Java Programming

7-2: Java Memory Structure

Practice Activities

Lesson Objectives:

- Introduce Java Heap Memory
- Garbage collection
- Analyze the Memory allocation in JVM

Vocabulary:

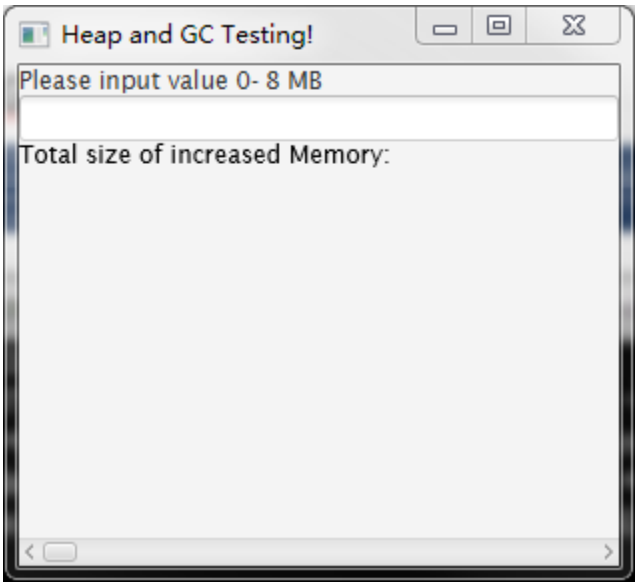
Identify the vocabulary word for each definition below.

	A data area from which memory for all class instances and arrays is allocated
	The GC which collects garbage from the Young space (Eden and Survivor spaces)
	The memory area that contains the class metadata.
	The GC that collects garbage from the Tenured space.

Try It/Solve It:

Run the Testing Program

java -verbose:gc -Xms20M -Xmx20M -Xmn10M -XX:+PrintGCDetails -XX:SurvivorRatio=8 -XX:+PrintCommandLineFlags -XX:+PrintTenuringDistribution -jar TestMemory.jar



Give different size of Memory to check the activities of JVM GC.

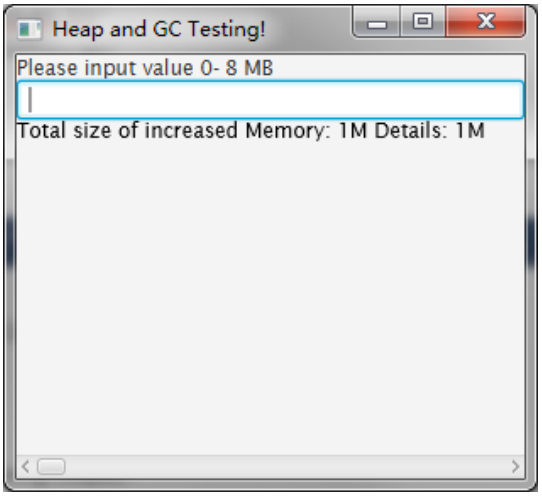
1. Check the output from the console of the Java command. How Many GC happened during the startup of the program?

```
[GC (Allocation Failure)
Desired survivor size 1048576 bytes, new threshold 7 (max 15)
[PSYoungGen: 8192K->1006K(9216K)] 8192K->1842K(19456K), 0.0071282 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
[GC (Allocation Failure)
Desired survivor size 1048576 bytes, new threshold 7 (max 15)
[PSYoungGen: 9198K->1016K(9216K)] 10034K->3271K(19456K), 0.0067886 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
[GC (Allocation Failure)
Desired survivor size 1048576 bytes, new threshold 7 (max 15)
[PSYoungGen: 9208K->1016K(9216K)] 11463K->3937K(19456K), 0.0082836 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
```

2. Use jps to list the active Java process.

3. Use the jstat command to check the output and find the change of heap.

4. Give the value of 1M input to the application.



- Analyze the following output: from the java console

[GC (Allocation Failure)

Desired survivor size 1048576 bytes, new threshold 7 (max 15)

[PSYoungGen: 8849K->1016K(9216K)] 11741K->9410K(19456K), 0.0281064 secs] [Times:user=0.03 sys=0.00, re-al=0.03 secs]

[Full GC (Ergonomics) [PSYoungGen: 1016K->0K(9216K)] [ParOldGen: 8394K->7305K(10240K)] 9410K->7305K(19456K), [Metaspace: 14327K->14327K(1062912K)], 0.0395641 secs]

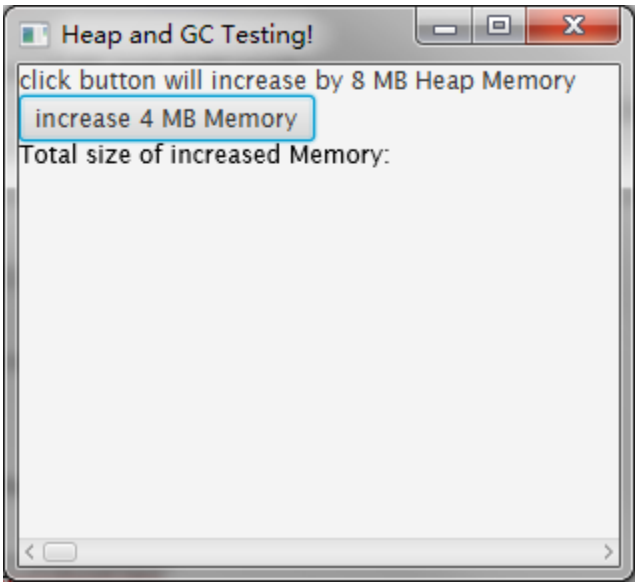
Times: user=0.03 sys=0.00, real=0.04 secs]

- Analyze the data from the output of jstat

5. Print out the time of the GC happened.

6. Run the application sizetest.jar:

```
java -verbose:gc -Xms20M -Xmx20M -Xmn10M -XX:+PrintGCDetails -XX:SurvivorRatio=8  -
XX:+PrintTenuringDistribution  -XX:PretenureSizeThreshold=20000 -jar sizetest.jar
```



In this lab, the program will generate 4 MB heap memory, but the data will reside in the Tenured area, not in the Young Eden space.

7. Check the output from the jstat utility. Where is the 4 MB heap memory located?