

1. Open Windows command prompt
2. Change directory to the folder where Lesson5Concurrent.java file and its class files are stored (Lesson5Concurrent.class, WithoutLock.class, ReentrantLockCounter.class, and AtomicLongCounter.class).
3. Enter **java Lesson5Concurrent -NoLocking** on the command line to start the counting of characters without using any locking.
Enter **java Lesson5Concurrent -ReentrantLock** on the command line to start the counting of characters using Reentrant locking mechanism.
Enter **java Lesson5Concurrent -AtomicLong** on the command line to start the counting of characters using any AtomicLong locking mechanism.
4. The results for 1 thread

```
C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -NoLocking
Number of threads: 1
WithoutLock Count : 975

C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -ReentrantLock
Number of threads: 1
ReentrantLock Count : 975

C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -AtomicLong
Number of threads: 1
AtomicLong Count : 975
```

The results for 8 threads

```
C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -NoLocking
Number of threads: 8
WithoutLock Count : 7621

C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -ReentrantLock
Number of threads: 8
ReentrantLock Count : 7800

C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -AtomicLong
Number of threads: 8
AtomicLong Count : 7800
```

The results for 16 threads

```
C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -NoLocking
Number of threads: 16
WithoutLock Count : 14874

C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -ReentrantLock
Number of threads: 16
ReentrantLock Count : 15600

C:\Users\hole1\Google Drive\LearnJava\JavaAdv\Lesson5Concurrent-Annie-Yen>java Lesson5Concurrent -AtomicLong
Number of threads: 16
AtomicLong Count : 15600
```

When the number of threads increases up to 8 or 16, the value reported by count for the -NoLocking option becomes the lowest, suggesting that the run of program without locking starts to have threads interleaving. The locking mechanisms are needed for serializing the access to the run method, preventing threads from interleaving. Therefore, when the number of threads increases, the value of count is the same for option -ReentrantLock and -AtomicLong, suggesting that these mechanisms are capable of securing access to run method for multiple threads.