Problem A: Kth Bit in Nth Binary String

Problem

Given two positive integers **n** and **k**, the binary string S_n is formed as follows:

S_1 = **"0"**
$S_i = S_{i-1}$ + **"1"** + **reverse(invert(S_{i-1}))** for i > 1

Where + denotes the concatenation operation, reverse(x) returns the reversed string x, and invert(x) inverts all the bits in x (0 changes to 1 and 1 changes to 0). For example, the first four strings in the above sequence are:

S_1 = **0** S_2 = **011** S_3 = **0111001** S_4 = **011100110110001**

Return the k^{th} bit in S_n. It is guaranteed that **k** is valid for the given **n**.

Input

The first line contains an integer **T**, i.e., the number of test cases.
Next **T** lines will contain 2 integers **n** and **k**.

Output

Print a single integer corresponding to each test case.

Constraints

1 <= T <= 1000
1 <= n <= 20
1 <= k <= 2^n - 1

Sample Input	**Sample Output**
1 3 1	0
2 2 3 4 11	1 1

Problem B: Extreme Prime Summation

Problem

The sum of the primes below **10** is **2 + 3 + 5 + 7 = 17**.

Find the sum of all the primes not greater than given **N**.

Input

First line contains **T** which denotes the number of test cases.
This is followed by **T** lines, each containing an integer, **N**.

Output

Print a single integer corresponding to each test case.

Constraints

$1 <= T <= 10^4$
$1 <= N <= 10^6$

Sample Input	**Sample Output**
2 5 10	10 17
4 4 8 11 13	5 17 28 41

Problem C: Max Area of Island

Problem

Given an **m x n** 2D grid which represents a map of 'L's (land) and 'W's (water). An island is surrounded by water and is formed by connecting adjacent lands horizontally, vertically, or diagonally. You may assume all four edges of the grid are all surrounded by water.

Return the maximum area of an island in the grid. If there is no island, return 0.

Input

First line contains **T** which denotes the number of test cases.
The first line of each test case contains 2 integers **m** and **n**, the dimensions of the grid.
The following m lines contain the grid.

Output

Print a single integer corresponding to each test case.

Constraints

Sample Input	**Sample Output**
1 4 5 LLLLW LLWLW LLWWW WWWWW	9
1 4 5 LLWWW LLWWW WWLWW WWWLL	7

Problem D: N-digit Fibonacci number

Problem

The Fibonacci sequence is defined by the recurrence relation:

$$\mathbf{F_n = F_{n-1} + F_{n-2}, \text{ where } F_1 = 1 \text{ and } F_2 = 1}$$

Hence the first 12 terms will be:

$\mathbf{F_1 = 1}$	$\mathbf{F_2 = 1}$	$\mathbf{F_3 = 2}$	$\mathbf{F_4 = 3}$	$\mathbf{F_5 = 5}$	$\mathbf{F_6 = 8}$
$\mathbf{F_7 = 13}$	$\mathbf{F_8 = 21}$	$\mathbf{F_9 = 34}$	$\mathbf{F_{10} = 55}$	$\mathbf{F_{11} = 89}$	$\mathbf{F_{12} = 144}$

The **12th** term, **144**, is the first term to contain three digits.
What is the first term in the Fibonacci sequence to contain **N** digits?

Input

The first line contains an integer **T**, i.e., the number of test cases.
Next **T** lines will contain an integer **N**.

Output

Print the values corresponding to each test case.

Constraints

1 <= T <= 5000
2 <= N <= 5000

Sample Input	Sample Output
2 3 4	12 17
4 4 5 8 10	17 21 36 45