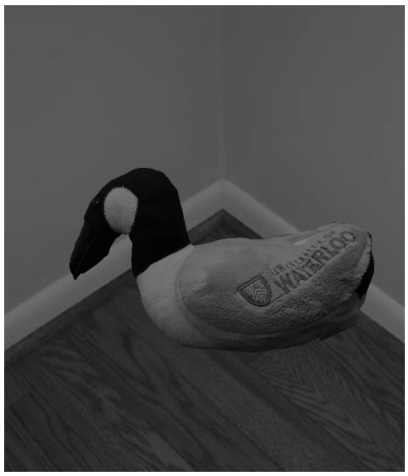
TLE '17 Contest 5 P3 - Willson and Factorization

Willson the Canada Goose is like any other Canada Goose - he suspects that many humans don't like him.



Willson is sad because nobody likes him.

As a result, he challenges you to do the following problem:

Consider the set $\mathbb{Z}_n = \{0, 1, 2, \ldots, n-1\}$.

We say that an element u in $\mathbb{Z}_n$ is a **unit** if there is some element v in $\mathbb{Z}_n$ with $uv \equiv 1 \pmod{n}$.

We say that a non-zero, non-unit element i in $\mathbb{Z}_n$ is **irreducible** if there are no elements a, b in $\mathbb{Z}_n$ where a, b are not units and $ab \equiv i \pmod{n}$.

We say that a non-zero, non-unit element p in $\mathbb{Z}_n$ is **prime** if for all elements a, b in $\mathbb{Z}_n$, if $px \equiv ab \pmod{n}$ for some element x in $\mathbb{Z}_n$, then $py \equiv a \pmod{n}$ for some element y in $\mathbb{Z}_n$ or $pz \equiv b \pmod{n}$ for some element z in $\mathbb{Z}_n$.

Given n, please output all of the units, irreducibles, and primes of $\mathbb{Z}_n$.

Input Specification

The only line of input will contain a single integer, n $(2 \leq n \leq 200)$.

For 20% of the points, n is prime.

For an additional 20% of the points, $n \leq 15$.

For an additional 20% of the points, $n \leq 50$.

Output Specification

Output, in numerical order, first the units, then the irreducibles, then the primes of $\mathbb{Z}_n$. See the Sample Output for more specific formatting.

Sample Input 1

```
10
```

Sample Output 1

```
Units:
1
3
7
9
Irreducibles:
Primes:
2
4
5
6
8
```

Sample Input 2

```
12
```

Sample Output 2

```
Units:
1
5
7
11
Irreducibles:
2
10
Primes:
2
3
9
10
```