Java2 - JavaFX Document

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Total = 6.5h

Exercise

Exercise1.

The root() subroutine must be called in a try...catch statement as below

```
try {
   solution = root(A,B,C);
   System.out.println("A solution of the equation is " + solution);
}
catch (IllegalArgumentException e) {
   System.out.println("Sorry, I can't find a solution.");
   System.out.println(e.getMessage());
}
```

And get the input to compute

```
static public double root( double A, double B, double C )
                                 throws IllegalArgumentException {
    if (A == 0) {
        throw new IllegalArgumentException("A can't be zero.");
    }
    else {
        double disc = B*B - 4*A*C;
        if (disc < 0)
            throw new IllegalArgumentException("Discriminant < zero.");
        return  (-B + Math.sqrt(disc)) / (2*A);
    }
}
```

```
Run: Quadratic
/Library/Java/JavaVirtualMachines/jdk1.8.0_131.jdk/Contents/Home/bin/java ...
This program will print a solution of an equation
of the form A*X*X + B*X + C = 0, where A, B, and
C are values that you enter.

Enter values for A, B, and C:
A = 2
B = 3
C = 5

Sorry, I can't find a solution.
Discriminant < zero.

Do you want to solve another equation?
? y

Enter values for A, B, and C:
A = 1
B = 2
C = 1

A solution of the equation is -1.0

Do you want to solve another equation?
Compilation completed successfully in 8 s 538 ms (a minute ago)
24:1 LF UTF-8 4 spaces
```

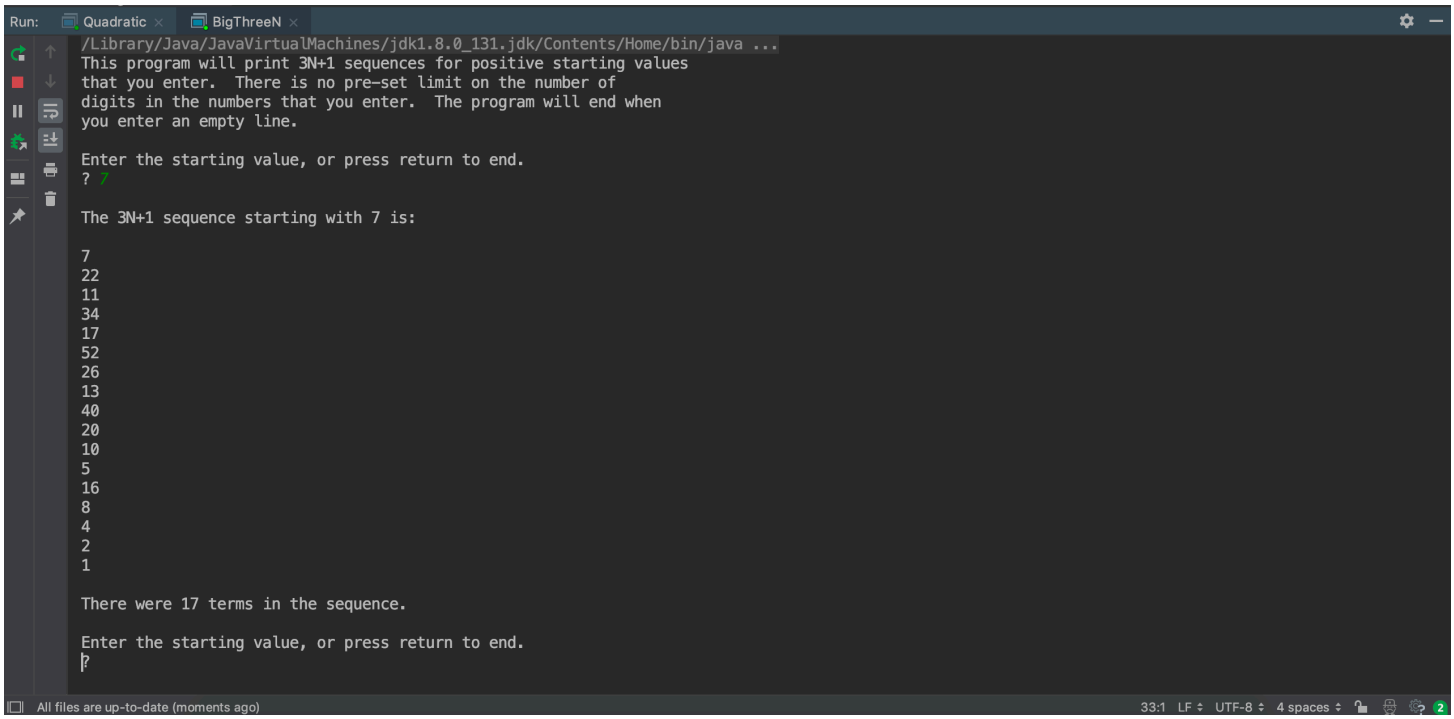
Exercise2.

Defines TWO as a constant, along with server other BigIntegers that represent values that I need:

```java
static final BigInteger THREE = new BigInteger("3");
static final BigInteger ONE = new BigInteger("1");
static final BigInteger TWO = new BigInteger("2");
```

With these constants, the code for computing the next term in a 3N+1 sequence becomes:

```java
if (N.testBit(0) == false) {
        // N is even.  Divide N by 2.
    N = N.divide(TWO);
}
else {
        // N is odd.  Multiply N by 3, then add 1.
    N = N.multiply(THREE);
    N = N.add(ONE);
}
```



Exercise3.

The algorithm for converting a String, roman, to an int, arabic as below

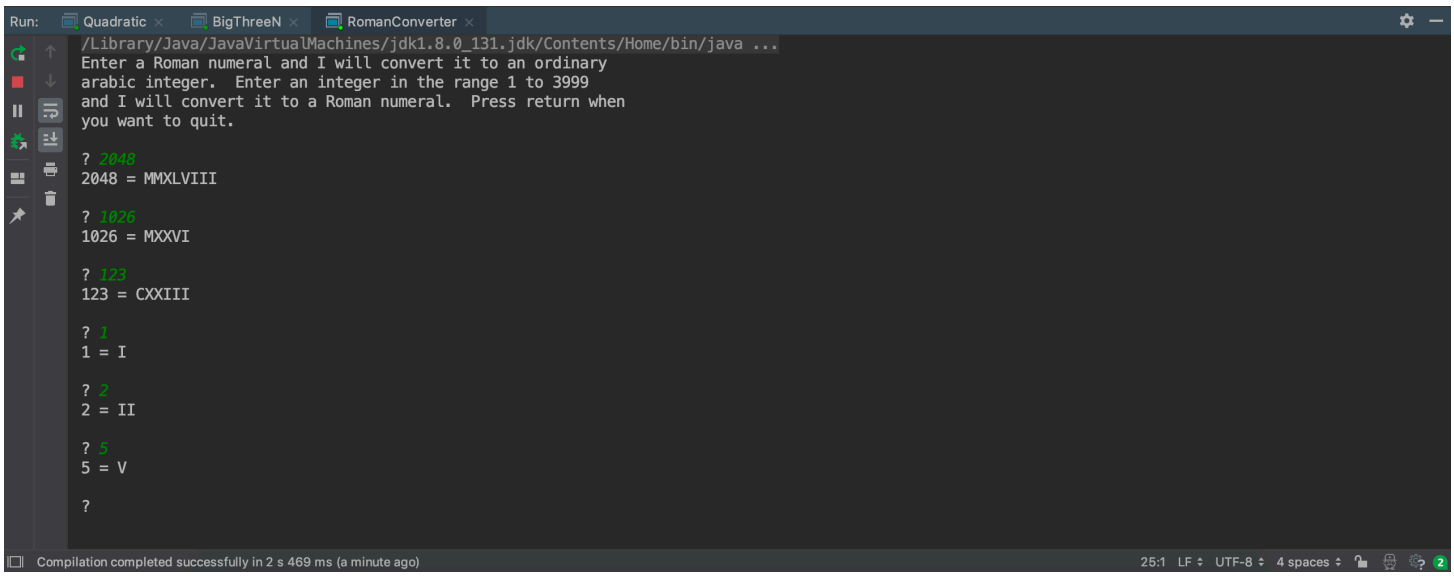
```
Let arabic = 0
Let i = 0  // representing a position in the string

while i is a legal position in the string:
    Let ch be the character in position i
    Let N be the numeric equivalent of ch
    i++   // to account for the character, ch
    if there are no additional characters in the string:
          // (We need to make this test first, to avoid an error
          // when we try to look at the next character.)
       Add N to arabic
    else:   // Try pairing the ch with the next character
       Let N2 be the numeric equivalent of the NEXT character
       If N < N2:  // Evaluate the characters as a pair
           Add (N2 - N) to arabic
           i++    // to account for the extra character
       else:
           Add N to arabic
```

This algorithm does not take into account that the string might not be a legal Roman numeral. We should consider the loop as below

```
while (N >= 1000) {
   roman += "M";
```

```
    N -= 1000;
}
```

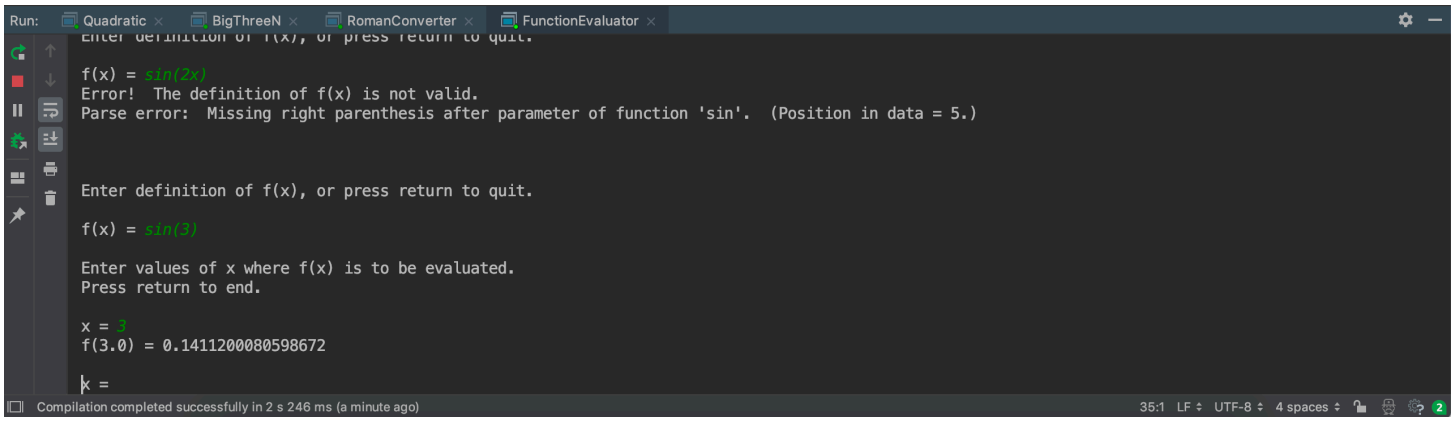
All the 1000's in N have been converted to M's in roman, and we can be sure that N is 999 or less.



Exercise4.

The algorithm for reading and processing the user's numbers becomes

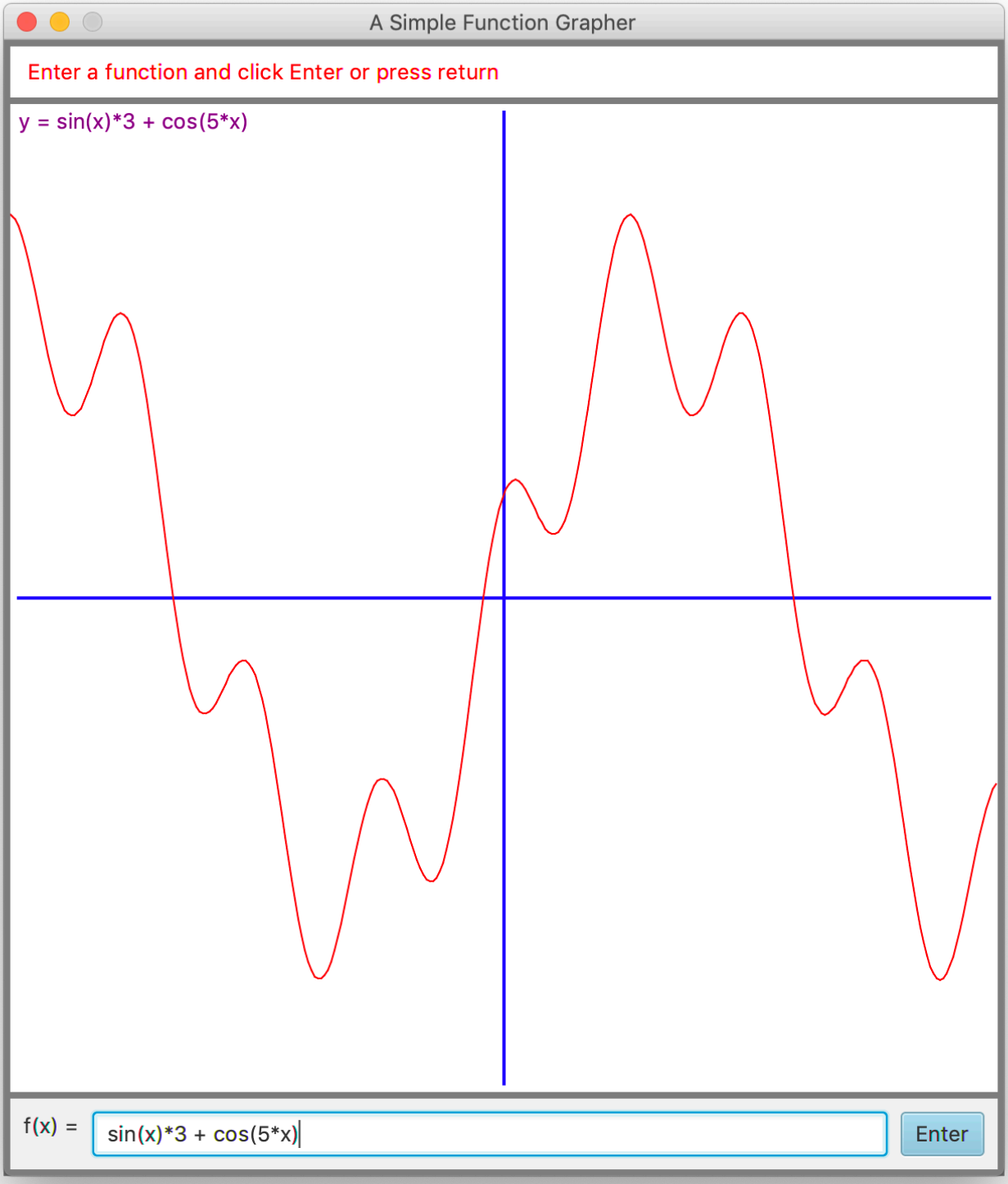
```
while (true):
    Get a line of input from the user
    if the line is empty:
        break
    try {
        Let x = Double.parseDouble(line)
    }
    catch (NumberFormatException e) {
        Print an error message
        continue
    }
    Let val = expression.value(x)
    if val is Double.NaN:
        Print an error message
    else:
        Output val
```



Exercise5.

The algorithm for the drawFunction() method is as below

```
Let dx = 10.0 / 300;
Let x = -5                  // Get the first point
Let y = func.value(x)
for i = 1 to 300:
    Let prevx = x           // Save the previous point
    Let prevy = y
    Let x = x + dx          // Get the next point
    Let y = func.value(x)
    if neither y nor prevy is Double.NaN:
       draw a line segment from (prevx,prevy) to (x,y)
```



Quiz & Notes

1. When variables must be declared, the unintentional creation of a variable is simply impossible, and a whole class of possible bugs is avoided.
2. A precondition is a condition that has to hold at a given point in the execution of a program, if the execution of the program is to continue correctly. Also, a precondition of a subroutine is a condition that has to be true when the subroutine is called in order for the

subroutine to work correctly.

3. In order to have a correct and robust program, the programmer must deal with the possible error. There are several approaches that the programmer can take.

4. Print out a `3N+1` sequence

```
    static void printThreeNSequence(int N) {
assert  N > 0 : "Starting value for 3N+1 sequence must be > 0.";
System.out.println("3N+1 sequence starting from " + N + " is: ");
System.out.println(N);
while (N > 1) {
    if (N % 2 == 0) {  // N is even.  Divide by 2.
        N = N / 2;
    }
    else {  // N is odd.  Multiply by 3 and add 1.
        assert  N <= 2147483646/3 : "Value has exceeded the largest int.";
        N = 3 * N + 1;
    }
    System.out.println(N);
}
}
```

5. `try...catch` statement

```
try {
processData();
}
catch (IOException e) {
System.out.println("An IOException occurred while processing the data.");
}
```