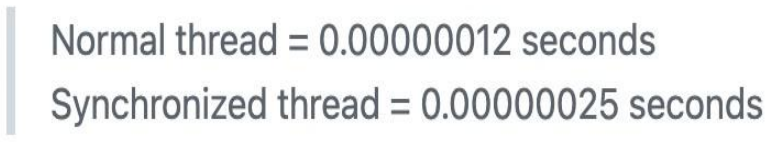
STIWK3014 REAL TIME PROGRAMMING
Tutorial / Exercise 8: TestAtomicInterger1p.java & Synchronization.java

Tasks 2:

- Write a program to compare execution times between normal thread and synchronized thread. The results should be displayed in 'second'.
- Sample output:



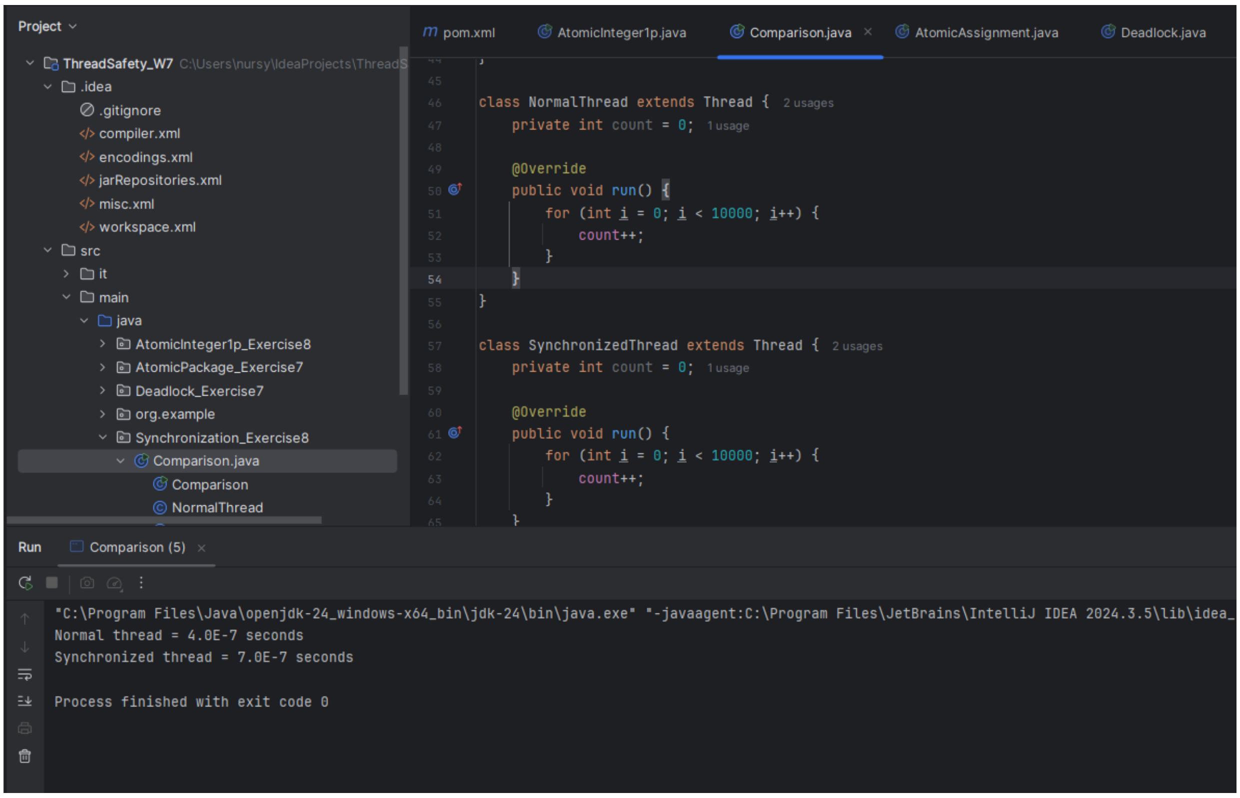
```
Normal thread = 0.00000012 seconds
Synchronized thread = 0.00000025 seconds
```

- For normal thread (unsynchronized), kindly create a class: `NormalThread extends Thread {}`
- To enables the synchronized thread, kindly create a class: `SynchronizedThread extends Thread {}`
- The number of test thread is 10 threads.
- Copy and paste the sample code and the output for the submission. (Rename as: Comparison of Normal Thread and Synchronized Thread and the Outputs)

Code

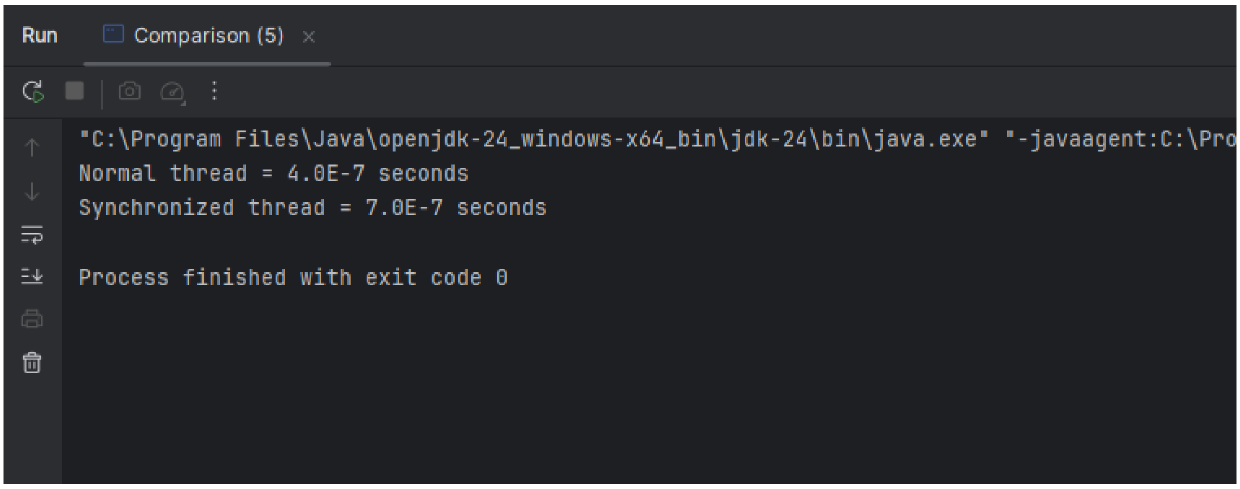
```
package Synchronization_Exercise8;

public class Comparison {

    public static void main(String[] args) throws InterruptedException {

        int threadCount = 10;

        //Normal
        Thread[] normalThreads = new NormalThread[threadCount];

        long normalStartTime = System.nanoTime();
        long normalEndTime = System.nanoTime();
        double normalTime = (normalEndTime - normalStartTime) / 1_000_000_000.0;

        for (int i = 0; i < threadCount; i++) {
            normalThreads[i] = new NormalThread();
            normalThreads[i].start();
        }

        for (Thread t: normalThreads) {
            t.join();
        }

        //Synchronized
        Thread[] syncThreads = new SynchronizedThread[threadCount];

        long syncStartTime = System.nanoTime();
        long syncEndTime = System.nanoTime();
        double syncTime = (syncEndTime - syncStartTime) / 1_000_000_000.0;

        for (int i = 0; i < threadCount; i++) {
            syncThreads[i] = new SynchronizedThread();
            syncThreads[i].start();
        }

        for (Thread t: syncThreads) {
            t.join();
        }

        System.out.println("Normal thread = " + normalTime + " seconds");
        System.out.println("Synchronized thread = " + syncTime + " seconds");
    }
}

class NormalThread extends Thread {
    private int count = 0;

    @Override
    public void run() {
        for (int i = 0; i < 10000; i++) {
            count++;
        }
    }
}

class SynchronizedThread extends Thread {
    private int count = 0;

    @Override
    public void run() {
        for (int i = 0; i < 10000; i++) {
            count++;
        }
    }
}
```

Output



```java
}

class NormalThread extends Thread {  2 usages
    private int count = 0;  1 usage

    @Override
    public void run() {
        for (int i = 0; i < 10000; i++) {
            count++;
        }
    }
}

class SynchronizedThread extends Thread {  2 usages
    private int count = 0;  1 usage

    @Override
    public void run() {
        for (int i = 0; i < 10000; i++) {
            count++;
        }
    }
```

```
"C:\Program Files\Java\openjdk-24_windows-x64_bin\jdk-24\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2024.3.5\lib\idea_
Normal thread = 4.0E-7 seconds
Synchronized thread = 7.0E-7 seconds

Process finished with exit code 0
```



```
"C:\Program Files\Java\openjdk-24_windows-x64_bin\jdk-24\bin\java.exe" "-javaagent:C:\Pro
Normal thread = 4.0E-7 seconds
Synchronized thread = 7.0E-7 seconds

Process finished with exit code 0
```

Plagiarism
No mark will be given for plagiarism activities especially those copied from ChatGPT.

Submission:

Platform: 1. Online Learning - Sample Coding & Output in PdF form
2. GitHub – Upload the file and attach your GitHub link repositories.

Date: 11 May 2025 (Sunday, before 12.30 noon)