For this program, you will write two versions of functions to compute the Nth Fibonacci number, where fib(n) is defined as:

$$fib(n) = \begin{cases} 0, where\ n = 1 \\ 1, where\ n = 2 \\ fib(n-1) + fib(n-2), where\ n > 2 \end{cases}$$

The purpose of this exercise is to write the Fibonacci computation using a traditional loop to compute the value, and write the computation as a recursive function solution. You should see that the performance of the recursive version is poor for larger value of N.

Additionally, there is a library <chrono> that will allow you to measure elapsed time in small enough units to detect the differences in execution speeds. This library makes use of templates in C++ so the type declarations look quite different from what we have used in the past. Here is an example demonstrating the use of the library to measure time before and after an execution:

```
// the following two statements declare instances of the clock time

std::chrono::time_point<std::chrono::steady_clock> before;
std::chrono::time_point<std::chrono::steady_clock> after;

int elapsedTime;

// the following statement gets the current clock time from the system
before = std::chrono::steady_clock::now();

//. . . perform some execution here

after = std::chrono::steady_clock::now();

// the following statement uses the library to compute the difference in the
// two clocks and covert the value into microseconds

elapsedTime = std::chrono::duration_cast<std::chrono::microseconds> (after -
before).count();
```

Below is shown a screen capture of what the program would look like when I tested it. Note, your system computation speeds will vary! The values in ==YELLOW== are what were entered by the user in this example execution.

```
Which value of Fibonacci Sequence to compute (N)? 40

The 40th Fib number is: 63245986
The elapsed time for the loop version in microseconds is: 1505

The 40th Fib number is: 63245986
The elapsed time for the recursive version in microseconds is: 1104364

End Program - Goodbye.
```

HINTS/SUGGESTIONS:

- You may want to use the long int type, rather than int, for your Fibonacci computation.
- What happens if you enter a larger N, such a s 50? Does your program still behave (*mine doesn't! – for two reasons*)