("\nEnter Numerator of the first Value =")
      var nm = scala.io.StdIn.readLine().toInt           //Gets the input
from the user and reads it as Integer

      printf("Enter Denominator of the first Value =")
      var dn = scala.io.StdIn.readLine().toInt           //Gets the input
from the user and reads it as Integer

      var x = new calculator(nm,dn)  // Object to access the class methods

      printf("Enter Numerator of the second Value =")
      nm = scala.io.StdIn.readLine().toInt               //Gets the input
```

```
from the user and reads it as Integer

      printf("Enter Denominator of the second Value =")
      dn = scala.io.StdIn.readLine().toInt               //Gets the input
from the user and reads it as Integer

      var y = new calculator(nm,dn)                      //Object to
access the class methods


//if-else for choosing the Arithematic Operation
      if( option == 1)
      {   var ad = x + y
          println("\nAdditon Of Two Rational Numbers = "+ad)
      }
      else if ( option == 2)
      {   var sb = x - y
        println("\nSubstraction of Two Rational Numbers = "+sb)
      }
      else if ( option == 3)
      {
        var ml = x * y
        println("\nMultiplication of Two Rational Numbers = "+ml)
      }
      else if ( option == 4)
      {
        var dv = x / y
        println("\nDivison of Two Rational Numbers = "+dv)
      }
    }
    else if (value == 2)
    {

      println("\nOPERATION ON WHOLE NUMBERS")
      println("-------------------------")

      printf("\nEnter Numerator for the Rational Number =")
      var num = scala.io.StdIn.readLine().toInt  //Gets the input from
user and read it as Integer

      printf("Enter Denominator of the Rational Number =")
      var den = scala.io.StdIn.readLine().toInt  //Gets the input from
user and read it as Integer

      var z = new calculator(num,den) // Object to access the class methods

      println("Enter any value for doing arithematic operation with
rational numbers =")
      var numb = scala.io.StdIn.readLine().toInt  //Gets the input from
user and read it as Integer

      println("For Addition-->1\nFor Substraction-->2\nFor
Multiplication-->3\nFor Divison-->4\nEnter the Corresponding Option to do
Operation On =")
      var option: Int = scala.io.StdIn.readLine().toInt  //Gets the input
from user and read it as Integer

      if( option == 1)
      {   var ad = z + numb
          println("\nAdditon Of Two Rational Numbers = "+ad)
      }
      else if ( option == 2)
      {   var sb = z - numb
        println("\nSubstraction of Two Rational Numbers = "+sb)
      }
      else if ( option == 3)
      {
        var ml = z * numb
        println("\nMultiplication of Two Rational Numbers = "+ml)
      }
      else if ( option == 4)
      {
        var dv = z / numb
        println("\nDivison of Two Rational Numbers = "+dv)
      }
    }

//do-while loop Used for Continuation of the Process
    println("\nTo Continue Press 'Y' or To Stop 'N' = ")
    continue = scala.io.StdIn.readLine().toUpperCase()
  }

  while (continue.equals ("Y"))
 }
}
```

OUTPUT :

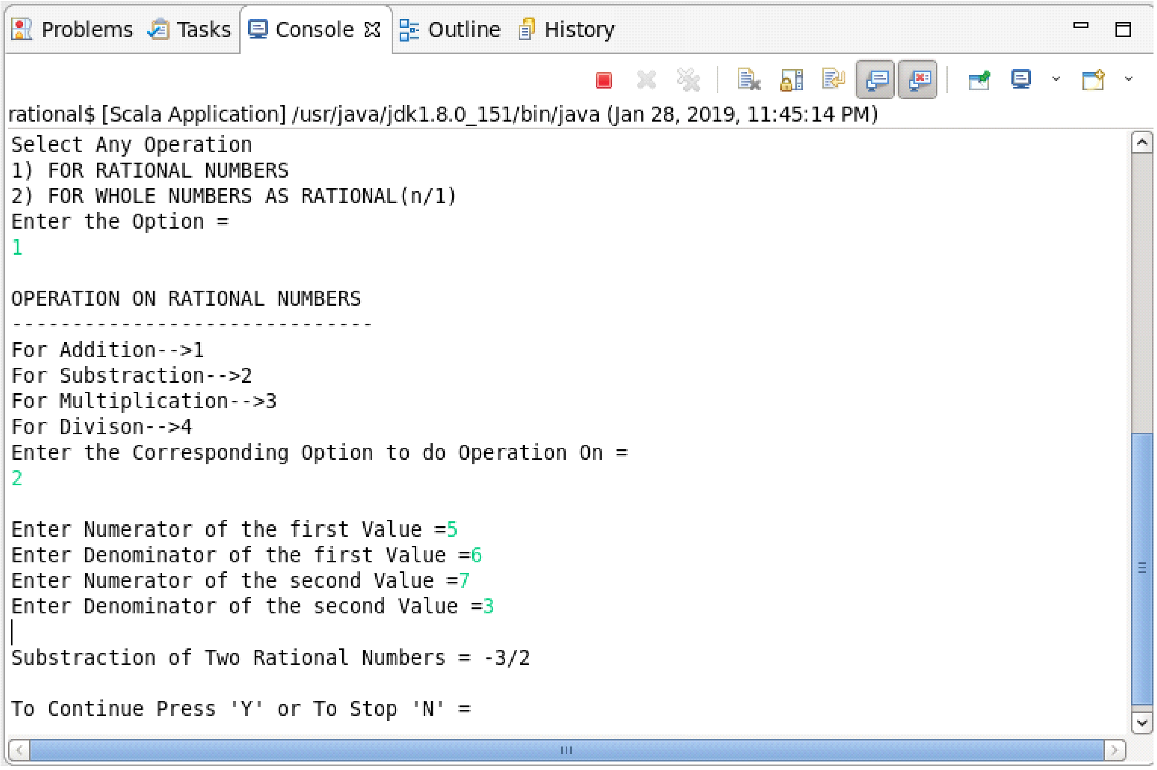
FOR RATIONAL NUMBERS

1) ADDITION OF TWO NUMBERS



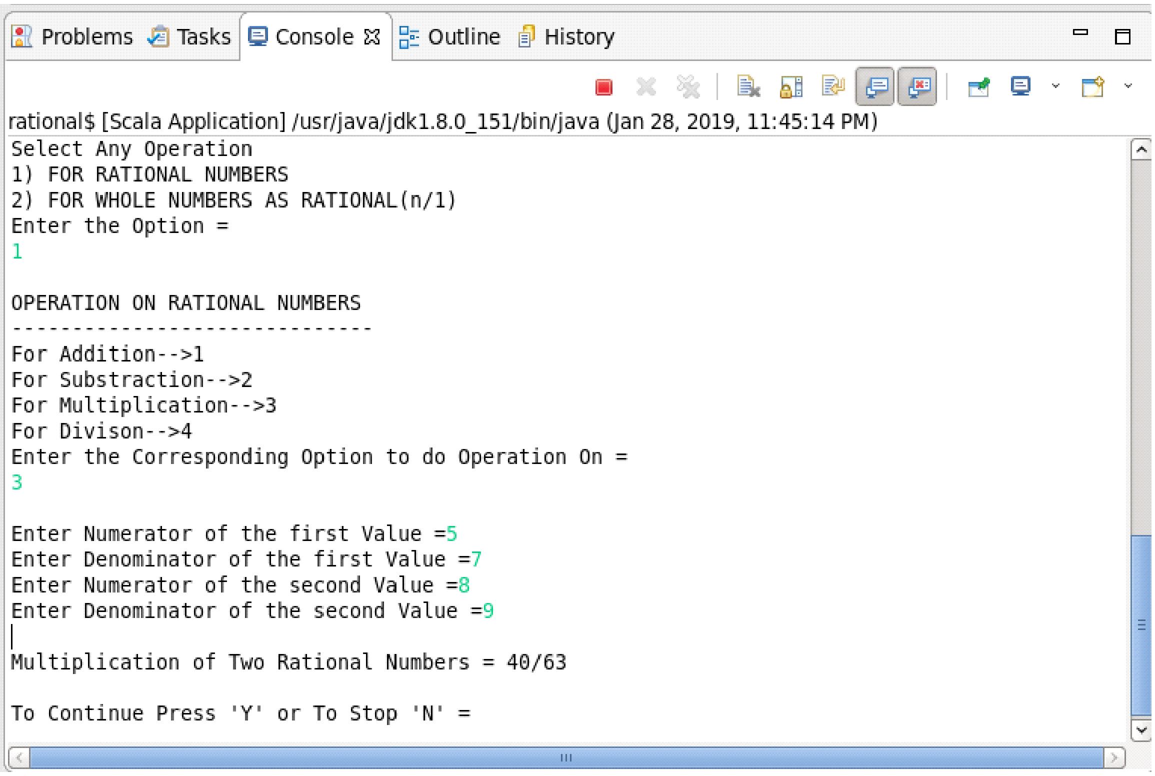
```
rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
1

OPERATION ON RATIONAL NUMBERS
------------------------------
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
1

Enter Numerator of the first Value =1
Enter Denominator of the first Value =5
Enter Numerator of the second Value =2
Enter Denominator of the second Value =6

Additon Of Two Rational Numbers = 8/15

To Continue Press 'Y' or To Stop 'N' =
```

2) SUBTRACTION OF TWO NUMBERS



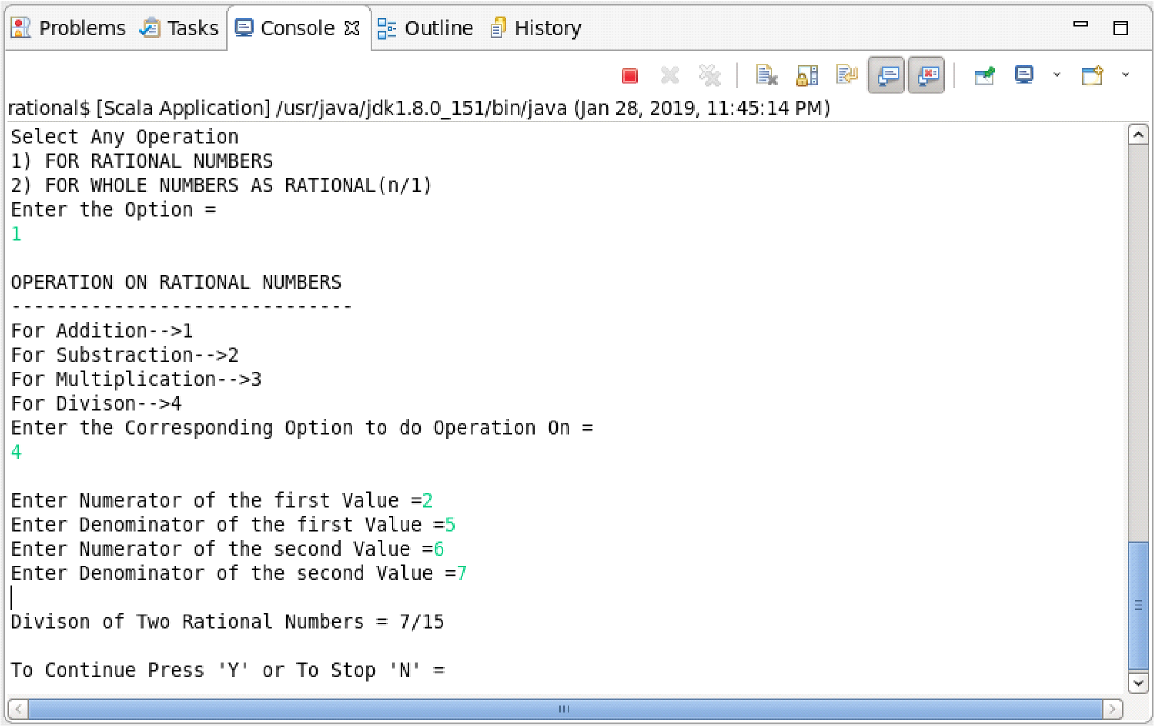
```
rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
1

OPERATION ON RATIONAL NUMBERS
------------------------------
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
2

Enter Numerator of the first Value =5
Enter Denominator of the first Value =6
Enter Numerator of the second Value =7
Enter Denominator of the second Value =3

Substraction of Two Rational Numbers = -3/2

To Continue Press 'Y' or To Stop 'N' =
```

3) MULTIPLICATION OF TWO NUMBERS



```
rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
1

OPERATION ON RATIONAL NUMBERS
------------------------------
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
3

Enter Numerator of the first Value =5
Enter Denominator of the first Value =7
Enter Numerator of the second Value =8
Enter Denominator of the second Value =9

Multiplication of Two Rational Numbers = 40/63

To Continue Press 'Y' or To Stop 'N' =
```

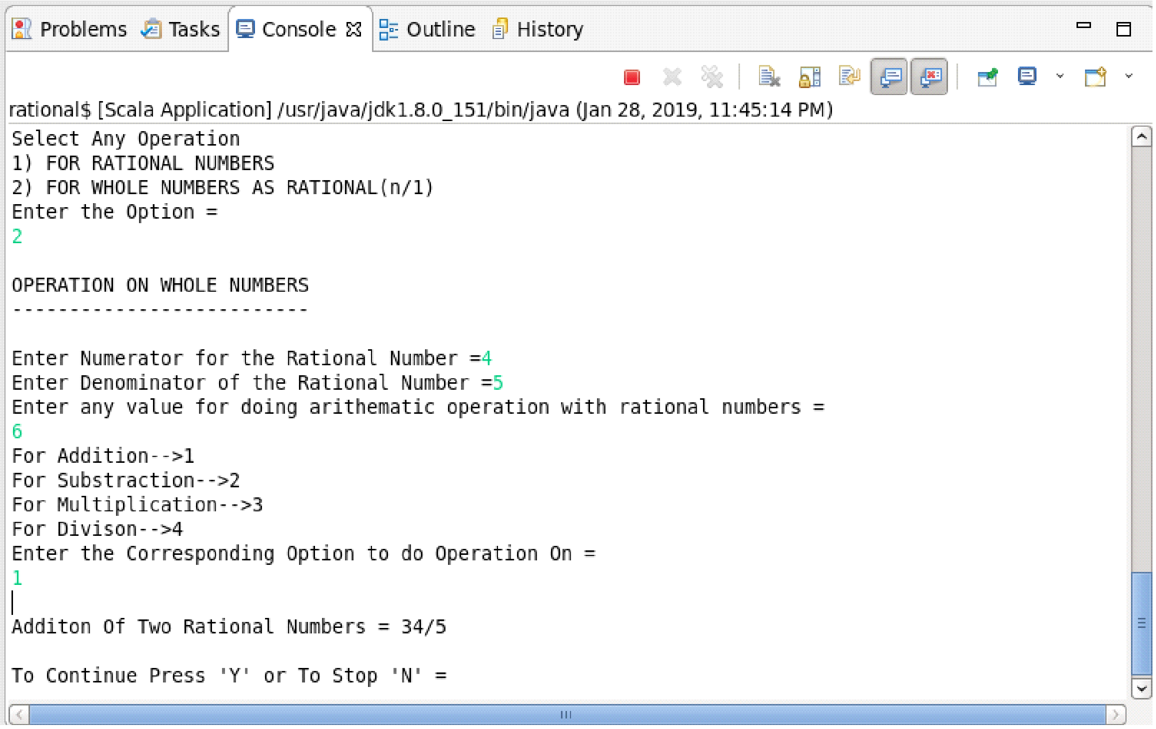
4) DIVISION OF TWO NUMBERS



```
rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
1

OPERATION ON RATIONAL NUMBERS
------------------------------
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
4

Enter Numerator of the first Value =2
Enter Denominator of the first Value =5
Enter Numerator of the second Value =6
Enter Denominator of the second Value =7

Divison of Two Rational Numbers = 7/15

To Continue Press 'Y' or To Stop 'N' =
```

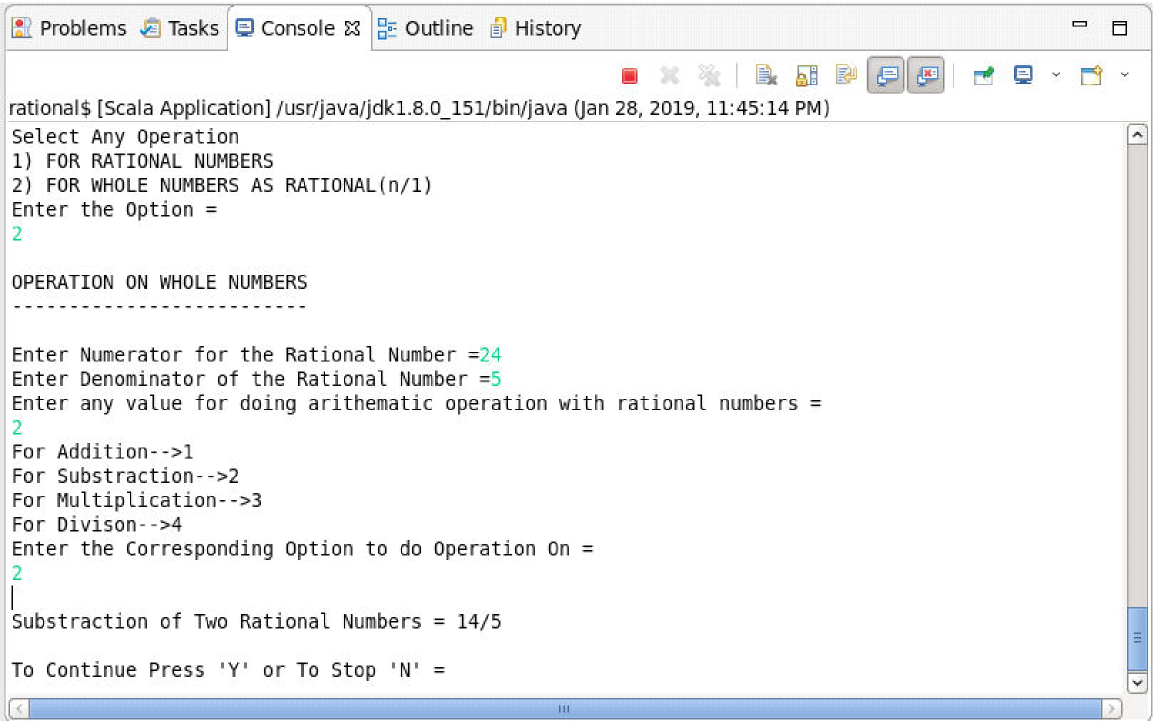
FOR WHOLE NUMBERS WITH RATIONAL NUMBER(n/1)

1) ADDITION OF TWO NUMBERS



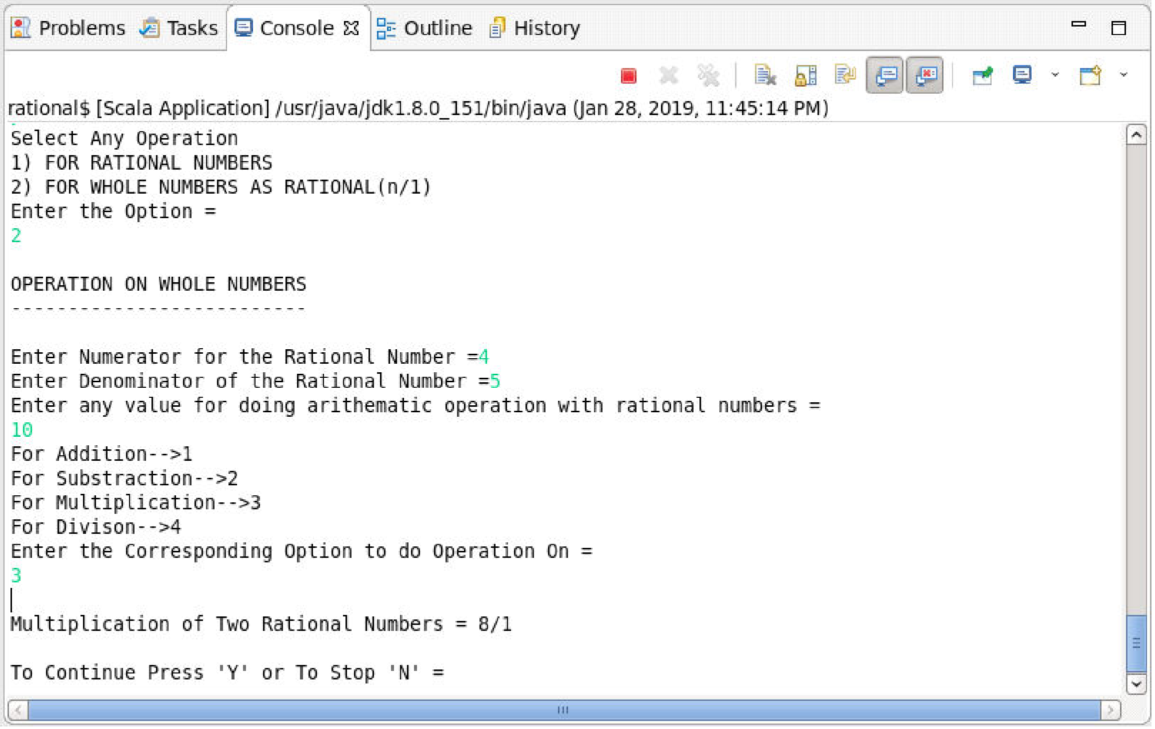
```
rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
2

OPERATION ON WHOLE NUMBERS
--------------------------

Enter Numerator for the Rational Number =4
Enter Denominator of the Rational Number =5
Enter any value for doing arithematic operation with rational numbers =
6
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
1

Additon Of Two Rational Numbers = 34/5

To Continue Press 'Y' or To Stop 'N' =
```

2) SUBTRACTION OF TWO NUMBERS



```
rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
2

OPERATION ON WHOLE NUMBERS
--------------------------

Enter Numerator for the Rational Number =24
Enter Denominator of the Rational Number =5
Enter any value for doing arithematic operation with rational numbers =
2
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
2

Substraction of Two Rational Numbers = 14/5

To Continue Press 'Y' or To Stop 'N' =
```

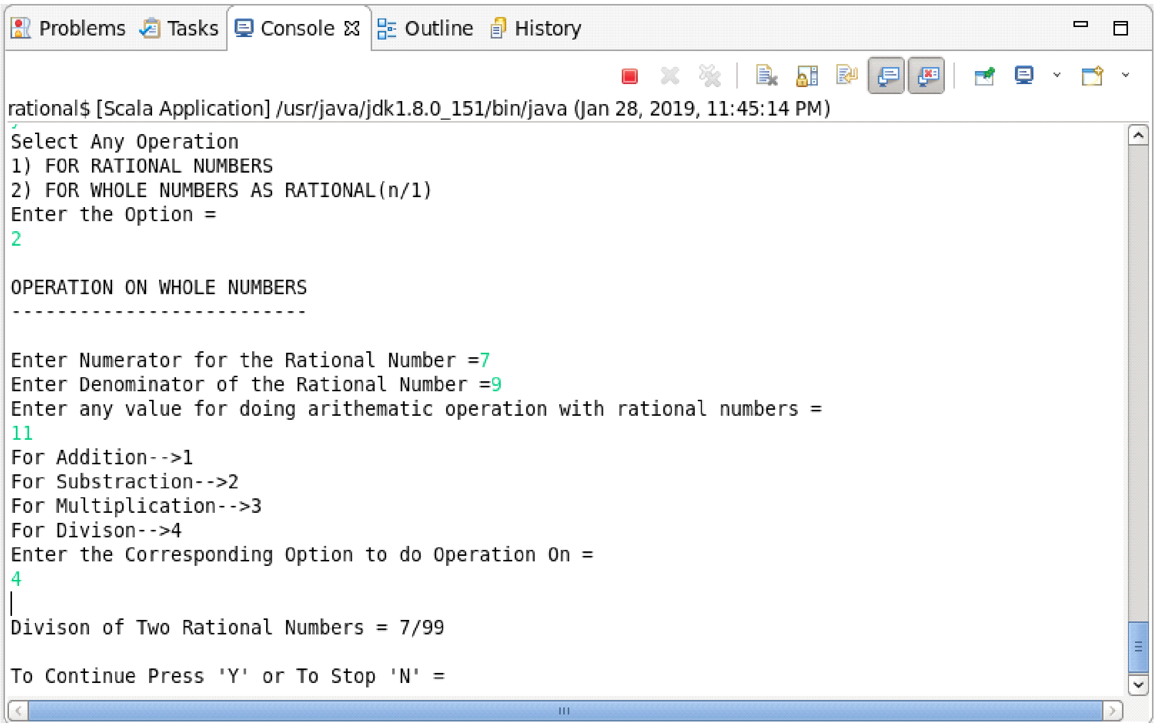
3) MULTIPLICATION OF TWO NUMBERS



rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)

```
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
2

OPERATION ON WHOLE NUMBERS
--------------------------

Enter Numerator for the Rational Number =4
Enter Denominator of the Rational Number =5
Enter any value for doing arithematic operation with rational numbers =
10
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
3

Multiplication of Two Rational Numbers = 8/1

To Continue Press 'Y' or To Stop 'N' =
```

4) DIVISION OF TWO NUMBERS



rational$ [Scala Application] /usr/java/jdk1.8.0_151/bin/java (Jan 28, 2019, 11:45:14 PM)

```
Select Any Operation
1) FOR RATIONAL NUMBERS
2) FOR WHOLE NUMBERS AS RATIONAL(n/1)
Enter the Option =
2

OPERATION ON WHOLE NUMBERS
--------------------------

Enter Numerator for the Rational Number =7
Enter Denominator of the Rational Number =9
Enter any value for doing arithematic operation with rational numbers =
11
For Addition-->1
For Substraction-->2
For Multiplication-->3
For Divison-->4
Enter the Corresponding Option to do Operation On =
4

Divison of Two Rational Numbers = 7/99

To Continue Press 'Y' or To Stop 'N' =
```