

7175 Primes

Define a mass split operation for the multiset of positive integers K : for each integer k_i in the multiset we will replace it with the pair d_i and k_i/d_i , where d_i is the random integer divisor of k_i , which is greater than 1, and less than k_i . If k_i is prime, it remains untouched. All divisors can be chosen equiprobably.

For example, let's take the multiset $\{2, 10, 12, 12\}$. Then $\{2, 2, 3, 3, 4, 4, 5\}$, $\{2, 2, 2, 3, 4, 5, 6\}$ and $\{2, 2, 2, 2, 5, 6, 6\}$ will be the possible outcomes of the first mass split (first and third with probability 0.25, second with probability 0.5), and $\{2, 2, 2, 2, 2, 2, 3, 3, 5\}$ will be the only possible outcome of the second mass split.

If we start with a multiset containing one integer N , find the expected number of mass splits needed to obtain a multiset with prime numbers only, where the expected number is the probability-weighted average of all possible values.

Input

First line of the input contains integer T ($1 \leq T \leq 10^4$) — number of test cases. Each test case consists of one integer N — the starting multiset ($2 \leq N \leq 10^{10}$).

Output

For each test case, print one number — the expected number of mass splits, with absolute or relative error not worse than 10^{-6} .

Sample Input

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3
3
12
48
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Sample Output

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0
2.0
3.3333333
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