Greetings From Globussoft

- Given below are 5 Programming questions, you have to solve any 3 out of 5 questions.

- These 5 questions you can attempt in any technology like C/C++, java, .Net, PHP

- To solve these 3 questions you've max. 3 hours.

- While Solving these questions you are not allowed to use any Search Engine like Google, Yahoo, Bing ...

All the best for your test

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QUESTION - 1

Ted thinks that integers having equal number of 1's and 0's in their binary representation are special. Therefore, he wants to know how many such integers are present.

Note: For this problem, the binary representation of an integer(>0) is considered from the least significant bit to the last set bit. Which means, 5 has a binary representation of 101, 3 has a binary representation of 11 etc. As such, one example of a special number is 9 which has a binary representation, 1001.

Input

First line contains an integer T(atmost 100) denoting the total number of test cases. Each test case contains a single integer N(2 <= N <= 2^60). N is always a power of 2.

Output

A single integer denoting the total number of such special numbers in the range 1 to N (inclusive).

Example

```
Input:
3
8
16
32

Output:
1
4
4
```

QUESTION – 2

You may have come across questions like, Match-The-Following words with their synonyms in the second column and alike. Ted also stumbled upon one such question. Being weak at english, he tried guessing the answers. While he guessed, he thought about how unlucky he was at guessing.

Being also weak at math, he needs help from you for a slightly different task. Find the total number of ways of completing the solution to this question in which he gets none of the matches correct.

Note: In the match-the-following problem, there are two columns of words. Each column contains N words. Words in the first column have to be matched with words in the second column. A valid solution to this question requires every word in the first column to be matched with only one word in the second column and vice-versa.

Input

First line contains a single integer T(1 <= T <= 1000) denoting the total number of test cases. Each test case contains a single integer N (1 <= N <= 1000000).

Output

For each test case, print a single integer the required number of ways modulo 1000000007

Example

```
Input:
3
1
2
7
Output:
0
1
1854
```

QUESTION – 3

Benjamin is going to host a party for his big promotion coming up.

Every party needs candies, chocolates and beer, and of course Benjamin has prepared some of those. But as everyone likes to party, many more people showed up than he expected. The good news is that candies are enough. And for the beer, he only needs to buy some extra cups. The only problem is the chocolate.

As Benjamin is only a 'small court officer' with poor salary even after his promotion, he can not afford to buy extra chocolate. So he decides to break the chocolate cubes into smaller pieces so that everyone can have some.

He have two methods to break the chocolate. He can pick one piece of chocolate and break it into two pieces with bare hand, or put some pieces of chocolate together on the table and cut them with a knife at one time. You can assume that the knife is long enough to cut as many pieces of chocolate as he want.

The party is coming really soon and breaking the chocolate is not an easy job. He wants to know what is the minimum number of steps to break the chocolate into unit-size pieces (cubes of size

1×1×1). He is not sure whether he can find a knife or not, so he wants to know the answer for both situations.

Input

The first line contains an integer **T** ($1 \le \mathbf{T} \le 10000$), indicating the number of test cases.

Each test case contains one line with three integers **N**, **M**, **K** ($1 \le \mathbf{N}, \mathbf{M}, \mathbf{K} \le 2000$), meaning the chocolate is a cube of size **N**×**M**×**K**.

Output

For each test case in the input, print one line: `"Case #X: A B"`, where **X** is the test case number (starting with 1) , **A** and **B** are the minimum numbers of steps to break the chocolate into **N**×**M**×**K** unit-size pieces with bare hands and knife respectively.

Example

Input:
```
2
1 1 3
2 2 2
```

Output:
```
Case #1: 2 2
Case #2: 7 3
```

QUESTION – 4

There are N hotels along the beautiful Adriatic coast. Each hotel has its value in Euros.

Sroljo has won M Euros on the lottery. Now he wants to buy a sequence of consecutive hotels, such that the sum of the values of these consecutive hotels is as great as possible - but not greater than M.

You are to calculate this greatest possible total value.

Input

In the first line of the input there are integers N and M ($1 \le N \le 300\,000$, $1 \le M < 2^{31}$).

In the next line there are N natural numbers less than 10^6, representing the hotel values in the order they lie along the coast.

Output

Print the required number (it will be greater than 0 in all of the test data).

Example

input
```
5 12
2 1 3 4 5
```
output
```
12
```

input
```
4 9
7 3 5 6
```
output
```
8
```

QUESTION – 5

Having crossed the first hurdle, Mario encounters a long and narrow alleyway, with turtles. Mario can cross it by jumping from one turtle to another. Whenever Mario makes his jump on any given turtle, he can leave it in any of the three possible states, as per his choice. These states are:

- Active (A)
- Dormant (D)
- Bruised (B)

There are n turtles in the street, indexed 0..(n-1)
Each jump costs some amount of energy, which depends on the index of turtle as well as the state it is left in. However, Mario has to take care that no neighboring turtles are left in the same state, or otherwise they all will reunite and cause a fatal attack on Mario, as he is about to leave the alley.
The neighbors of turtle i are turtles i-1 and i+1. The first and last turtles are not neighbors.
You need to find out the minimum amount of energy required to cross the alley.

Input
first line contains no. of test cases T (T <= 5)
T input sets are given in the following manner
the first line contains n, no. of turtles (n <= 20)
the next n lines have space separated 3 numbers (a1, a2, a3), the values of energy needed for ith turtle to change into states A D B (0 <= ai <= 1000)
similarly, the inputs are given for other cases

Output
T lines, the minimal energy needed for each set of input

Sample I/O

Input

```
2
3
0 1 2
1 4 8
9 2 5
4
10 10 10
2 4 9
12 7 10
6 6 6
```

Output

```
4
25
```