

# CCC '13 S5 - Factor Solitaire

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## Canadian Computing Competition: 2013 Stage 1, Senior #5

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  $c = a \times b$ . 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

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The input consists of a single integer  $N \geq 1$ . In at least half of the cases  $N \leq 50\,000$ , in at least another quarter of the cases  $N \leq 500\,000$ , and in the remaining cases  $N \leq 5\,000\,000$ .

## Output Specification

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Compute the minimum cost that gets you to  $N$ .

## Sample Input 1

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15

## Output for Sample Input 1

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9

## Sample Input 2

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2013

## Output for Sample Input 2

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91

## Explanation of Output for Sample Input 2

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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.