Practice Problems
7 Problems Numbered 1 Through 7
Time Limit: ∞
09.22.2006

All of these problems are *ad-hoc* problems. That is, they are meant to be solveable without the use of any fancy theory or algorithms (though that does not mean that they are easy!).

1. (Topcoder SRM 315) Continually sum of the digits of a given non-negative integer N until there is only one digit left, and print the result. Time limit: 2000 ms, $0 \leq N \leq 2^{31} - 1$, task: **dsum**.

2. (Topcoder SRM 316) You want to clean out your inbox. Once, at the beginning of checking your M e-mails, you can set the number of messages to display per page as any integer in the range $[L, H]$. Each message will be denoted as either real mail or junk mail. You can perform any of the following operations with one click: add a message to the selection, remove a message from the selection, select all messages on the current page, remove all selected messages, and advance to the next page. New messages will not appear on a page when old ones are removed, and advancing to the next page automatically deselects all previously selected messages. Return the minimal number of clicks necessary to remove your junk mail without removing any real mail, assuming you choose the optimal number of messages to display per page. Time limit: 2000 ms, $1 \leq L \leq H \leq M \leq 50$, task: **inbox**.

3. (Topcoder SRM 315) Find the number of solutions to a $4x4$ Sudoku puzzle. Time limit: 2000 ms, task: **sudo**.

4. (Topcoder SRM 314) Given a list of sides, fit sets of three sides together to make triangles with the total maximal area. Your answer should be printed to exactly 8 decimal places (use rounding, not truncation, on the last decimal place). Each side will have a length between 1 and 100, and there will be no more than 16 sides. Time limit: 2000 ms, task: **tarea**.

5. (USACO 2002) Given a set of N mountains, all in the shape of isosceles triangles twice as tall as they are wide, find the total area covered by the mountains (count overlapping areas only once). Each mountain will be specified by integer x and y coordinates, $1 \leq x, y \leq 2^{15} - 1$. Time limit: 1000 ms, $N \leq 100000$, task: **mview**.

6. (Google Codejam 2006) Given a set of N digits, and an integer K, determine, if possible, the minimum number of alterations that must be made to the digits so that their product is K. Time limit: 2000 ms, $N \leq 50$, $K \leq 2^{63} - 1$, task: **dprod**.

7. (USACO 2002) Given a 6x6 grid of digits, a transformation consists of increasing or decreasing either the major diagonal (top left to bottom right) or any row or column by one. However, under these transformations, $9 + 1 = 0$ and $0 - 1 = 9$. Given an unlimited number of transformations, what is the maximum sum we can achieve in our special number system (calculate the sum normally)? Time limit: 3000 ms, task: **hypno**.