Back To School '18: An FFT Problem

Time limit: 1.0s **Memory limit:** 128M

To prepare for the upcoming school year, Richard has bought N books for his English class. Each book is assigned a value, a_i, Richard's willingness to read that book.

Richard wants to choose k of the N books and calculate his willingness to read those k books. The willingness to read those k books is the product of the willingness to read each individual book. For example, if he bought books of value $a = [2, 5, 7, 9, 13]$, and he chose $k = 3$ books with indices $1, 2, 4$, the willingness to read those books would be $a_1 \cdot a_2 \cdot a_4 = 2 \cdot 5 \cdot 9 = 90$.

Richard wants the *sum* of the willingness of all **distinct combinations** of k books for all values of k $(1 \le k \le N)$.

However, since Richard does not like large numbers, he wants each *sum* modulo $998\,244\,353$.

Two combinations are considered **distinct** if the indices of the books chosen are different, **regardless of the values of the books**.

Input Specification

The first line of input will contain a single integer N $(1 \le N \le 2\,000)$, the number of books that Richard bought.

The second line of input will contain N space-separated integers, the i^{th} integer representing a_i $(|a_i| \le 10^9)$, the value of each book.

Output Specification

On one line, print N space-separated integers, the k^{th} integer representing the *sum* of the willingness of all **distinct combinations** of choosing k books, modulo $998\,244\,353$.

We define A modulo B in the 2 equivalent ways:

1. Taking the remainder of $A \div B$, adding B if the result is negative.
2. Subtracting B from A, or adding B to A, until A is in the interval $[0, B)$.

It may or may not help to know that $998\,244\,353 = 119 \cdot 2^{23} + 1$.

Constraints

Subtask 1 [5%]

$N \le 10$

Subtask 2 [10%]

$N \le 20$

Subtask 3 [35%]

$|a_i| \leq 10^3$

Subtask 4 [50%]

No additional constraints.

Sample Input 1

```
4
1 2 2 3
```

Sample Output 1

```
8 23 28 12
```

Explanation for Sample Output 1

$N = 4$, $a = [1, 2, 2, 3]$.

There are 4 distinct combinations to read 1 book:

$a_1 = 1$

$a_2 = 2$

$a_3 = 2$

$a_4 = 3$

Their sum is 8.

There are 6 distinct combinations to read 2 books.

$a_1 \cdot a_2 = 1 \cdot 2 = 2$

$a_1 \cdot a_3 = 1 \cdot 2 = 2$

$a_1 \cdot a_4 = 1 \cdot 3 = 3$

$a_2 \cdot a_3 = 2 \cdot 2 = 4$

$a_2 \cdot a_4 = 2 \cdot 3 = 6$

$a_3 \cdot a_4 = 2 \cdot 3 = 6$

Their sum is 23.

There are 4 distinct combinations of reading 3 books.

$a_1 \cdot a_2 \cdot a_3 = 1 \cdot 2 \cdot 2 = 4$

$a_1 \cdot a_2 \cdot a_4 = 1 \cdot 2 \cdot 3 = 6$

$a_1 \cdot a_3 \cdot a_4 = 1 \cdot 2 \cdot 3 = 6$

$a_2 \cdot a_3 \cdot a_4 = 2 \cdot 2 \cdot 3 = 12$

Their sum is 28.

The only distinct combination of reading 4 books is $a_1 \cdot a_2 \cdot a_3 \cdot a_4 = 1 \cdot 2 \cdot 2 \cdot 3 = 12$.

Sample Input 2

```
3
-1 -1 -1
```

Sample Output 2

```
998244350 3 998244352
```