

Java Basics Assignment

1) Default Heap Size of JVM

Java8 takes Larger of 1/6th of your physical memory for your Xmsize (Minimum HeapSize) and Smaller of 1/4th of your physical memory for your -Xmxsize (Maximum HeapSize). If physical memory of 8GB RAM, you will have Xmsize as Larger of $8 \times (1/6)$ and Smaller of -Xmxsize as $8 \times (1/4)$.

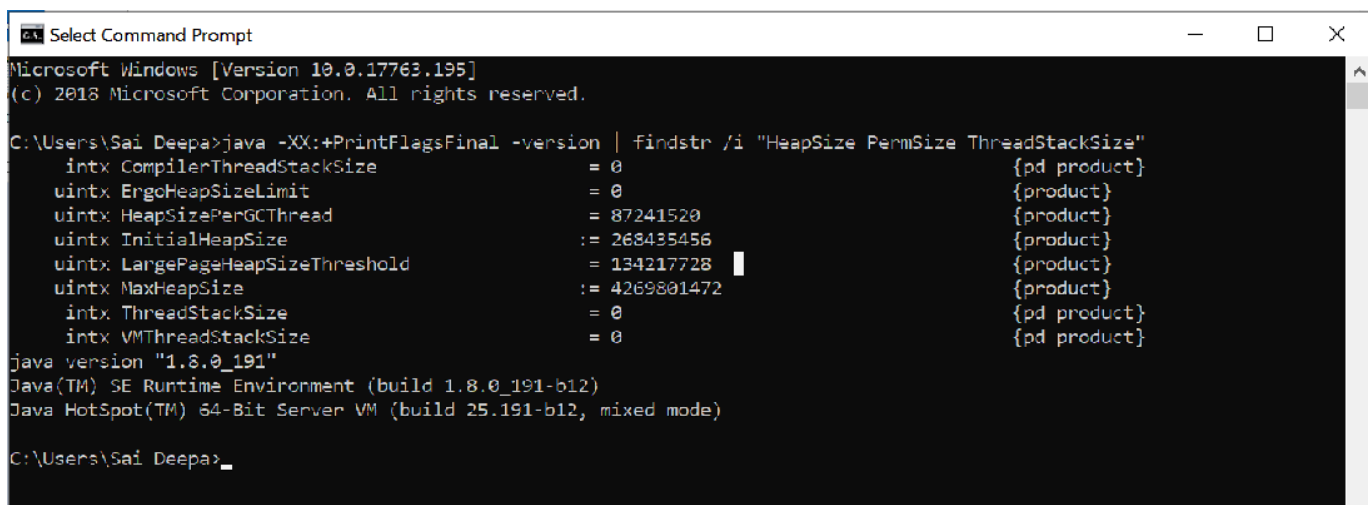
Java 8 takes:

1. 1/6th of the physical memory for Xmsize(Min Heap Size)
2. 1/4th of the physical memory for Xmxsize(Max Heap Size)

Example:

Suppose RAM: 16GB then

1. Xmsize : $16 \times (1/6) = 2.6\text{GB}$
2. Xmxsize: $16 \times (1/4) = 4\text{GB}$

A screenshot of a Windows Command Prompt window titled "Select Command Prompt". The window shows the output of the command `java -XX:+PrintFlagsFinal -version | findstr /i "HeapSize PermSize ThreadStackSize"`. The output lists various JVM flags and their values, including `intx: CompilerThreadStackSize = 0`, `uintx: ErgoHeapSizeLimit = 0`, `uintx: HeapSizePerGCThread = 87241520`, `uintx: InitialHeapSize := 268435456`, `uintx: LargePageHeapSizeThreshold = 134217728`, `uintx: MaxHeapSize := 4269801472`, `intx: ThreadStackSize = 0`, and `intx: VMThreadStackSize = 0`. It also shows the Java version as "1.8.0_191" and the runtime environment as "Java(TM) SE Runtime Environment (build 1.8.0_191-b12)".

```
Microsoft Windows [Version 10.0.17763.195]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\Sai Deepa>java -XX:+PrintFlagsFinal -version | findstr /i "HeapSize PermSize ThreadStackSize"
    intx: CompilerThreadStackSize           = 0                      {pd product}
    uintx: ErgoHeapSizeLimit                = 0                      {product}
    uintx: HeapSizePerGCThread              = 87241520               {product}
    uintx: InitialHeapSize                  := 268435456            {product}
    uintx: LargePageHeapSizeThreshold       = 134217728             {product}
    uintx: MaxHeapSize                      := 4269801472          {product}
    intx: ThreadStackSize                   = 0                      {pd product}
    intx: VMThreadStackSize                 = 0                      {pd product}
java version "1.8.0_191"
Java(TM) SE Runtime Environment (build 1.8.0_191-b12)
Java HotSpot(TM) 64-Bit Server VM (build 25.191-b12, mixed mode)

C:\Users\Sai Deepa>
```

2) Code to increase the memory size(set max heap size)

```
-Xmx39m
```

3) Out Of Memory Exception

Program

```
public class App
{
    public static void main( String[] args )
    {
        Double[] a;
        System.out.println("Starting with JVM size max 20mb");

        while (true) {
            a = new Double[1000];
        }
    }
}
```

Given max jvm size of 20mb

```
Sai Deepa@SAIDEEPA-HYD-01 MINGW64 /d/training/temp
$ java -Xmx20m App
Starting with jvm size max 20mb
Exception in thread "main" java.lang.OutOfMemoryError: GC overhead limit exceeded
    at App.main(App.java:10)
```

Observations in JMC

GC Tables						
PS Scavenge PS MarkSweep						
Name	Value	Type	Update Interval	Description		
Total Collection Time	8 s 309 ms	Duration	Default	The accumulated collection time.		
Collection Count	17,371	Number	Default	The total number of collections t...		
GC Start Time	36 s 769 ms	Duration	Default	The start time of this GC since the...		
GC End Time	36 s 794 ms	Duration	Default	The end time of this GC since the ...		
GC Duration	25 ms	Duration	Default	The elapsed time of this GC.		
GC ID	17,371	Number	Default	The identifier of this GC which is t...		

Active Memory Pools						
These are the currently available memory pools						
Filter Column Pool Name						
Pool Name	Type	Used	Max	Usage	Peak Used	Peak Max
Metaspace	NON_HEAP	8.97 MB	N/A	N/A	9.07 MB	N/A
PS Old Gen	HEAP	13.48 MB	13.50 MB	99.84%	13.50 MB	13.50 MB
PS Eden Space	HEAP	4.71 MB	5.50 MB	85.70%	5.50 MB	5.50 MB
Code Cache	NON_HEAP	4.46 MB	240.00 MB	1.86%	4.49 MB	240.00 MB

Without limiting JVM size Observations

Program

```
public class App
{
    public static void main( String[] args )
    {
        Double[] a;
        System.out.println("Starting JVM with its usual size");

        while (true) {
            a = new Double[1000];
        }
    }
}
```

Not limiting JVM size

```
Sai Deepa@SAIDEEPA-HYD-01 MINGW64 /d/training/temp
$ java App
Starting JVM with its usual size
```

Observations in JMC for without limiting JVM size

GC Tables

PS Scavenge | PS MarkSweep

Name	Value	Type	Update Interval	Description
Total Collection Time	2 s 292 ms	Duration	Default	The accumulated collection time.
Collection Count	3,817	Number	Default	The total number of collections t...
GC Start Time	3 min 54 s	Duration	Default	The start time of this GC since the...
GC End Time	3 min 54 s	Duration	Default	The end time of this GC since the ...
GC Duration	1 ms	Duration	Default	The elapsed time of this GC.
GC ID	3,817	Number	Default	The identifier of this GC which is t...

Active Memory Pools

These are the currently available memory pools

Filter Column | Pool Name

Pool Name	Type	Used	Max	Usage	Peak Used	Peak Max
Metaspace	NON_HEAP	9.14 MB	N/A	N/A	9.14 MB	N/A
PS Old Gen	HEAP	68.89 MB	2.65 GB	2.54%	68.89 MB	2.65 GB
PS Eden Space	HEAP	18.49 MB	1.32 GB	1.36%	1.32 GB	1.32 GB
Code Cache	NON_HEAP	4.68 MB	240.00 MB	1.95%	4.75 MB	240.00 MB

4) Spring Boot Application

The screenshot shows an IDE with a Java file named `AssignmentDemoApplication.java`. The code is as follows:

```
1 package com.example.AssignmentDemo;
2
3 import org.springframework.boot.SpringApplication;
4
5
6 @SpringBootApplication
7 public class AssignmentDemoApplication {
8
9     public static void main(String[] args) {
10         SpringApplication.run(AssignmentDemoApplication.class, args);
11     }
12 }
13
14
15
```

The console output shows the application starting successfully:

```
AssignmentDemoApplication [Java Application] C:\Program Files\Java\jre1.8.0_191\bin\javaw.exe (14-Jan-2019, 7:15:30 am)

:: Spring Boot :: (v2.1.2.RELEASE)

2019-01-14 07:15:31.202 INFO 14040 --- [main] c.e.A.AssignmentDemoApplication : Starting AssignmentDemoApplication on SAIDEEPA-HYD-0
2019-01-14 07:15:31.206 INFO 14040 --- [main] c.e.A.AssignmentDemoApplication : No active profile set, falling back to default profi
2019-01-14 07:15:34.059 INFO 14040 --- [main] o.s.b.web.embedded.netty.NettyWebServer : Netty started on port(s): 8080
2019-01-14 07:15:34.061 INFO 14040 --- [main] c.e.A.AssignmentDemoApplication : Started AssignmentDemoApplication in 3.317 seconds (
```