

Programming Assignment #1: Prime Checker

(due 23:59, Oct 8th, 2019)

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_0750264_陳珮融.zip**”. Then upload the compressed file to the new E3 website by the deadline (**Oct 8th, 2019**).

- (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)