Amazing Factor Sequence (hard)

Let $s_1(n)$ be the sum of positive **proper** divisors of n.

For example, $s_1(1) = 0$, $s_1(2) = 1$ and $s_1(6) = 6$.

Let $$S(n) = \sum _{i=1}^n s_1(i).$$

Your task is to find $S(N)$.

Input

First line contains T ($1 \le T \le 10^5$), the number of test cases.

Each of the next T lines contains a single integer N. ($1 \le N < 2^{63}$)

Output

For each number N, output a single line containing $S(N)$.

Example

Input

```
6
1
2
3
10
100
1000000000000000000
```

Output

```
0
1
2
32
3249
3224670334241132188634876277354014 33
```

Information

There are 6 Input files.

- Input #1: $1 \le N \le 10^5$, TL = 2s.

- Input #2: $1 \le T \le 60,\ 1 \le N \le 10^{15}$, TL = 10s.

- Input #3: $1 \le T \le 25,\ 1 \le N \le 10^{16}$, TL = 10s.

- Input #4: $1 \le T \le 10,\ 1 \le N \le 10^{17}$, TL = 10s.

- Input #5: $1 \le T \le 5,\ 1 \le N \le 10^{18}$, TL = 10s.

- Input #6: $1 \le T \le 2, 1 \le N < 2^{63}$, TL = 10s.

My C++ solution runs in about 0.85 seconds for each Input #2 - #6.

Note

- Probably, $O(\sqrt{n})$ solutions will not pass.
- Time limits are somewhat **strict**.
- The answer can be $\ge 2^{64}$.
- DIVCNT1 is a little easier than this.