Programming Design, Spring 2015
Homework 2

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To submit your work, please upload a PDF file for Problems 1 and 2 and a CPP file for Problem 3 to PDOGS at http://pdogs.ntu.im/judge/. Each student must submit her/his individual work. No hard copy. No late submission. The due time of this homework is ***8:00am, March 16, 2014***. Please answer in either English or Chinese.

Before you start, please read Sections 3.6, 3.10–3.12, and 4.1–4.11 of the textbook.[1]

Problem 1

(20 points) Consider the following program (similar to the one on Page 43 of the slides for March 9). The programmer who wrote this program hopes that the loop is terminated if and only if the user enters y or Y.

```
#include <iostream>
using namespace std;

int main()
{
  char a = 0;
  cin >> a;

  while (a != 'y' && a != 'Y')
  {
    cin >> a;
  }

  return 0;
}
```

(a) (10 points) Is this program correct? Explain why or why not. In particular, should the logic operator in the while condition-checking section be && or ||?

(b) (10 points) Try to execute this program and enter multiple characters with no y and Y (e.g., try to enter abc and then press "enter"). What do you observe? Explain why.

Problem 2

(10 points) Given an integer i whose value is 5, is the statement `i = i + 1;` equivalent to `i++;` or `++i;`? Explain why.

Problem 3

(70 points) Given two integers $n \in \{1, 2, ..., 1000\}$ and $m \in \{0, 1, 2, ..., 9\}$, please list all the prime numbers that are smaller than n and having its last digit not equal to m.[2] Below are some examples:

[1] The textbook is *C++ How to Program: Late Objects Version* by Deitel and Deitel, seventh edition.

[2] You may find the following C++ built-in operators/functions helpful: ^, %, sqrt(), and power(). To use these functions, include the C++ library <cmath>. To learn how to use these functions, check out the documents for <cmath> by yourself.

- Input: $n = 20$ and $m = 4$; output: $2, 3, 5, 7, 11, 13, 17, 19$.
- Input: $n = 20$ and $m = 3$; output: $2, 5, 7, 11, 17, 19$.
- Input: $n = 19$ and $m = 3$; output: $2, 5, 7, 11, 17$.

Input/output formats

There are 35 input files. In each file, there are 2 nonnegative integers n and m, separated by a white space, and then a newline character. The first value $n \in \{1, 2, ..., 1000\}$ is the upper bound of your search space, and the second value $m \in \{0, 1, ..., 9\}$ is the digit for you to avoid in the last digit of your outputs. For each file, your program should output all the prime numbers that are smaller than n and having its last digit not equal to m. Each two of these output values should be separated by one white space. At the end of the output line, append one newline character.

To read inputs from the files on PDOGS, simply use `cin` as if a user will enter those input values according to the above rules. Then simply output your results using `cout` as if you are required to print out values on your screen according to the above rules. PDOGS will execute your program for 35 times, each time with a different input file. The 35 sets of outputs will be graded separately.

What should be in your source file

Your .cpp source file should contain C++ codes that will both read testing data and complete the above task. For this problem, you are NOT allowed to use techniques not covered in lectures, except `break` and `continue`. Finally, you should write relevant comments for your codes.

Grading criteria

- 70% of your grades for this program will be based on the correctness of your output. PDGOS will compile your program, feed testing data into your program, and check the correctness of your outputs. Each fully correct set of outputs gives you 2 points.
- 30% of your grades for this program will be based on how you write your program, including the logic and format. Please try to write a robust, efficient, and easy-to-read program.