COMP SCI 1200 Summer 2017
Programming Assignment 2
Prime Factorization

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Synopsis

The goal of this assignment is for you to apply your understanding of the Unique Factorization of Integers Theorem to automate prime factorization.

Feel free to consult with your favorite search engine, the instructor, and your fellow classmates when you need help. Just make sure that what you turn in is your own work!

Problem statement

Write a program which takes as input a positive integer and produces as output its prime factorization in Standard Factored Form. The most straight-forward, but for large numbers very inefficient, method is *trial division*, which checks whether each prime number less than the number to be factored is a factor of that number.

For example, if the user inputs 18, your output may look something like this:

```
18 = 2 * 3^2
```

For a fun test, try your program on 13195.

Resubmissions, penalties, documents, and bonuses

If you submit before the deadline, then you may resubmit up to a reasonable number of times till the deadline but not thereafter, your last on time submission will be graded. If you do not submit before the deadline, then your first late submission will be graded.

The penalty for late submission is a 5% deduction for the first 24 hour period and a 10% deduction for every additional 24 hour period. So 1 hour late and 23 hours late both result in a 5% deduction. 25 hours late results in a 15% deduction, etc. Not following submission guidelines can be penalized for up to 5%, which may be in addition to regular deduction due to not following the assignment guidelines.

Some assignments may offer bonus points for extra work, but note that the max grade for the average of all assignments is capped at 100%.

Deliverables & Due Date

The deliverables of this assignment are:

1. Your source code with at the top of each file your name and the course's name.

2. Any necessary support files such as makefiles, project files, etc.)

3. A readme file that explains how to compile/execute your submission on a Windows or Linux computer in CLC 212/213 of the Computer Science Building.

Submit all files in a .zip, .7z, or gzipped tar ball format. The due date for this assignment is 11:59 PM on Friday June 30, 2017.

Grading

The maximum number of regular points you can get is 50. The point distribution is as follows:

Algorithmic	30
Good programming practices including code reliability and commenting	15
Output to user	5

Up to 50 bonus points can be earned by speeding up the prime factorization. The cleverer your speed ups, the more bonus points you get. There are many speedups possible, such as the Sieve of Eratosthenes, Fermat's factorization method, Pollard's ρ-algorithm, Quadratic Sieve, General Number Field Sieve, etc.

If you do some optimizations, for a very very fun test, try 600851475143. (If you want to do the very very fun test, in C++ you may need to use a long long to store your number.)