# Quantum Magic (magic)

Luca has recently discovered an ancient book[1] revealing a new candidate source of unlimited energy: *quantum magic*. Quantum magic is *quantized*, as it can only come in nine discrete levels of energy, corresponding to the integers from 1 to 9. But most importantly it is also *magic*, so that it can create free energy from nowhere!

Figure 1: Quantum magic flux across nodes and resonators.

Unfortunately, quantum magic occurs naturally only in very few specific locations, all along the most mystical of the *ley lines*. This line is $L$ miles long and contains $N$ quantum magic nodes, each at a specific (integer) number of miles $X_i$ along the line (with the first being at the start $X_0 = 0$), and each with a fixed energy level $E_i$. The total energy produced by all these nodes is barely enough to power a light bulb, but Edoardo has a trick up his sleeve: quantum magic *resonators*!

As the magic itself, resonators also come in discrete levels from 1 to 9, and are effective only if placed in integer number of miles along the ley line. A resonator of level $\ell$ in point $x$ can only be activated by a magic source in location $x' = x - \ell$ and energy level $\ell'$, and only if $\ell'$ is a divisor or multiple of $\ell$. If so happens, the resonator becomes a quantum magic source itself, creating the corresponding energy from nowhere, and possibly activating further resonators in locations $x'' > x$.

Help Marco compute how much total energy could be harnessed at most with a carefully planned array of resonators, recalling that (i) magic is only possible in integer miles $x \in 0 \dots L-1$ along the ley line; (ii) at most one magic source (node or resonator) can be present in each integer mile $x$; (iii) a resonator becomes a source of energy only if activated according to the conditions above.

[1] H. Tinfoil and T. Roll, *What they don't want you to know.* Conspiracy Editors, 1666. ISBN 667-3-71-698969-0.

☞ Among the attachments of this task you may find a template file `magic.*` with a sample incomplete implementation.

## Input

The first line contains integers $N$ and $L$. The second line contains $N$ integers $X_i$. The third line contains $N$ integers $E_i$.

## Output

You need to write a single line with $L$ integers from 0 to 9: the energies produced in each location by nodes or resonators in your plan.

## Constraints

- $1 \leq N \leq L \leq 200$.
- $0 \leq X_i < L$ for each $i = 0 \ldots N-1$.
- $1 \leq E_i \leq 9$ for each $i = 0 \ldots N-1$.
- The values $X_i$ are all distinct, in increasing order, and $X_0 = 0$.
- The optimal plan of resonators does not need to be unique and you can return any one of them (and you can also get a partial score for a sub-optimal plan).

## Scoring

Your program will be tested against several test cases grouped in subtasks. Your score on a subtask will be equal to the minimum score for one of its testcases multiplied by the value of the subtask. Your score on a test case will be zero if the output does not represent a valid resonator plan. If the output is valid, let $T_{\text{out}}$ be the sum of the energies reported, and $T_{\text{cor}}$ be the optimal total energy. Your score on a test case will be 1 if $T_{\text{out}} = T_{\text{cor}}$, or $0.5 \cdot (T_{\text{out}}/T_{\text{cor}})^3$ otherwise.

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (10 points) $N = L$.

– **Subtask 3** (40 points) $L \leq 15$.

– **Subtask 4** (30 points) $L \leq 50$.

– **Subtask 5** (20 points) No additional limitations.

## Examples

| input | output |
|---|---|
| 1 8<br>0<br>7 | 7 1 1 2 3 4 5 7 |
| 3 8<br>0 3 5<br>2 3 1 | 2 1 2 3 4 1 6 6 |

## Explanation

In the **first sample case**, there is a single quantum magic node of level 7, and we have space for 7 resonators after it. At position $x = 1$, a resonator can only get his energy from the node at $x = 0$, and it can do so if (and only if) its level is 1. At positions $x = 2 \dots 6$, no resonator can gather its energy from the node, since the resonator level needed would not be a multiple or divisor of the node level 7. In follows that the optimal choice for the resonators is to gather their energy from the resonator in position $x = 1$, and they can do so with levels $1 \dots 5$ respectively. Finally, at position $x = 7$ it is again possible to gather energy from the node, and that is the optimal choice.

In the **second sample case**, there are three nodes and we have space for other 5 resonators. At positions $x = 1, 2$ resonators can gather their energy from the first node, of level 2. At position $x = 3$ there is the second node, of level 3. At position $x = 4$ a resonator can again get its energy from the first node; while at position $x = 5$ the only option is to get energy from the adjacent resonator. Finally, at positions $x = 6, 7$ resonators of level 6 can get their energy from the node at $x = 0$ and the resonator at $x = 1$.