

## 3.2P: Answer Sheet

Recall task 2.2P *Counter Class* and answer the following questions.

1. How many *Counter* objects were created?

Two counters.

2. Variables declared without the **new** keyword are different to the objects created using **new**. In the **Main** function, what is the relationship between the variables initialized with and without the **new** keyword?

The object that used new keyword is stored in the heap and the one that created without new keyword is stored on the stack. The main purpose of them will be the same but only the memory location and the lifetime will be different.

3. In the **Main** function, explain why the statement **myCounters[2].Reset()**; also changes the value of **myCounter[0]**.

As both the counters are located in heap and pointing towards to the same object, the changes doing to the myCounters[2] affect the myCounters[0].

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

The dynamically allocated memory status the memory that set aside as the program running. The heap and the stack are two different places where the program store the data. But they are different due to certain reasons. Heap has a wide range of fields so that you can build any kind of data structures of any size while the lifetime of that object is constant until you tear it down. When we get the Stack, it has a fixed amount of space for each object. We cannot change the allocated space for it while the program is running. When we get the lifetime allocation of the Stack, it's temporary. Once the object's job done it automatically returned to the stack, making room for another one.

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

Objects are being allocated on the Heap while the local variables are allocated on the Stack.

6. What is the meaning of the expression **new** *ClassName*(), where *ClassName* refers a class in your application? What is the value of this expression?

New() is an operator which will be used to create objects/classes, while it initialize the fields into the default values and returns the relevant reference for it.

7. Consider the statement “*Counter myCounter;*”. What is the value of **myCounter** after this statement? Why?

In this case if we haven't use “=” sign, there will no objects be created. So that it will be stored as a null value which cannot be used for future uses. The reason is that it's a reference variable, without any specific thing it points to nothing.

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

