**COMP 1011 Programming Fundamentals**

# Laboratory Seven: Array

## Problem: Matrix Power

### Problem description

The power of a square matrix $A^n$ is defined as follows:

$$A^n = \begin{cases} A^{n-1} \cdot A & n > 0 \\ I & n = 0 \end{cases}$$

*I* is an identify matrix (https://en.wikipedia.org/wiki/Identity_matrix).

Design a function as follows to calculate the power of a square matrix under a given module base.

*void matrix_power(int A[][N], int d, int n, int x, int res[][N])*

- **Input & output requirements**

  Input the dimension *d*, the matrix *A*, the power *n* and the module base *x*.

  Note that *2 <= d <= 50, 0 <= n <= 1000, 2 <= x <= $10^4$* and *0 <= A[i][j] <= 100* for any *0 <= i, j < d*.

  Ouput the $A^n$ *mod x*.

- **Sample results**

  Sample Input I:

  2

  1 1

  1 1

  0 10

  Sample Ouput I:

  1 0

  0 1

  Sample Input II:

  5

  1 2 3 4 5

  6 7 8 9 1

  1 2 3 4 5

  4 5 6 7 8

  6 7 8 9 1

1000 1007

Sample Ouput II:

142 432 722 5 360

889 786 683 580 530

142 432 722 5 360

970 772 574 376 504

889 786 683 580 530