

OpenCL Closed Contest Problem Specifications

University of Waterloo Computer Science Club and Advanced Micro Devices

February 26, 2012

You must be registered in order to submit solutions to these problems. All solutions will be submitted and judged electronically. To submit solutions, navigate to <http://csclub.uwaterloo.ca/openc1/submit>. Plagiarism or collaboration beyond the scope of your team will result in disqualification from the contest. You will have until 11:59 PM on March 2nd, 2012 to submit solutions to contest problems. Your score will be the sum of the maximum scores for each problem.

Unless otherwise specified, all problems will read input from standard input, and write output to standard output. Writes to standard error will be ignored. If you have any questions about these problem specifications or other details of the contest, please email exec@csclub.uwaterloo.ca or join [#csc-openc1](irc://irc.freenode.net) on [irc.freenode.net](irc://irc.freenode.net).

1. For the purposes of this question, a palindrome is a sequence of alphabetic characters (a-z, A-Z) which does not change when reversed.

Write a program which consumes a sequence of alphabetic characters (a-z, A-Z), and produces a newline-separated list of all palindromes which are not subsequences of other palindromes in the input. That is, if there exists a palindrome which begins at index A and ends at index B , and there exists a palindrome which begins at index C and ends at index D , then if $A \leq C$ and $D \leq B$, the palindrome between indices C and D should not be printed. Otherwise, all palindromes should be printed. For example, consider the following input:

```
fooabcbabarabaaba
```

The output of your program on this input should be:

```
oo
abcba
bab
abaraba
abaaba
```

2. Write a program which consumes the decimal (ASCII) representation of a 256-bit unsigned integer. Given that this integer is the product of exactly two prime numbers, your program must produce the two prime numbers in decimal representation, separated by a newline.
3. Given a set of line segments as input, you are to write a program which identifies and prints all points of intersection between two or more line segments.

Input will be formatted as zero or more newline-separated lines, each of which will consist of four space-separated signed integers, $\langle x_1, y_1, x_2, y_2 \rangle$. You may assume that all integers lie between -2^{31} and $2^{31} - 1$. Your program must output zero or more newline-separated lines, each of which must consist of two space-separated signed decimal numbers, $\langle x, y \rangle$, which represent the location of an intersection between line segments.

4. Given a symmetric matrix, you are to write a program which finds the largest and smallest eigenvalues of the matrix.

Input will be formatted as a series of newline-separated signed decimal numbers. The first line will specify the width and height, n , of the matrix. n^2 lines will follow, filling the input matrix by rows, left-to-right and top-to-bottom. Your program must output the smallest eigenvalue, followed by a newline, followed by the largest eigenvalue, both in signed decimal notation.