

# CCC '18 S4 - Balanced Trees

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## Canadian Computing Competition: 2018 Stage 1, Senior #4

Trees have many fascinating properties. While this is primarily true for trees in nature, the concept of trees in math and computer science is also interesting. A particular kind of tree, a *perfectly balanced tree*, is defined as follows.

Every perfectly balanced tree has a positive integer *weight*. A perfectly balanced tree of weight 1 always consists of a single node. Otherwise, if the weight of a perfectly balanced tree is  $w$  and  $w \geq 2$ , then the tree consists of a root node with branches to  $k$  subtrees, such that  $2 \leq k \leq w$ . In this case, all  $k$  subtrees must be completely identical, and be perfectly balanced themselves.

In particular, all  $k$  subtrees must have the same weight. This common weight must be the maximum integer value such that the sum of the weights of all  $k$  subtrees does not exceed  $w$ , the weight of the overall tree. For example, if a perfectly balanced tree of weight 8 has 3 subtrees, then each subtree would have weight 2, since  $2 + 2 + 2 = 6 \leq 8$ .

Given  $N$ , find the number of perfectly balanced trees with weight  $N$ .

## Input Specification

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The input will be a single line containing the integer  $N$  ( $1 \leq N \leq 10^9$ ).

For 5 of the 15 marks available,  $N \leq 1\,000$ .

For an additional 2 of the 15 marks available,  $N \leq 50\,000$ .

For an additional 2 of the 15 marks available,  $N \leq 10^6$ .

## Output Specification

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Output a single integer, the number of perfectly balanced trees with weight  $N$ .

## Sample Input 1

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4

## Sample Output 1

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3

## Explanation for Sample Output 1

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One tree has a root with four subtrees of weight 1; a second tree has a root with two subtrees of weight 2; the third tree has a root with three subtrees of weight 1.

## Sample Input 2

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10

## Sample Output 2

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13