OOP (1010), Summer 2015

Lab 2

This lab is an exercise of `auto` and `decltype`. In this lab, **all declarations of all variables including function parameters and return type must be declared by `auto` or `decltype`.** This lab has three parts as follows:

1. Declare three global variables (gA, gB, and gC) by `auto` or `decltype` to store the **maximum** values of `int`, `unsigned int`, and `unsigned long long` respectively. And `cout` them.

2. Write a function named **`isPrime`** that can check whether a 64-bit unsigned integer, **`n`**, is a prime or not. The speed of isPrime must be limited to equal or less than $\mathbf{n}^{0.5}$.
   [Hint]
   If n = ab, and a ≤ b, where n, a, and b are integers. Assuming that $a^2 > n$, then n = ab ≧ a^2 > n causes contrary. Therefore, $a^2 \leq n$.

3. Given an integer n = $10^k x_k + 10^{k-1} x_{k-1} + \ldots + 10^0 x_0$, please implement the following equation:

   $$\texttt{digitSum}(n) = x_k{}^{x_k} + x_{k-1}{}^{x_{k-1}} + \cdots + x_0{}^{x_0} \ ,$$

   where $0^0 = 1$.
   For gA, gB, and gC declared in Part 1, you should design three functions with different parameter types to implement `digitSum`(n). That means you are requested to design three versions of `digitSum`(n) that can deal with gA, gB, and gC, respectively. Finally, using `isPrime` to check whether `digitSum`(gA), `digitSum`(gB), and `digitSum`(gC) are primes.