

Problem S5: Factor Solitaire

Problem Description

In the game of Factor Solitaire, you start with the number 1, and try to change it to some given target number n by repeatedly using the following operation. In each step, if c is your current number, you split it into two positive factors a, b of your choice such that $c = a * b$. You then add a to your current number c to get your new current number. Doing this costs you b points. You continue doing this until your current number is n , and you try to achieve this at the cost of a minimum total number of points.

For example, here is one way to get to 15:

- start with 1
- change 1 to $1+1 = 2$ — cost so far is 1
- change 2 to $2+1 = 3$ — cost so far is $1+2$
- change 3 to $3+3 = 6$ — cost so far is $1+2+1$
- change 6 to $6+6 = 12$ — cost so far is $1+2+1+1$
- change 12 to $12+3 = 15$ — done, total cost is $1+2+1+1+4=9$.

In fact, this is the minimum possible total cost to get 15. You want to compute the minimum total cost for other target end numbers.

Input Specification

The input consists of a single integer $N \geq 1$. In at least half of the cases $N \leq 50000$, in at least another quarter of the cases $N \leq 500000$, and in the remaining cases $N \leq 5000000$.

Output Specification

Compute the minimum cost that gets you to N .

Sample Input 1

15

Output for Sample Input 1

9

Sample Input 2

2013

Output for Sample Input 2

91

Explanation of Output for Sample Input 2

For example, start with 1, then get to 2, 4, 5, 10, 15, 30, 60, 61, 122, 244, 305, 610, 671, 1342, and then 2013.