

## 10565 Matrix

### Preliminaries

(He who has already studied linear algebra may skip this part)

A matrix is composed of  $n \times n$  elements. Formally,

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}$$

is an  $n \times n$  matrix.

For example,

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

is a  $2 \times 2$  matrix.

Two operations on matrices will be used in this problem:

1.  $A + k$  ( $A$  is an  $n \times n$  matrix,  $k$  is an integer) all the elements in the MAIN diagonal is added by  $k$ . That is

$$A + k = \begin{pmatrix} a_{11} + k & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} + k & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} + k \end{pmatrix}$$

For example,

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} + 5 = \begin{pmatrix} 6 & 2 \\ 3 & 9 \end{pmatrix}$$

$A - k$  is defined  $A + (-k)$ , so

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} - 5 = \begin{pmatrix} -4 & 2 \\ 3 & -1 \end{pmatrix}$$

2.  $A * B$  (both  $A$  and  $B$  are  $n \times n$  matrices). Let

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}, \quad B = \begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ b_{n1} & b_{n2} & \cdots & b_{nn} \end{pmatrix}$$

and

$$C = A \times B = \begin{pmatrix} c_{11} & c_{12} & \cdots & c_{1n} \\ c_{21} & c_{22} & \cdots & c_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ c_{n1} & c_{n2} & \cdots & c_{nn} \end{pmatrix}$$

then we have:

$$c_{ij} = \sum_{k=1}^n a_{ik}b_{kj} = a_{i1}b_{1j} + a_{i2}b_{2j} + \dots + a_{in}b_{nj}$$

For example,

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} = \begin{pmatrix} 5+14 & 6+16 \\ 15+28 & 18+32 \end{pmatrix} = \begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$$

Well, I have no time to explain why matrix multiplication is defined like this. Please just remember it.

### Problem

Find a matrix root of this equation:  $(A + k_1)(A + k_2)(A + k_3) \dots (A + k_m) = 0$  where  $k_1, k_2, \dots, k_m$  are distinct integers.

That is, EVERY ELEMENT OF the matrix computed from the left is zero.

For example,

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

is a matrix root of the equation  $(A + 1)(A - 5) = 0$  since

$$(A + 1)(A - 5) = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} -4 & 4 \\ 2 & -2 \end{pmatrix} = \begin{pmatrix} -8+8 & 8-8 \\ -8+8 & 8-8 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

It can be proven that there are infinitely many solutions, however, I do not like trivial answer, so your answer must have at least  $(n * n)/2$  non-zero elements.

### Input

The first line contains the number of tests  $t$  ( $1 \leq t \leq 15$ ). Each case contains two lines. The first line contains an integer  $m$  ( $1 \leq m \leq 30$ ). The second line contains  $m$  integers, representing  $k_1, k_2, \dots, k_m$  respectively. Absolute values of the integers are no greater than 100.

### Output

For each test case, if no answer can be found, print '-1'. Otherwise print  $n$ , indicating that you found an  $n \times n$  matrix root. The following  $n$  lines should be the matrix. It is guaranteed that if there is an answer, the smallest possible  $n$  is not greater than 50, so your  $n$  should also NOT be greater than 50. The absolute value of integers you gave should not be larger than 1000.

### Sample Input

```
2
2
1 -5
2
1 -5
```

**Sample Output**

```
2
1 4
2 3
2
1 4
2 3
```