The Sum of Unitary Divisors

A natural number d is a unitary divisor of n if d is a divisor of n and if d and $\frac{n}{d}$ are coprime.

Let $\sigma^{*}(n)$ be the sum of the unitary divisors of n. For example, $\sigma^{*}(1) = 1$, $\sigma^{*}(2) = 3$ and $\sigma^{*}(6) = 12$.

Let $$S(n) = \sum_{i=1}^n \sigma^{*}(i).$$

Given n, find $S(n) \bmod 2^{64}$.

Input

There are multiple test cases. The first line of input contains an integer T ($1 \le T \le 50000$), indicating the number of test cases. For each test case:

The first line contains an integer n ($1 \le n \le 5 \times 10^{13}$).

Output

For each test case, output a single line containing $S(n) \bmod 2^{64}$.

Example

Input:

```
7
1
2
3
4
5
100
100000
```

Output:

```
1
4
8
13
19
6889
6842185909
```

Information

There are 8 Input files.

- Input #1: $1 \le n \le 50000$, TL=1s

- Input #2: $1 \le T \le 1000, \ 1 \le n \le 5 \times 10^7$, TL=5s
- Input #3: $1 \le T \le 300, \ 1 \le n \le 5 \times 10^8$, TL=5s
- Input #4: $1 \le T \le 80, \ 1 \le n \le 5 \times 10^9$, TL=5s
- Input #5: $1 \le T \le 30, \ 1 \le n \le 5 \times 10^{10}$, TL=10s
- Input #6: $1 \le T \le 10, \ 1 \le n \le 5 \times 10^{11}$, TL=10s
- Input #7: $1 \le T \le 3, \ 1 \le n \le 5 \times 10^{12}$, TL=10s
- Input #8: $T=1, \ 1 \le n \le 5 \times 10^{13}$, TL=10s

My unoptimized C++ solution runs in 8.9 sec (total time). And with some constant optimization, now my C++ solution runs in 1.03 sec (total time).