

## Data Structure and Algorithm

### Homework #0

Due: 23:59, Thursday, February 28, 2013

TA email: dsa1@csie.ntu.edu.tw

#### ==== Homework submission instructions ====

- Submit your source code to the course SVN server ([katrina.csie.ntu.edu.tw](http://katrina.csie.ntu.edu.tw)). You should create a new folder “hw0” at the root of your repository and put your file(s) for hw0 in it.
- The file name of the source code should be “det.c”; you will get some penalties in your grade if your submission does not follow the naming rule.
- For more information about the SVN server, please see the slide from the course website. ([http://www.csie.ntu.edu.tw/~hsinmu/courses/lib/exe/fetch.php?media=dsa\\_13spring:svn\\_introduction.pptx](http://www.csie.ntu.edu.tw/~hsinmu/courses/lib/exe/fetch.php?media=dsa_13spring:svn_introduction.pptx))
- No late submission of the homework will be accepted, and you will not qualify to be registered in this course.

#### **Problem 1.**

A matrix is a rectangular array of numbers. When the number of rows and the number of columns of a matrix are the same, we called the matrix a “square matrix”. In linear algebra, the determinant is a value associated with a square matrix.

The determinant can be computed by a specific arithmetic expression with the numbers of the square matrix. We usually denote the determinant of matrix  $A$  as  $\det(A)$  or  $|A|$ .

The definition of determinant can be found on Wikipedia:

<http://en.wikipedia.org/wiki/Determinant>

*Example 1.*  $A = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 8 & 1 \\ 3 & 1 & 2 \end{bmatrix}, \det(A) = -56$

*Example 2.*  $B = \begin{bmatrix} 1 & 2 \\ 5 & 8 \end{bmatrix}, \det(B) = -2$

Write a program to calculate the value of the determinant  $\det(A)$  of a given matrix  $A$ . The input has the following format (you may download a sample of the input, "hw0\_input\_example", from the course website):

$n \leftarrow$  The number of rows (the number of columns) of  $A$   
 $a_{11} a_{12} \dots \dots a_{1n} \leftarrow$  the  $n$  numbers of the first row  
 $a_{21} a_{22} \dots \dots a_{2n} \leftarrow$  the  $n$  numbers of the second row  
 $\vdots$   
 $a_{n1} a_{n2} \dots \dots a_{nn} \leftarrow$  the  $n$  numbers of the  $n$ -th row

Because the final determinant value could be too large or too small to be stored in a variable, we ask you to output **det(A) modulo 1000000007** in one line.

You can utilize the following assumptions:

1. Every entry of the matrix from the input can be stored in a 32-bit integer.
2.  $1 \leq n \leq 10$ .
3. Take the input from the standard input device (stdin) and output to the standard output device (stdout).