# Oracle MOOC: JVM Troubleshooting

## Lab 2: Dissecting Memory Problems

In this lab, you'll run two test programs that fail with an `OutOfMemoryError`. Your goal is to dissect the error and find the cause of the problem. Begin by unzipping `Lab2_Files.zip`.

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### Part 1: Monitor memory usage of the program `OOM` using JConsole and Java Mission Control

1.  Compile and run the Java program `OOM`.
    a.  Open a command prompt or terminal.
    b.  Compile the program by typing `javac OOM.java`
    c.  Run the program by typing `java –Xmx30m OOM`

2.  Observe the output.
    a.  Notice the program fails with '`OutOfMemoryError: Java heap space`'.
    b.  Reason out why this happens and which memory space managed by the JVM is getting exhausted.
    c.  Inspect the source code of the program to understand why the program fails with `OutOfMemoryError`.

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### Part 2: Monitor memory usage of the program `LoadClasses` using JConsole and Java Mission Control

3.  Compile and run the Java program `LoadClasses`.
    a.  Open a command prompt or terminal.
    b.  Compile the program by typing:

        `java –XX:MaxMetaspaceSize=20m LoadClasses`

4.  Observe the output.
    a.  Launch JConsole and attach it to the LoadClasses process.
    b.  Under the Memory tab, select Memory Pool "Metaspace" Chart and observe the Metaspace usage.
    c.  Let the program run for 10-15 minutes.
    d.  You'll notice a saw-tooth memory usage graph. Why does this pattern occur?
    e.  Look at the program code to understand what is happening and how that can be avoided.