Programming Assignment #1: Prime Checker

(due 23:59, Oct 7th, 2020)

Introduction:

RSA is one of the first practicable public-key cryptosystems and is widely used for secure data transmission. In such cryptosystems, primes play an important role. Hence, how to efficiently separate the primes from the composite numbers is a critical job in today's internet world.

Objective:

In this programming assignment, you are asked to write a C++ program to perform prime checker through a defined integer interval, and then return the number of primes within the interval.

Provided files:

(1) **main.cpp**: it checks the answer of *PrimeChecker()* and can be modified for debugging.

(2) **PrimeChecker.cpp** & **PrimeChecker.h**: these are the program files you need to implement. The function *PrimeChecker()* receives two unsigned long integer a and b, and returns the number of primes within the integer interval [a,b].

(3) **example**: this is an exemplary input test case, which can be used to test your program. It can be modified if you want to change it.

Implementation Details:

a	b	Prime numbers within the interval [a,b]	Number of primes
2	7	2,3,5,7	4
1355633696	1355633704	n/a	0

The numbers **a** and **b** are the input integers of the function *PrimeChecker()*, and the **number of primes** are the golden answers that should be returned by the function. The number returned by *PrimeChecker()* will then be used in *main()* to check if it is the correct answer.

The input file will look like this:

```
 1   1268080854 1268081064 8
 2   1028961968 1028962323 13
 3   1109202787 1109203007 14
 4   1153947194 1153948004 37
 5   1932074676 1932074814 4
 6   1599477167 1599477516 20
 7   518432803 518433336 22
 8   1355633696 1355633704 0
 9   629324533 629324755 15
10   1850251556 1850252337 34
```

There are 1000 test patterns in the example case. The first and the second numbers are input a and input b (ex. 1268080865 and 1268081064), and the last number is the golden answer (ex. 8).

*Note that the minimum and maximum of the input numbers are 0 and $2^{64}-1$ (about 1.8446744e19) respectively. (1.8446744e19 is the maximum number of unsigned long integer in UNIX/Linux).

Language:
C or C++.

Platform:
You may develop your software on UNIX/Linux.
Compile: $ g++ main.cpp PrimeChecker.cpp
Execution: $ ./a.out

Submission:
Please compress the following files into a zip file and name it by your *__name and student ID__*. For example, **"HW1_0850232_李嘉運.zip"**. Then upload the compressed file to the new E3 website by the deadline (Oct 7th,2020).

(1) PrimeChecker.h

(2) PrimeChecker.cpp

Grading policy:
(1) Example case correctness (60%)

(2) Hidden case correctness (10%)

(3) Hidden case ranking (30%, ranked by run time)