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Course	: BBM 104 Introduction to Programming II Lab
Experiment	:Lab1-Introduction to Java on eclipse platform
Subject	: Math with Java
Data Due	: 8.03.2017 23:29
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Main Program	: HelloJava.java

2. Software Using Documentation

2.1. Software Usage

Software input is *input.txt.* Input file reads such that an argument. Software output is write console.I wrote with eclipse neon2.0 and java jdk1.8.

3. Software Design Note

3.1 Desctiption Of The Program

In this assignment I have developed a very simple application which does some mathematical calculations. Shortly these tasks;

i- Integral computation via middle Riemann sum with in a range

ii- Numerical approximation of arcsinh(x) function by Maclaurin series

iii- Finding the Armstrong (narsist) numbers within a range

To do assignment, I read the input.txt (command) file supplied as input.
I gave this file a command argument.

3.1.1 Problem

Calculation of the area under the given 3 functions using the middle Riemann sum.
(Func1(x) = x^2-x+3 Func2(x) = (3sin(x)-4)^2 Func3(x)=Arcsinh(x))
For second operation, I will implement arcsinh(x) function as Maclaurin Series.
(Defining the Arcsinh(x) function)
For third section, I am to find out and print the Armstrong numbers whose digit number is below or equal to the given digit parameter.
(Armstrong number example: 407 = 4^3 + 0^3 + 7^3)

3.1.2 Solution

For the first stage, I use to middle Riemann Sum.
The sum is calculated by dividing the region up into rectangles that form a region that is similar to the region being measured, then the area for each of these shapes, and finally adding all of these small areas together. I wrote this algorithm and applied it to the values in the given input file.
For the second stage, the formula for the arcsinh (x) function is given to me. I wrote this formula with get help the math class in Java
For the third stage, firstly I wrote an algorithm that checks for Armstrong numbers. Later, I setted the number ranges according to the digit. I sent every number in range to function I wrote.

3.2 System Chart

INPUT
Command syntax:
IntegrateRiemann name_of_function a b number_of_partitions
String String int int int
IntegrateReimann Func1 -5.0 12.0 40

PROGRAMS
Name:
MiddleReimannSum (String Func, double dFirst, double dLast, int iAreaNum)

OUTPUT
Command syntax:
IntegrateRiemann name_of_function a b number_of_partitions Result: c
String String int int int String int
IntegrateReimann Func1 -5.0 12.0 40 Result:608.9107812499999

INPUT
Arcsinh value
String double
Arcsinh 0.4

PROGRAMS
ArcsinhFunc(double x)

OUTPUT
Arcsinh 0.4 Result:0.39003531977071526

INPUT
Command syntax:
Armstrong value
String int
Armstrong 3

PROGRAMS
ArmDigit (int iDigit)

OUTPUT
Armstrong 3 Result:0 1 2 3 4 5 6 7 8 9 153 370 371 407

3.3 Function and Tasks

3.3.1 Main Function

Program begins in main function.This function read the input file, parse the input file and call the other functions.

3.3.2 MiddleReimannSum Function

The function is calculated by dividing the region up into rectangles that together form a region that is similar to the region being measured, then calculating the area for each of these shapes, and finally adding all of these small areas together.

3.3.3 f1 Function

This function define to Func1. Func1(x) = x^2-x+3

3.3.4 f2 Function

This function define to Func2. Func2(x) = (3sin(x)-4)^2

3.3.5 f3 Function

Func3 is Arcsinh(x).The function is call ArcsinhFunc()

3.3.6 FactFunc Function

This function makes factorial account.

3.3.7 ArcsinhFunc Function

This function define to arcsinh function. $arcsinh\ (x)$= Σ(−1)^n(2n)! / 4^n(n!)^2(2n+1) *(x)^2n+1.

3.3.8 AmsNumControl Function

This function that checks whether a number is an armstrong number.

3.3.9 ArmDigit Function

The function set range of numbers for the given digit.
The function sends the specified numbers to the function AmsNumControl()

3.4 Algorithm

1- Program begins in main function
2- Read the input.txt with args.
3- Parse and split the input.txt with args.
4- Shared tasks by split [0] (name)
5- The program call the MiddleReimannSum Function
6- The proper function (f1, f2, f3,) is selected and called
7- The result of IntegrateReimann is found and print on the console.
8- Arcsinh function is called.
9- FactFunc function is called
10-Arcsinh function is calculated
11-The result of Arcsinh function and print on the console
12- The program call the ArmDigit Function
13-The function set range of numbers for the given digit.
14-The function AmsNumControl is called for the specified range
15- The result of armstrong number is found and print on the console.
16- Program ends.

4. Comment

Homework was easy overall.But this is my first program with java.So I'm a little tough. Especially if you learn to parse a file. But thanks to this assignment, I got a better understanding of the logic by java. I learned Java methods (function) too. I have learned to java syntax. I learned the application of math class.I saw that the java is much more difficult than python. ☺ It was a useful homework for me in general.

5. References

https://docs.oracle.com/javase/8/docs/

https://www.tutorialspoint.com/java/index.htm

http://web.cs.hacettepe.edu.tr/~bbm102/misc/java_notes_by_oa.pdf