Swinburne University of Technology

COS20007 Object Oriented Programming

The Stack and Heap

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Task 3.2P Answer Sheet

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1. In 2.2P, how many Counter objects were created?

Ans: We created 2 objects: Counter 1 and Counter 2.

2. Variables declared without the "new" keyword are different to the objects created when we call "new". Referring to the main method in task 2.2P, what is the relationship between the variables initialised with and without the "new" keyword?

Ans: The 'new' keyword is used to create new instances of the class. Each instance has a separate memory. When we create an instance, a memory block is created in stack which stores the address of a memory block in heap. Like in 2.2 Main program we first instantiate an array myCounters which creates a memory spot in stack which further pinpoints to the actual array stored in heap by using new keyword to create individual items of the array. Now the variable myCounters[2] is a reference to the previous instance of the myCounter at index 0. It does not make a memory block for itself but points to the previously created memory block.

3. In 2.2P, explain why resetting the counter in myCounters[2] also changed the value of the counter in myCounters[0].

Ans: Because of this:

```
myCounters[2] = myCounters[0];
```

if we do something to one, it happens to the other because they're both pointing at the same Counter object. Hence, resetting myCounter[2] also resets the myCounters[0]. It is used as a reference object which does not create a new memory block for itself but uses the memory allocated to the object at index 0.

4. The key difference between memory on the heap and memory on the stack is that the heap holds "dynamically allocated memory". What does this mean? In your answer, focus on the size and lifetime of the allocations.

Ans. Instead of allocating memory for function calls beforehand, Dynamically allocated memory can be used to ask for memory when the program is running. We usually use it when we don't know the size and lifetime we will need. Memory on heap has longer lifetime as we can control it. Memory in the stack has fixed size allocation and smaller lifetime.

5. Are objects allocated on the heap or the stack? What about local variables?

Ans: Objects are allocated on the heap, because we are not sure of the memory we will need for the object hence, memory on heap which is dynamic can be used. Whereas, for variables we use stack, because we can define the memory when the function is called.

6. What does the new() method do when called for a particular class, and what does it return?

Ans: The new() method creates a new object for the class. And, it return reference for the object that we created.

7. Assuming the class Counter exists in my project, if I wrote the code “Counter myCounter;” (note there is no “=”), what value would myCounter have? Why?

Ans: Counter myCounter declares a variable from the counter class and it will not have any value because we just declared it and not assigned any value to it.

8. Based on the code you wrote in task 2.2P, draw a diagram showing the locations of the variables and objects in main and their relationships to one another.