

## COMP 210 – Data Structures and Analysis (Sections 1 & 2)

### Assignment #1 – Part 2 – Getting Started

Issue Date: August 30, 2023.

**Due Date: Wednesday September 6<sup>th</sup>, 11:55pm**

Total Points: 5. *Part 3 = 4 Points.*

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#### **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 2 (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 2”**.

- i) In the same package (assn01) create another java class called “Part2”, 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 **int[] a3 = {'a', 'z'}**
  - Runs the following statement: **System.out.println(a3[0]+" "+ a3[1]);**

a) Insert a copy of your code in the space below (image or text):

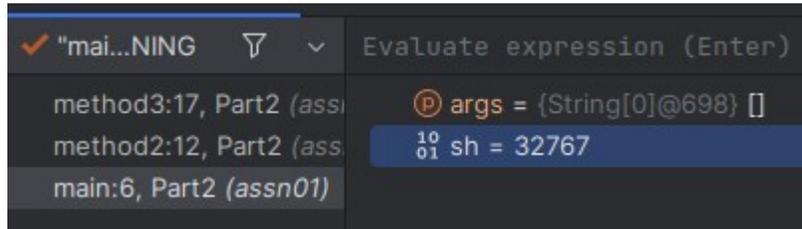
```
package assn01;

public class Part2 {
    public static void main(String[] args) {
        short sh = Short.MAX_VALUE;
        method2();
    }

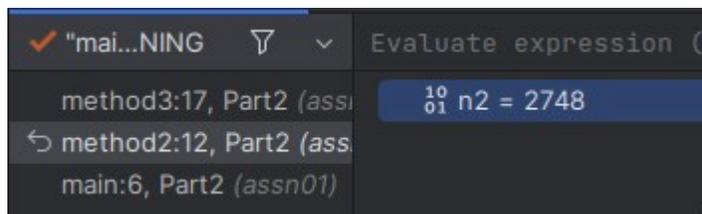
    1 usage
    static void method2() {
        int n2 = 0xABC;
        System.out.println(n2);
        method3();
    }

    1 usage
    static void method3() {
        int[] a3 = {'a', 'z'};
        System.out.println(a3[0] + " " + a3[1]);
    }
}
```

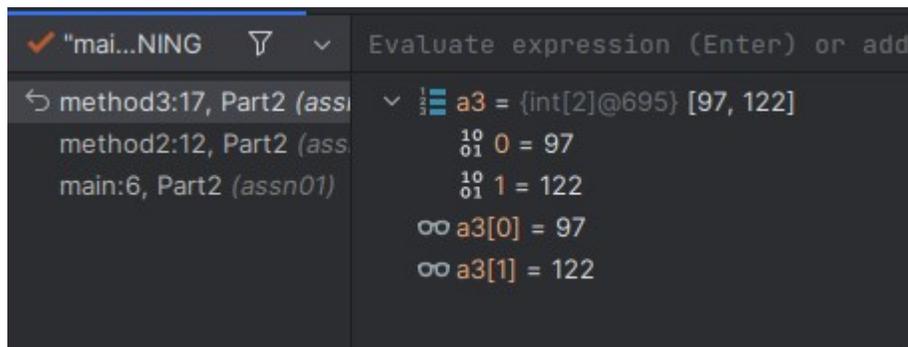
- b) Setup a breakpoint in **method3** before it exits, and debug the program to stop at this breakpoint to show the following: The **main**, **method2** and **method3** stacks and their **variables** with expanded details. (You must capture these images and show the values below).



```
✓ "mai...NING" [Filter] [Dropdown] Evaluate expression (Enter)
method3:17, Part2 (assn01) args = {String[0]@698} []
method2:12, Part2 (assn01) sh = 32767
main:6, Part2 (assn01)
```



```
✓ "mai...NING" [Filter] [Dropdown] Evaluate expression (Enter)
method3:17, Part2 (assn01) n2 = 2748
method2:12, Part2 (assn01)
main:6, Part2 (assn01)
```



```
✓ "mai...NING" [Filter] [Dropdown] Evaluate expression (Enter) or add
method3:17, Part2 (assn01) a3 = {int[2]@695} [97, 122]
method2:12, Part2 (assn01) 0 = 97
main:6, Part2 (assn01) 1 = 122
a3[0] = 97
a3[1] = 122
```

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

The stack memory contains the function calls for main(), method2(), and method3() along with locally declared primitives such as sh and n2 and pointers to variables in the heap. The heap memory contains the objects a3 and args (passed to main).

d)

- (i) Can you write an equation showing how the required value of 'sh' can be calculated (based on number of bits)?

A short is a two-byte signed integer value which means that the first bit defines the sign and the following 15 bits define the value. This means that the maximum value would be represented by the following equation:

$$\sum_{i=0}^{14} 2^i = 2^{15} - 1 = 32767$$

- (ii) show how 'n2' can be calculated?

In hex, A → C is equivalent to 10 → 12. When represented as the hexadecimal "ABC":

$$ABC = 10(16^2) + 11(16^1) + 12(16^0) = 2748$$

- (iii) Explain how the 2 values printed out in method3 were obtained.

Those values are the ASCII representation of the char values 'a' and 'z', the first letter a is 97, and 25 letters later is 122 which is 'z'