



Multiplication Program

Problem Code: **MULDIG**

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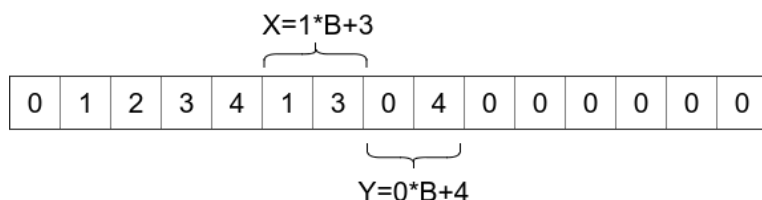
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Bear Limak hopes you can solve the following problem. You are given an integer **B** which is equal to 3, 5 or 7. Your goal will be to print a sequence of moves that are able to multiply any two 2-digit numbers **X** and **Y** in base **B**.

Consider a computer memory consisting of 10^5 cells, numbered 0 through 10^5-1 , each storing one digit (in base **B**, a digit must be between 0 and **B** - 1, inclusive). Let t_i denote the digit in the *i*-th cell. Initially:

- $t_i = i$ for $i < \mathbf{B}$
- $t_{\mathbf{B}}$ and $t_{\mathbf{B}+1}$ are digits of the number **X**, so $X = t_{\mathbf{B}} * \mathbf{B} + t_{\mathbf{B}+1}$
- $t_{\mathbf{B}+2}$ and $t_{\mathbf{B}+3}$ are digits of the number **Y**, so $Y = t_{\mathbf{B}+2} * \mathbf{B} + t_{\mathbf{B}+3}$
- $t_i = 0$ for all $i > \mathbf{B}+3$



The first of the two drawings above shows the initial situation for **B** = 5 and multiplying numbers 8 and 4 (represented in base 5 as 13 and 04 respectively). After applying your sequence of moves, the result of the multiplication should be stored in cells **B**+4, **B**+5, **B**+6, **B**+7, which is shown in the second drawing (please note that $8 * 4 = 32$ and this number is represented as 0112 in base 5). Except for those 4 cells containing the answer, the final value of t_i doesn't matter. In particular, you are allowed to change values in the first **B**+4 cells.

You should choose one function $F : [0, \mathbf{B}-1] \times [0, \mathbf{B}-1] \rightarrow [0, \mathbf{B}-1]$. It means that the function **F** should take two digits and return one, where each digit is in the set $\{0, 1, \dots, \mathbf{B}-1\}$. One example of **F** is addition $F(x, y) = (x + y) \% \mathbf{B}$. We don't require any particular properties from **F** (e.g. associativity or symmetricity).

You should create a sequence of at most 10^5 moves. In each move, choose three cells **c**1, **c**2 and **c**3, not necessarily distinct. The result of **F** for digits in cells **c**1 and **c**2 will be computed, and then written in the cell **c**3. In other words, in C++ or Python it's the

operation $t[c3] = F(t[c1], t[c2])$. For every possible pair of 2-digit numbers X and Y , your sequence of moves should produce the correct answer $X * Y$ as described above.

Input

The only line of the input contains a single integer B , denoting the base.

Output

You should first print the description of the function F that you choose, and then the chosen sequence of moves.

First print B lines. The i -th line should contain B space-separated integers $F(i,0)$, $F(i,1)$, ..., $F(i,B-1)$.

In the next line, print a single integer K , denoting the number of moves in the sequence.

In the i -th of the next K lines, print three space-separated integers $c1$, $c2$, $c3$ (each between 0 and 10^5-1 inclusive), describing the i -th move.

Subtasks

There are 5 subtasks, each worth 20 points.

1. $B = 3$ and the checker checks only if your program works correctly for X and Y consisting of digits 0 and 1 only (in base B).
2. $B = 3$
3. $B = 5$
4. $B = 5$ and the first digit (in base B) of X and the first digit of Y are both 0.
In other words: $X, Y < B$.
5. $B = 7$

Example

```
Input:
3

Output (please note that it's incorrect):
1 1 2
2 2 2
0 1 0
2
1 6 7
0 0 0
```

Explanation

The provided output has valid formatting but isn't correct. Let's analyze the printed moves to multiply $X = 7$ and $Y = 5$. These X and Y in base 3 are 21 and 12 respectively, so the initial numbers in cells are: 0, 1, 2, 2, 1, 1, 2, 0, 0, ...

The first operation is $t[7] = F(t[1], t[6]) = F(1, 2) = 2$, so now we have cells: 0, 1, 2, 2, 1, 1, 2, 2, 0, ...

The second operation is $t[0] = F(t[0], t[0]) = F(0, 0) = 1$, so we will have: 1, 1, 2, 2, 1, 1, 2, 2, 0, ...

After those two operations, cells 7, 8, 9, 10 should contain the product $X * Y = 35$, while in fact they contain digits 2, 0, 0, 0, what represents a number $2 * 3^3 = 2 * 27 = 54$. The printed sequence of moves should correctly multiply any two 2-digit numbers X, Y , so this particular output would get verdict Wrong Answer.

Author: 5★ [errichto \(/users/errichto/\)](/users/errichto/)

Date Added: 1-05-2017

Time Limit: 2 secs

Source Limit: 50000 Bytes

Languages: ADA, ASM, BASH, BF, C, C99 strict, CAML, CLOJ, CLPS, CPP

4.3.2, CPP 4.9.2, CPP14, CS2, D, ERL, FORT, FS, GO, HASK, ICK, ICON, JAVA, JS, LISP clisp, LISP sbcl, LUA, NEM, NICE, NODEJS, PAS fpc, PAS gpc, PERL, PERL6, PHP, PIKE, PRLG, PYPY, PYTH, PYTH 3.4, RUBY, SCALA, SCM chicken, SCM guile, SCM qobi, ST, TCL, TEXT, WSPC

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