

# Project Euler #167: Investigating Ulam sequences

This problem is a programming version of [Problem 167](#) from [projecteuler.net](#)

For two positive integers  $a$  and  $b$ , the Ulam sequence  $U(a, b)$  is defined by  $U(a, b)_1 = a$ ,  $U(a, b)_2 = b$  and for  $k > 2$ ,  $U(a, b)_k$  is the smallest integer greater than  $U(a, b)_{(k-1)}$  which can be written in exactly one way as the sum of two distinct previous members of  $U(a, b)$ .

For example, the sequence  $U(1, 2)$  begins with

$$1, 2, 3 = 1 + 2, 4 = 1 + 3, 6 = 2 + 4, 8 = 2 + 6, 11 = 3 + 8;$$

5 does not belong to it because  $5 = 1 + 4 = 2 + 3$  has two representations as the sum of two previous members, likewise  $7 = 1 + 6 = 3 + 4$ .

Find  $U(2, 2n + 1)_k$

## Input Format

Two space-separated integers  $n$  and  $k$  are given on first line.

## Constraints

- $2 \leq n \leq 10$
- $1 \leq k \leq 10^{11}$

## Output Format

Print one integer which is the answer to the problem.

## Sample Input 0

```
2 10
```

## Sample Output 0

```
23
```

## Explanation 0

Beginning of  $U(2, 5)$  is

$$2, 5, 7, 9, 11, 12, 13, 15, 19, 23, 27, 29, 35, 37, 41, 43, \dots$$