Just Primes II

Given a positive integer **N**, calculate the minimum number of distinct primes required such that their sum equals to **N**. Also calculate the number of different ways to select these primes. Two ways are considered to be different **iff** there exists at least one prime in one set not existing in the other.

Input

The first line contains an integer **T**, denoting the number of test cases. Each of the next subsequent **T** lines contain a positive integer **N**.

Constraints

- **1 ≤ T ≤ 500,000**
- **1 ≤ N ≤ 500,000**

Output

For each test case, output two integers **X** and **Y** separated by a single space. **X** denotes the minimum number of distinct primes required such that their summation equals to **N**, and **Y** is the number of ways to select these primes. If it is not possible to express **N** as a summation of distinct primes, set **X** and **Y** to **-1** and output them. You can safely assume that the answer will always fit in a signed 32 bit integer.

Sample Input

```
20
1
2
10
27
100
666
1000
1729
4572
4991
10000
100000
480480
482790
499799
499847
499901
499979
499999
```

500000

Sample Output

-1 -1
1 1
2 1
3 3
2 6
2 31
2 28
3 2393
2 110
3 13396
2 127
2 810
2 8499
2 8291
3 31121027
3 31139901
3 31124665
1 1
3 30974053
2 3052

Warm Up

Too hard? Try the easier version here - Just Primes