Gebze Technical University
Computer Engineering

CSE 222 - 2018 Spring

HOMEWORK 3 REPORT

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1 INTRODUCTION

1.1 Problem Definition

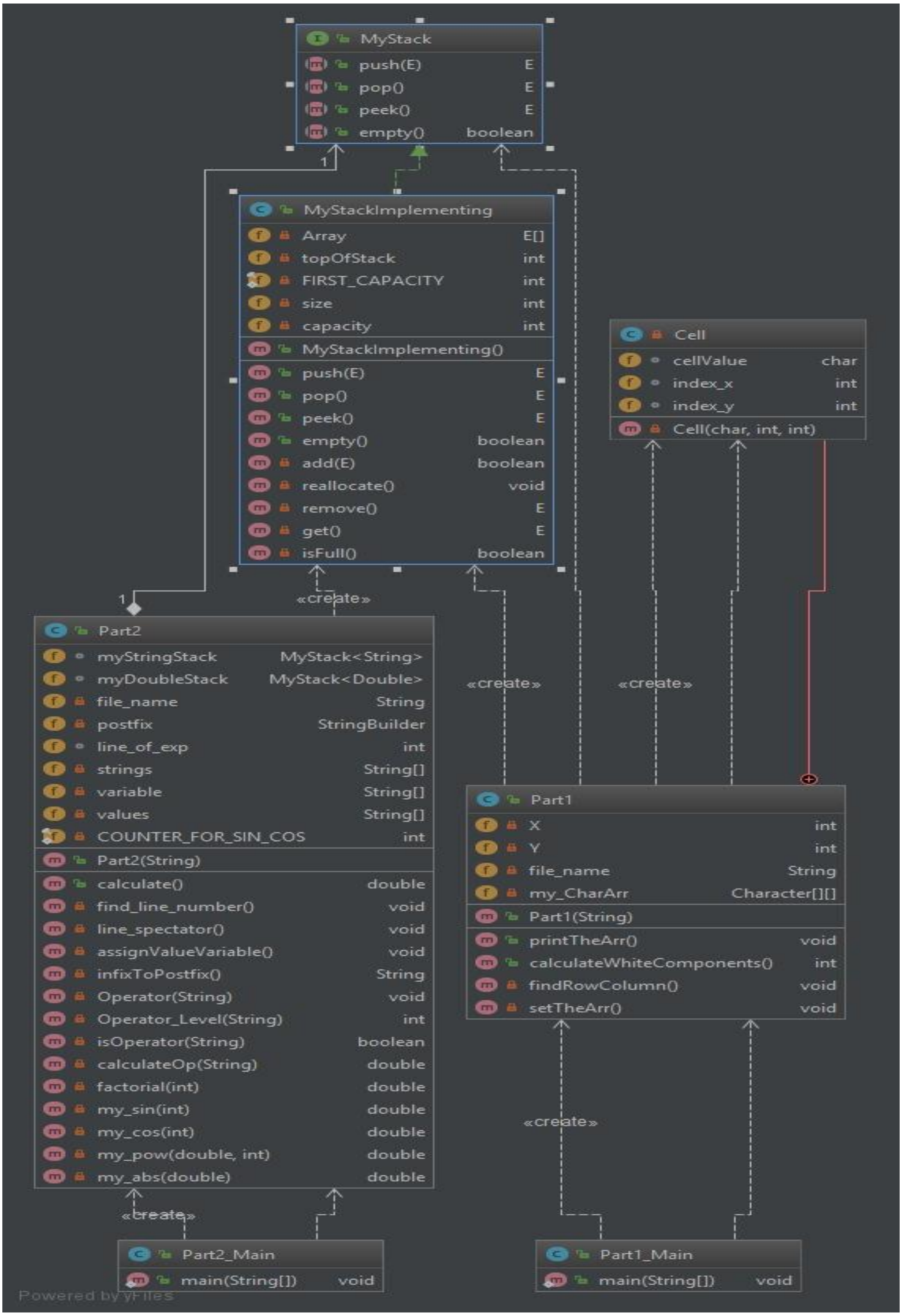
I solve a matrix problem in part1. This problem is like a image processing problem. I found connected paths without breaking with each other. Condition of being a path ‘1’ are linked together without breaking. Link can be up, down, left and rigth. Finally I found the number of how many path matrix has.
I solve a mathematical expression which is infix notation. The infix notation contains “+”, ”-”, ”*”, ”/”, ”(”, ”)” ,”sin(”, ”cos(”, ”abs(”. The easiest way to solve this problem is using stack and traversing infix notation to spostfix notation.

1.2 System Requirements

To work my solution for two parts there is some library. These are : java.io.BufferedReader, java.io.File, java.io.FileReader, java.io.IOException, java.util.EmptyStackException.
My solution does not require a specific pice of hardware. It works anywhere which has JVM. There is no certain operaing system, It can work Windows, Linux…

2 METHOD

2.1 Class Diagrams



2.2 Use Case Diagrams

Part1 : Users only give a file name -which will read- as a program argument, and create a new object with Part1’s constructor and call the calculateWhiteComponents() methods.

Simple usage :

```
Part1 try1 = new Part1(args[0]);
Sytem.out.println(try1. calculateWhiteComponents());
```

Part2 : Users only give a file name -which will read- as a program argument, and create a new object with Part2’s constructor and call the calculate() methods.

Simple usage :

```
Part2 try2 = new Part2(args[0]);
Sytem.out.println(try2. calculate());
```

2.3 Problem Solution Approach

Part1 : calculateWhiteComponents method is the only method which can be used by user. The method uses helper methods insede itself. My decision is like that : First of all I read the file and find the number of row and column. Then again I read the file character by character and fill an Character array to make index operations. In calculateWhiteComponents I search ‘1’ inside my Character array. When I found ‘1’ I push into a stack type of Cell with their indexes and value. (Cell is an inner class to keep row column and value of ‘1’). Then until my stack will be empty I search ‘1’ around of my found ‘1’. If left, right, up and down not contains ‘1’ pop the Cell. The most important think is when found ‘1’ make it someting else to prevent from infinite loop. We do not allow to use recursive so that the best way to solve this problem is using stack. My program has O(n) complexity, n is the total elements of my matrix.

Part2 : calculate method is the only method which can be used by user. The method uses helper methods inside itself. My decision like that : First of all I read the file and find the number of line. Then again I read the file line by line and fill strings array. (strings[line_counter]). In file first lines there can be variables so that I make another string array to keep name of variable and its value. The given expression is infix notation. Easy way to solve such problem is traverse it postfix notation. So that I traverse the infix notation to postfix. And finally I calculate the result of postfix notation. I used stack it makes much easier. My program has O(n) complexity. I did not solve sin cos and abs function with more than one parameter. For example I can not solve sin(45 + 45) but I can solve sin(45) or sin(x) … Because of that I thought sin, cos and abs like an operator. For one argument like sin(45) it is easy to make it this way, but in more than two argumnets this solution get stuck.

2.4 Problem Solution Approach

Part1 : calculateWhiteComponents method is the only method which can be used by user. The method uses helper methods insede itself. My decision is like that : First of all I read the file and find the number of row and column. Then again I read the file character by character and fill an Character array to make index operations. In calculateWhiteComponents I search ‘1’ inside my Character array. When I found ‘1’ I push into a stack type of Cell with their indexes and value. (Cell is an inner class to keep row column and value of ‘1’). Then until my stack will be empty I search ‘1’ around of my found ‘1’. If left, right, up and down not contains ‘1’ pop the Cell. The most important think is when found ‘1’ make it someting else to prevent from infinite loop. We do not allow to use recursive so that the best way to solve this problem is using stack. My program has O(n) complexity, n is the total elements of my matrix.

Part2 : calculate method is the only method which can be used by user. The method uses helper methods inside itself. My decision like that : First of all I read the file and find the number of line. Then again I read the file line by line and fill strings array. (strings[line_counter]). In file first lines there can be variables so that I make another string array to keep name of variable and its value. The given expression is infix notation. Easy way to solve such problem is traverse it postfix notation. So that I traverse the infix notation to postfix. And finally I calculate the result of postfix notation. I used stack it makes much easier. My program has O(n^2) complexity. I did not solve sin cos and abs function with more than one parameter. For example I can not solve sin(45 + 45) but I can solve sin(45) or sin(x) … Because of that I thought sin, cos and abs like an operator. For one argument like sin(45) it is easy to make it this way, but in more than two argumnets this solution get stuck.

3 RESULT

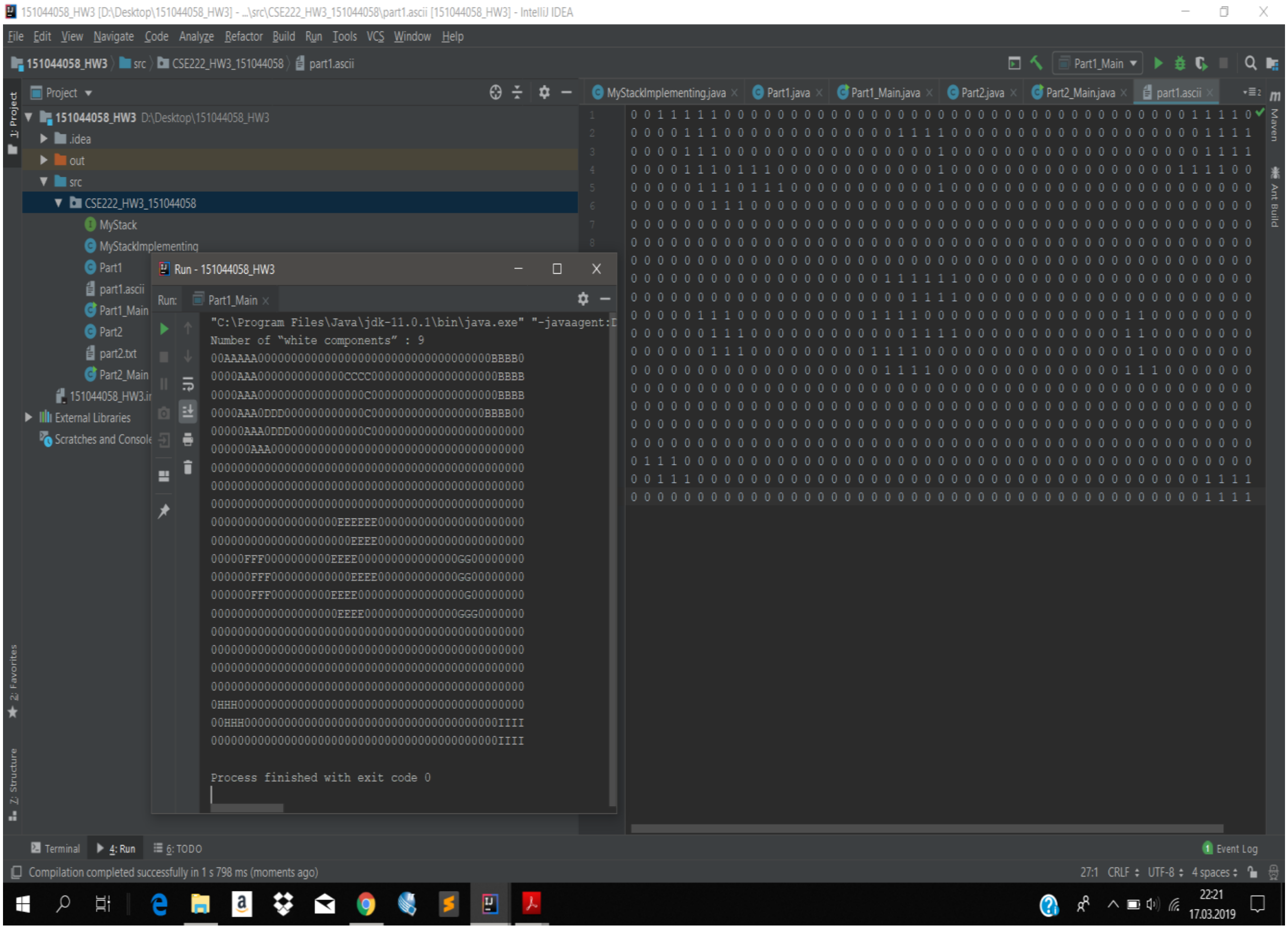
3.1 Test Cases

In Part1 I tested my program according to the test in moodle. Then I tryed a few extra cases in which program must use diffrent results.

In Part2 I tested my program according to the test in moodle with only one difference sin cos and abs take only one argument, if they take more than one argument my program will crash. Then I tryed a few extra cases in which program must use diffrent results and control the result with calculatur.

3.2 Running Results

Part1 Result 1:



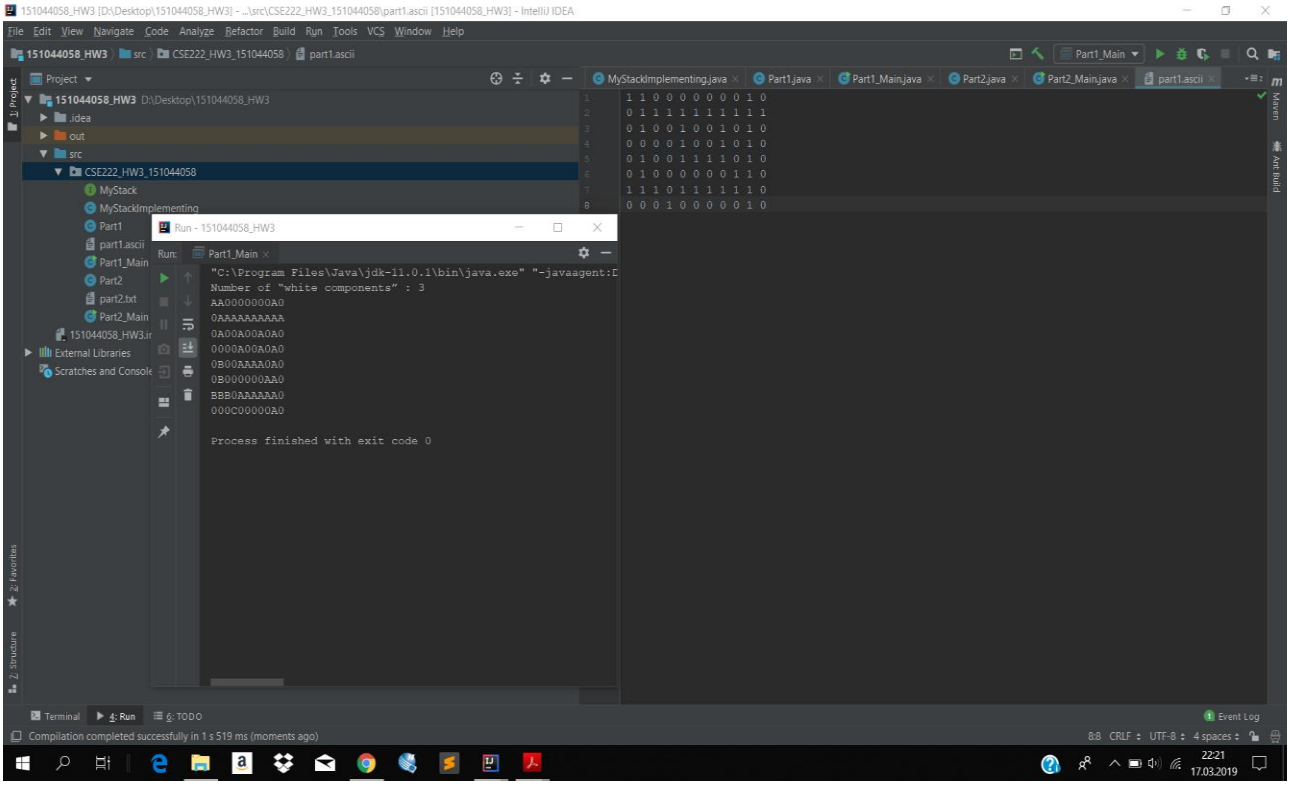
```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Number of "white components" : 9
00AAAAA00000000000000000000000000000000000BBBB0
0000AAA0000000000000CCCC0000000000000000000BBBB
0000AAA0000000000000000C0000000000000000000BBBB
0000AAA0DDD000000000000C00000000000000000BBBB00
00000AAA0DDD00000000000C00000000000000000000000
000000AAA00000000000000000000000000000000000000
00000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000
0000000000000000000EEEEEE0000000000000000000000
000000000000000000000EEEE0000000000000000000000
00000FFF0000000000EEEE000000000000000GG00000000
000000FFF000000000000EEEE000000000000GG00000000
000000FFF000000000EEEE0000000000000000G00000000
0000000000000000000EEEE00000000000000GGG0000000
00000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000
0HHH0000000000000000000000000000000000000000000
00HHH00000000000000000000000000000000000000IIII
0000000000000000000000000000000000000000000IIII

Process finished with exit code 0
```

```
0 0 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0
0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1
0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1
0 0 0 0 1 1 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0
0 0 0 0 0 1 1 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1
```

Compilation completed successfully in 1 s 798 ms (moments ago)

Part1 Result 2:



151044058_HW3 [D:\Desktop\151044058_HW3] - ...\src\CSE222_HW3_151044058\part1.ascii [151044058_HW3] - IntelliJ IDEA

part1.ascii:

```
1 1 0 0 0 0 0 0 0 1 0
0 1 1 1 1 1 1 1 1 1 1
0 1 0 0 1 0 0 1 0 1 0
0 0 0 0 1 0 0 1 0 1 0
0 1 0 0 1 1 1 1 0 1 0
0 1 0 0 0 0 0 0 1 1 0
1 1 1 0 1 1 1 1 1 1 0
0 0 0 1 0 0 0 0 0 1 0
```

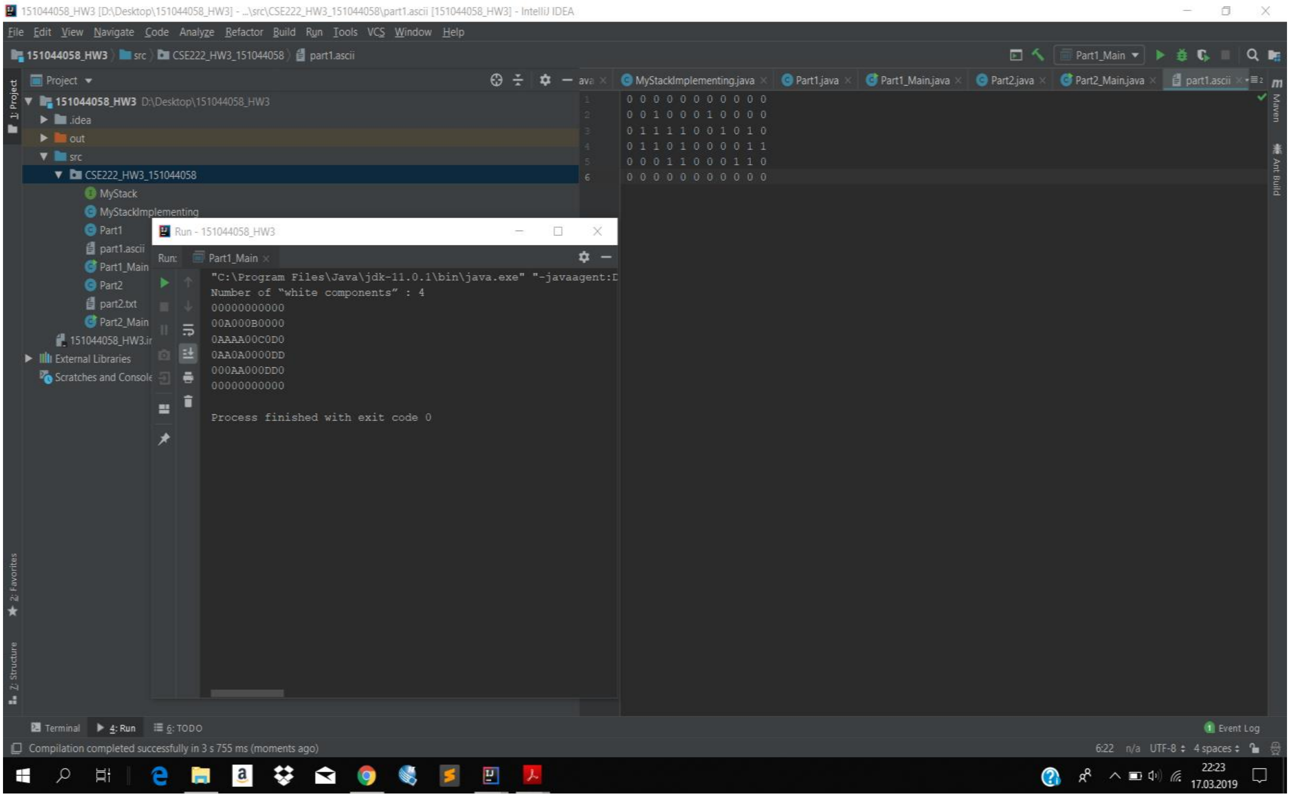
Run - 151044058_HW3

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Number of "white components" : 3
AA0000000A0
0AAAAAAAAAA
0A00A00A0A0
0000A00A0A0
0B00AAAA0A0
0B000000AA0
BBB0AAAAAA0
000C00000A0

Process finished with exit code 0
```

Compilation completed successfully in 1 s 519 ms (moments ago)

Part1 Result 3:



151044058_HW3 [D:\Desktop\151044058_HW3] - ...\src\CSE222_HW3_151044058\part1.ascii [151044058_HW3] - IntelliJ IDEA

part1.ascii:

```
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 1 0 0 0 0
0 1 1 1 1 0 0 1 0 1 0
0 1 1 0 1 0 0 0 0 1 1
0 0 0 1 1 0 0 0 1 1 0
0 0 0 0 0 0 0 0 0 0 0
```

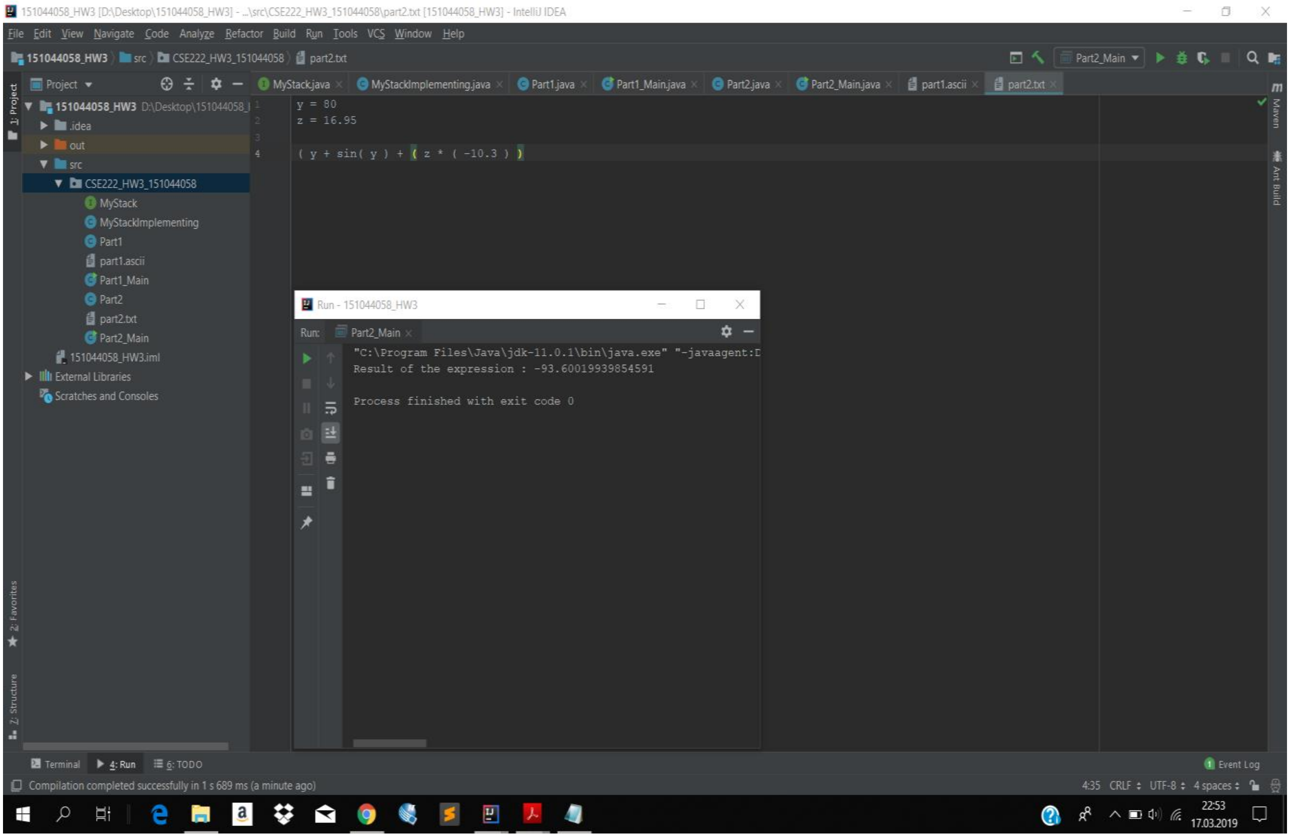
Run - 151044058_HW3

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Number of "white components" : 4
00000000000
00A000B0000
0AAAA00C0D0
0AA0A0000DD
000AA000DD0
00000000000

Process finished with exit code 0
```

Compilation completed successfully in 3 s 755 ms (moments ago)

Part2 Result 1:



151044058_HW3 [D:\Desktop\151044058_HW3] - ...\src\CSE222_HW3_151044058\part2.txt [151044058_HW3] - IntelliJ IDEA

```
y = 80
z = 16.95

( y + sin( y ) + ( z * ( -10.3 ) )
```

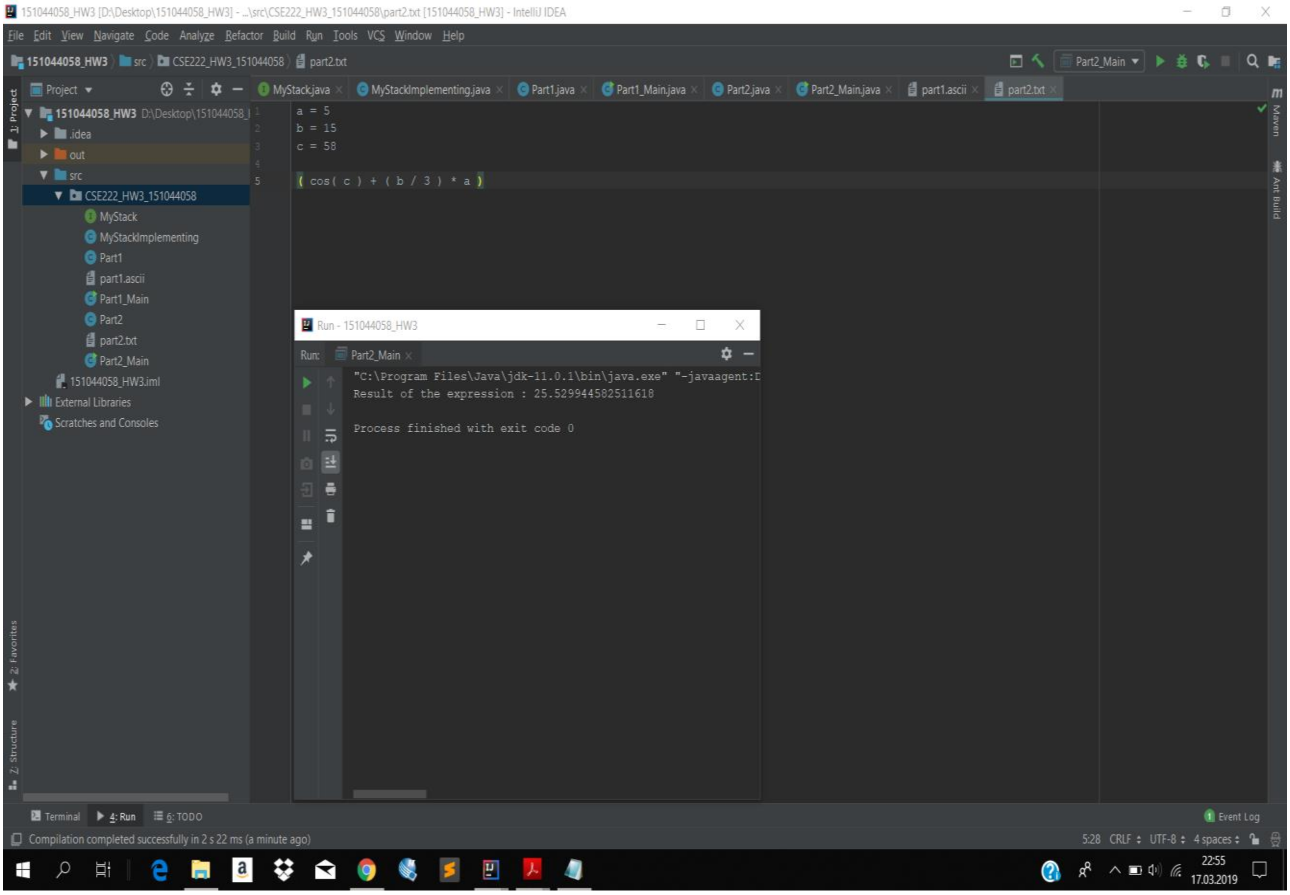
Run - 151044058_HW3

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Result of the expression : -93.60019939854591

Process finished with exit code 0
```

Compilation completed successfully in 1 s 689 ms (a minute ago)

Part2 Result 2:



151044058_HW3 [D:\Desktop\151044058_HW3] - ...\src\CSE222_HW3_151044058\part2.txt [151044058_HW3] - IntelliJ IDEA

```
a = 5
b = 15
c = 58

( cos( c ) + ( b / 3 ) * a )
```

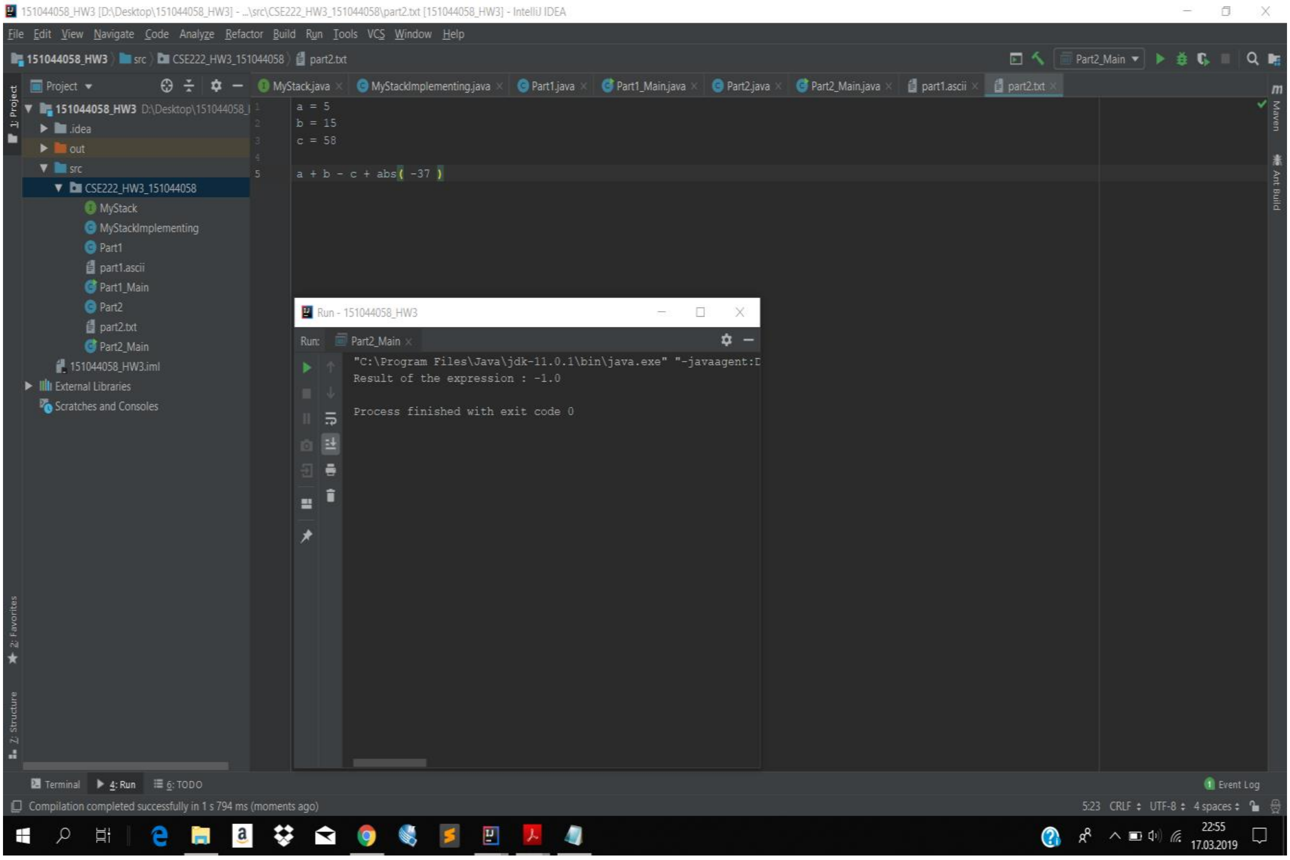
Run - 151044058_HW3

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Result of the expression : 25.529944582511618

Process finished with exit code 0
```

Compilation completed successfully in 2 s 22 ms (a minute ago)

Part2 Result 3:


151044058_HW3 [D:\Desktop\151044058_HW3] - ...\src\CSE222_HW3_151044058\part2.txt [151044058_HW3] - IntelliJ IDEA
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
151044058_HW3 src CSE222_HW3_151044058 part2.txt
Part2_Main
Project
MyStack.java MyStackImplementing.java Part1.java Part1_Main.java Part2.java Part2_Main.java part1.ascii part2.txt
151044058_HW3 D:\Desktop\151044058_I
.idea
out
src
CSE222_HW3_151044058
MyStack
MyStackImplementing
Part1
part1.ascii
Part1_Main
Part2
part2.txt
Part2_Main
151044058_HW3.iml
External Libraries
Scratches and Consoles
Run - 151044058_HW3
Run: Part2_Main
Terminal 4: Run 6: TODO
Event Log
Compilation completed successfully in 1 s 794 ms (moments ago)
5:23 CRLF UTF-8 4 spaces
22:55
17.03.2019

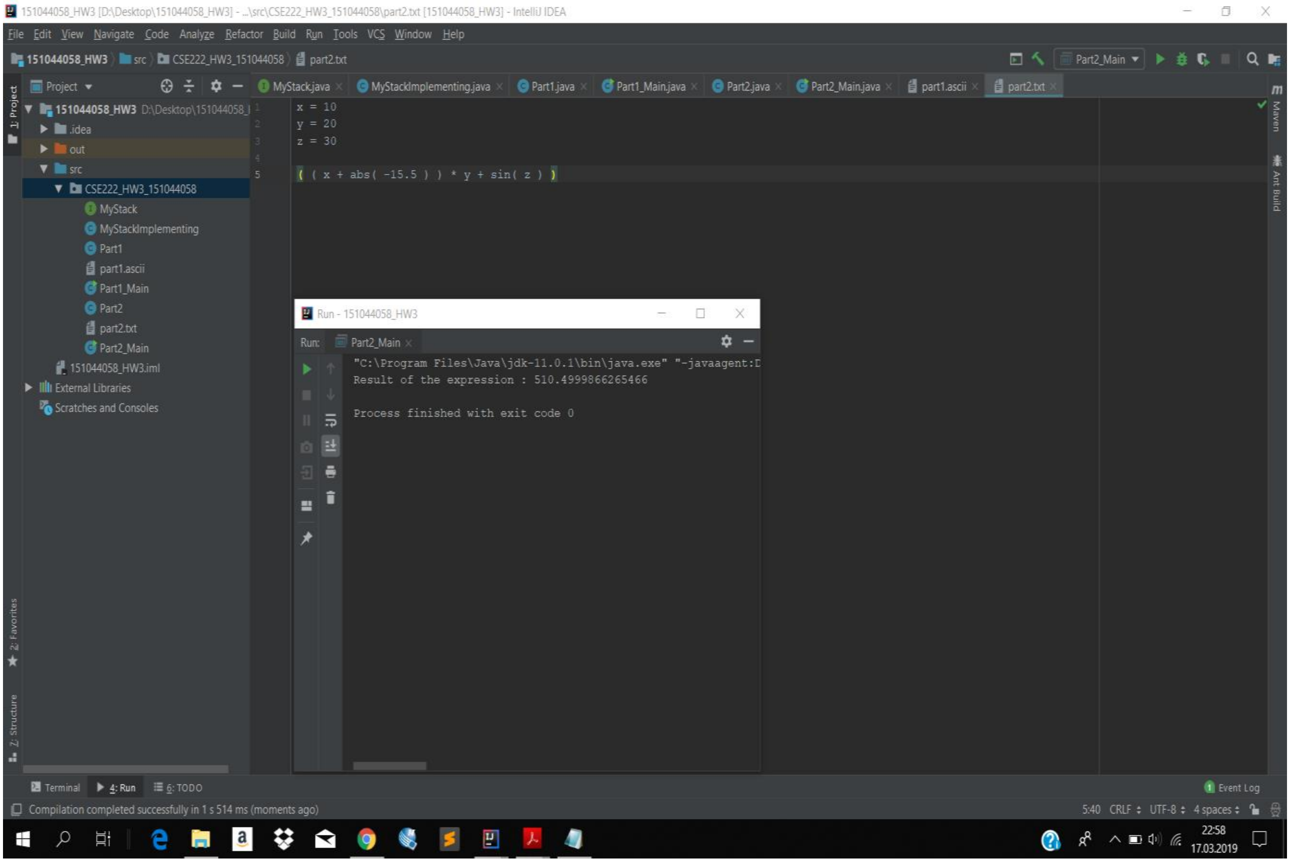
```
a = 5
b = 15
c = 58


a + b - c + abs( -37 )
```

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Result of the expression : -1.0

Process finished with exit code 0
```

Part2 Result 4:


151044058_HW3 [D:\Desktop\151044058_HW3] - ...\src\CSE222_HW3_151044058\part2.txt [151044058_HW3] - IntelliJ IDEA
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
151044058_HW3 src CSE222_HW3_151044058 part2.txt
Part2_Main
Project
MyStack.java MyStackImplementing.java Part1.java Part1_Main.java Part2.java Part2_Main.java part1.ascii part2.txt
151044058_HW3 D:\Desktop\151044058_I
.idea
out
src
CSE222_HW3_151044058
MyStack
MyStackImplementing
Part1
part1.ascii
Part1_Main
Part2
part2.txt
Part2_Main
151044058_HW3.iml
External Libraries
Scratches and Consoles
Run - 151044058_HW3
Run: Part2_Main
Terminal 4: Run 6: TODO
Event Log
Compilation completed successfully in 1 s 514 ms (moments ago)
5:40 CRLF UTF-8 4 spaces
22:58
17.03.2019

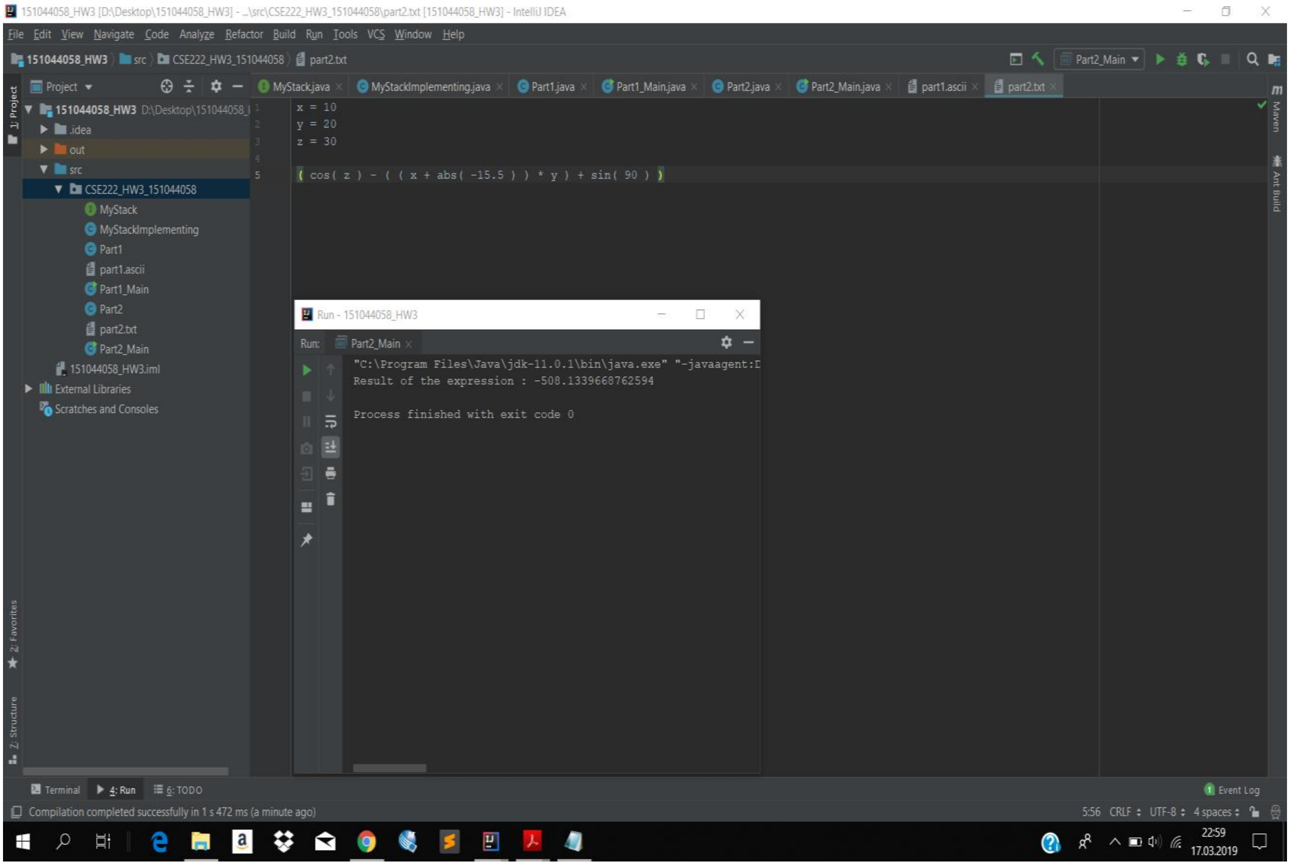
```
x = 10
y = 20
z = 30


( ( x + abs( -15.5 ) ) * y + sin( z ) )
```

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Result of the expression : 510.4999866265466

Process finished with exit code 0
```

Part2 Result 5:



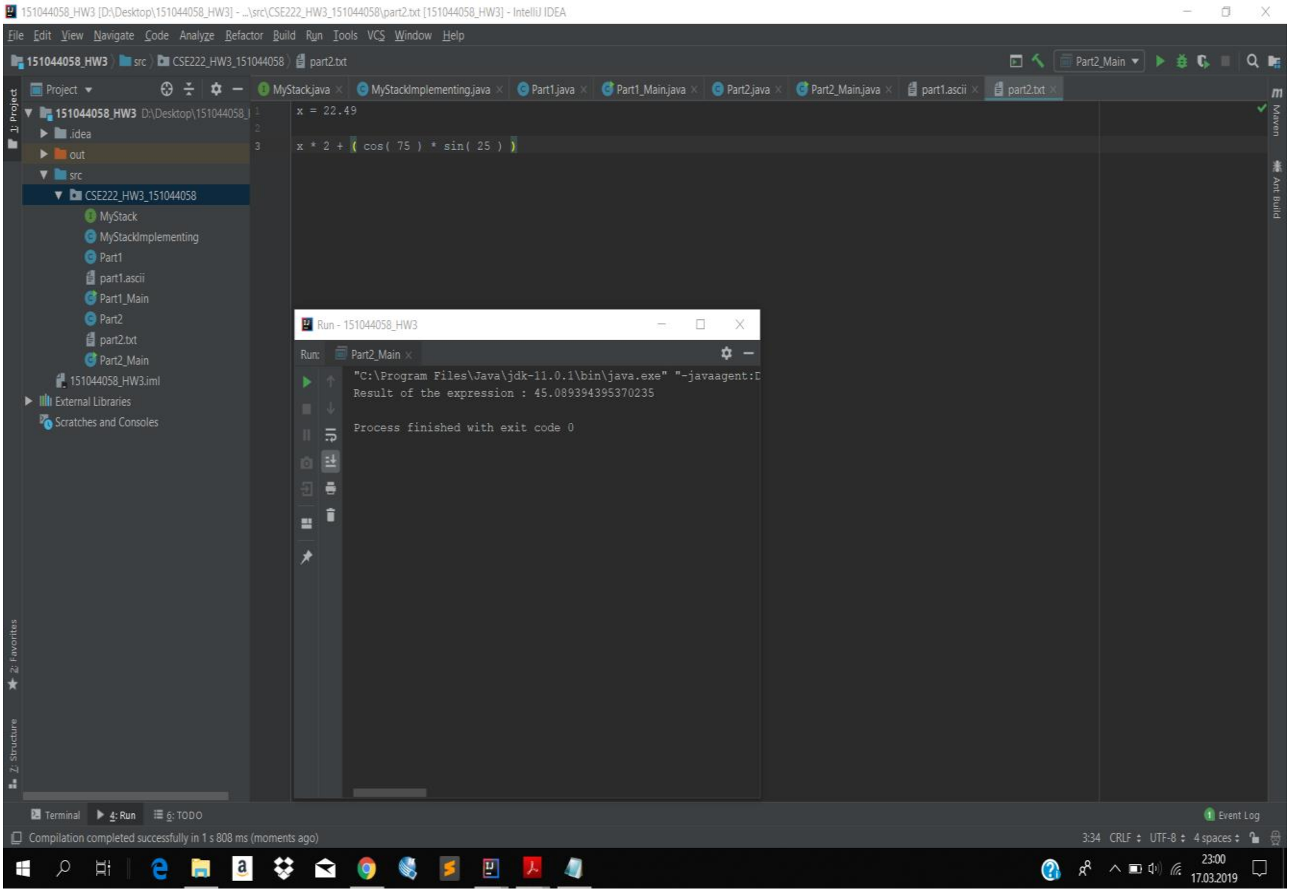
```
x = 10
y = 20
z = 30

( cos( z ) - ( ( x + abs( -15.5 ) ) * y ) + sin( 90 ) )
```

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Result of the expression : -508.1339668762594

Process finished with exit code 0
```

Part2 Result 6:



```
x = 22.49

x * 2 + ( cos( 75 ) * sin( 25 ) )
```

```
"C:\Program Files\Java\jdk-11.0.1\bin\java.exe" "-javaagent:D
Result of the expression : 45.089394395370235

Process finished with exit code 0
```