COMP 210 – Data Structures and Analysis (Sec 2)

Assignment #1 – Part 3 – Getting Started

Issue Date: January 14th, 2023. Due Date: January 21st, 11:55pm

Rules for ALL HWs (in addition to any statements in the syllabus):
You are encouraged to discuss the homework assignments and study together in groups, but when it comes to formulating/writing/coding solutions you must work alone and independently. If required, you should be able to explain your answer clearly to TAs/LAs. Copying homework solutions from another student, from the Internet, solution sets of friends, or other sources will be considered cheating and treated accordingly.

Part 3 (4 Points)

In this part you are required to write an additional Java program and answer questions given below. This part will be manually graded and you should provide your responses in the spaces below and then upload this file **as a pdf in Gradescope "Assignment 1 – Part 3".**

i) In the same package (assn01) create another java class called "Part3", with a "main" method that does the following:
- Declares a variable short **sh**, which is to be set to the largest short integer.
- Then calls another static method "method2".

ii) Create "method2" that:
- Declares a (Hex) **int n2 = 0xABC**, and prints out the number as a decimal.
- Calls another static method "method3".

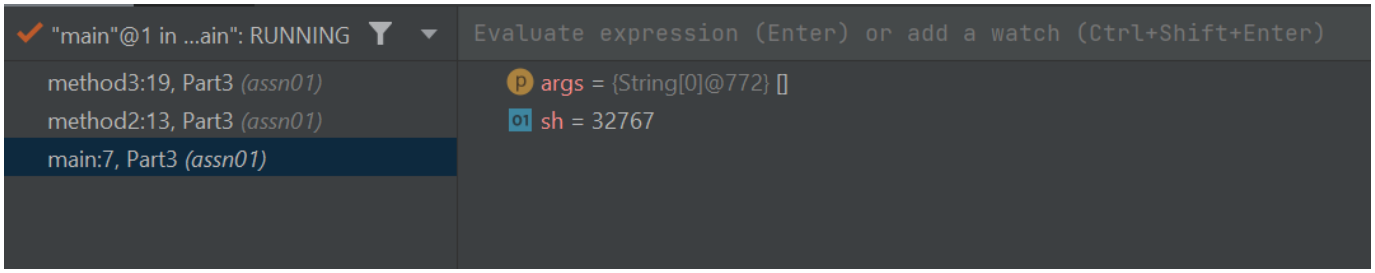
iii) Create "method3" that:
- Declares an array **a3 = {'a', 'z'}**
- Runs the following statement: **System.out.println(a3[0]+" "+ a3[1]);**

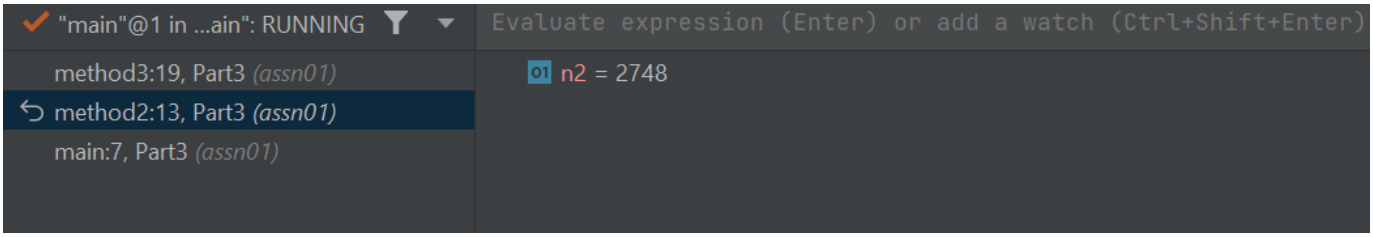
a) Provide a copy of your code in the space below (this should not be an image):

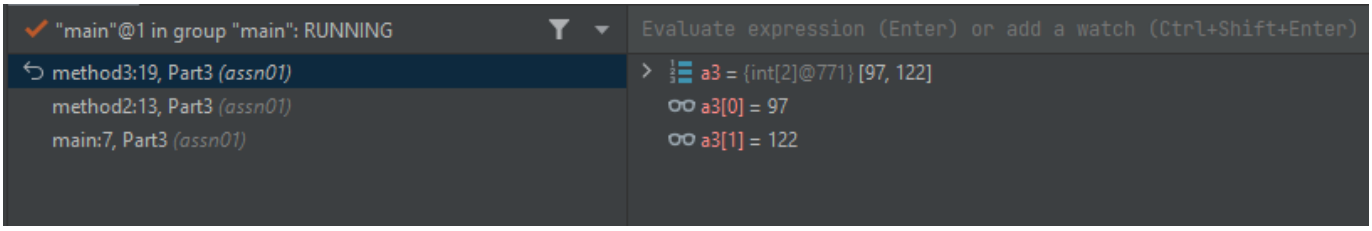
```
package assn01;

no usages
public class Part3 {
    no usages
    public static void main (String [] args)
    {
        short sh=32767;
        method2();
    }
    1 usage
    public static void method2()
    {
        int n2=0xABC;
        System.out.println(n2);
        method3();
    }
    1 usage
    public static void method3()
    {
        int [] a3 = {'a','z'};   a3: [97, 122]
        System.out.println(a3[0]+""+a3[1]);   a3: [97, 122]
    }
}
```

b) Setup a breakpoint in method3 before it exits, and debug the program to stop at this breakpoint to show the following: The **main**, **method2** and **method3** stacks and their **variables** with full details. (You must capture these images and show the values below).







c) What are the contents of the Stack memory? What are the contents of the Heap memory?

Stack:
method3: a3
method2: n2=2748
main: sh = 32767

Heap: args=[], {97,122}

d) Once the program is fully run, give equations showing how ‘sh’ and ‘n2’ were calculated?

short is stored using 2 bytes (2B), therefore it can be represented in 4 nibbles. The highest number should be then: 1111 1111 1111 1111 in binary. Converting this into decimals:
1*2^{15}+1*2^{14}+1*2^{13}+1*2^{12}+1*2^{11}+1*2^{10}+1*2^{9}+1*2^{8}
+1*2^{7}+1*2^{6}+1*2^{5}+1*2^{4}+1*2^{3}+1*2^{2}+1*2^{1}+1*2^{0}=1*(1-2^15)/(1-2) = 32767

since hexadecimals are in basis 16, and 'A'=10, 'B'=11, 'C'=12, we have:
10*16^2+11*16^1+12*16^0 = 2748

e) Explain the values printed when you printed the a3 elements a3[0] and a3[1]. Why do we see numbers instead of characters and what do those numbers mean?

Because we declare a3 as an array of integers. The output 97 and 122 are the decimal versions of the ascii characters 'a' and 'z' respectively