Session 16

Assignment 1 Questions

Problem Statement

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.

Program:-

```
class Rational(n: Int, d: Int) {

  require(d != 0)
  private val g = gcd(n.abs, d.abs)
```

```
val numer = n / g
val denom = d / g

def this(n: Int) = this(n, 1)

def + (that: Rational): Rational =
  new Rational(
    numer * that.denom + that.numer * denom,
    denom * that.denom
  )

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

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

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

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

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

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

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

override def toString = numer +"/"+ denom
```

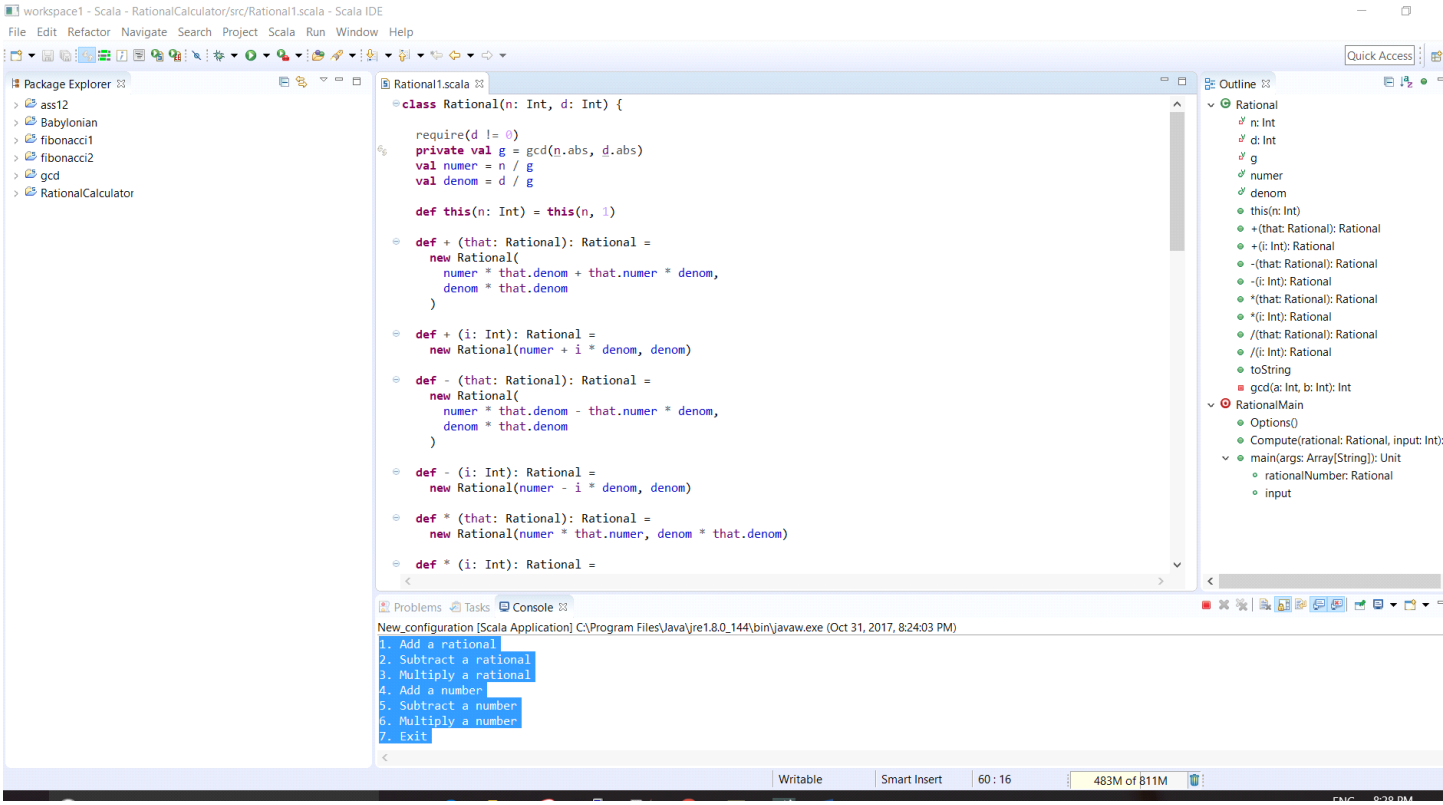
```
  private def gcd(a: Int, b: Int): Int =
    if (b == 0) a else gcd(b, a % b)
}

object RationalMain {
  def Options() = {
    println("1. Add a rational")
    println("2. Subtract a rational")
    println("3. Multiply a rational")
    println("4. Add a number")
    println("5. Subtract a number")
    println("6. Multiply a number")
    println("7. Exit")
  }

  def Compute(rational: Rational, input: Int): Rational = {

    input match {
      case 1 =>
        val p = scala.io.StdIn.readInt()
        val q = scala.io.StdIn.readInt()
        rational.+(new Rational(p, q))
      case 2 =>
        val p = scala.io.StdIn.readInt()
        val q = scala.io.StdIn.readInt()
        rational.-(new Rational(p, q))
      case 3 =>
        val p = scala.io.StdIn.readInt()
        val q = scala.io.StdIn.readInt()
        rational.*(new Rational(p, q))
      case 4 =>
        val p = scala.io.StdIn.readInt()
        rational.+(new Rational(p))
      case 5 =>
        val p = scala.io.StdIn.readInt()
        rational.-(new Rational(p))
      case 6 =>
```

```
      val p = scala.io.StdIn.readInt()
      rational.*(new Rational(p))
    case _ =>
      rational
  }
 }

 def main(args: Array[String]): Unit = {

  var rationalNumber: Rational = new Rational(0)


  var input = 1
  do {
   Options()
   input = scala.io.StdIn.readInt()
   rationalNumber = Compute(rationalNumber, input)
   println("Output is : " + rationalNumber.toString)
  } while (input != 7)
 }
}
```

Output: -

1. Add a rational
2. Subtract a rational
3. Multiply a rational
4. Add a number
5. Subtract a number
6. Multiply a number
7. Exit

Screenshot: -


workspace1 - Scala - RationalCalculator/src/Rational1.scala - Scala IDE
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input
Problems Tasks Console
New_configuration [Scala Application] C:\Program Files\Java\jre1.8.0_144\bin\javaw.exe (Oct 31, 2017, 8:24:03 PM)
1. Add a rational
2. Subtract a rational
3. Multiply a rational
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5. Subtract a number
6. Multiply a number
7. Exit
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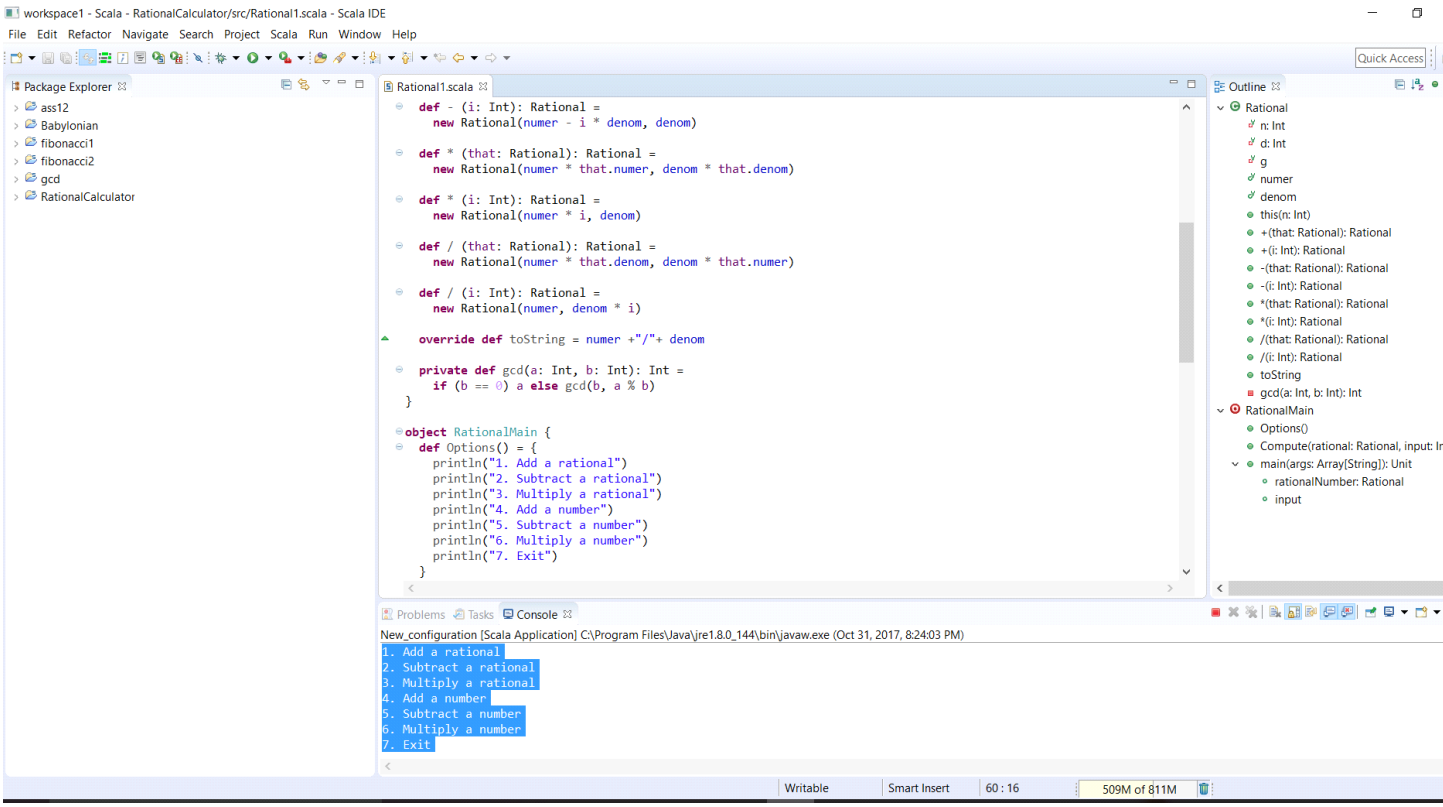
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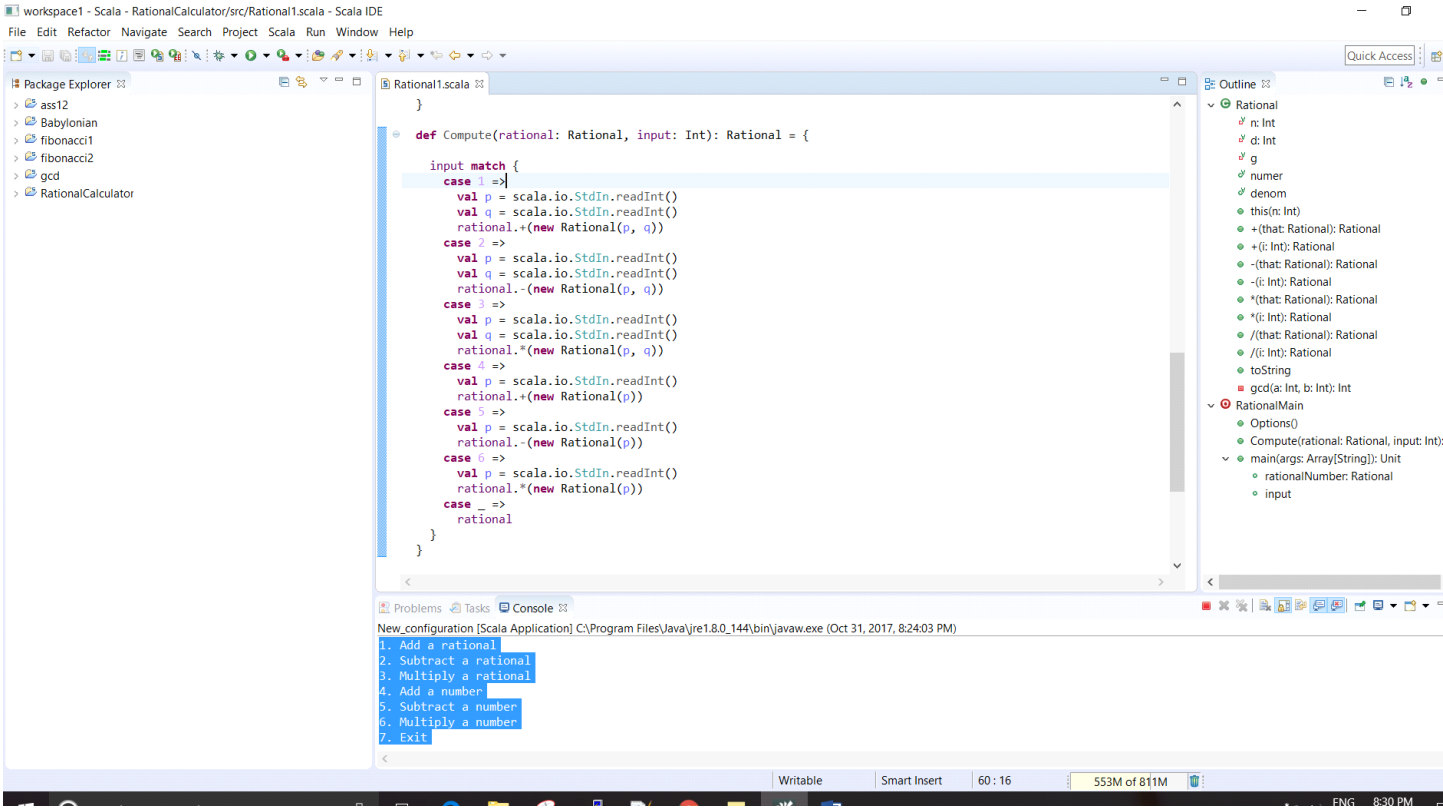
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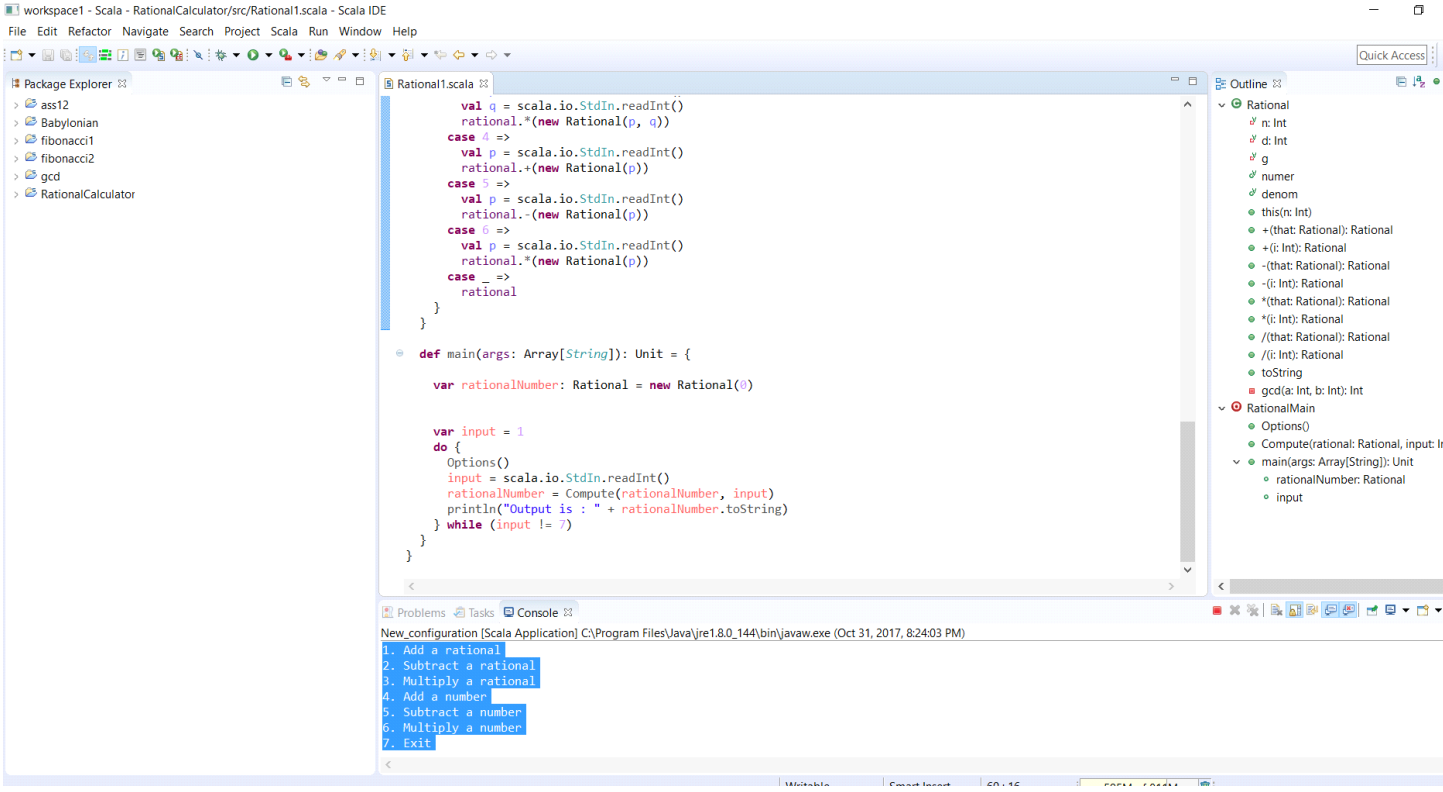
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