

### The Travelling Ant

There is an Ant that lives in Baskerville and loves to travel. As Baskerville is a small place, it consists of only 5 cities placed one next to each other.

There is a train between each successive cities ie between City 1 - City 2, City 2 - City 3, ... City 5 - City 1. Note that our Ant loves to travel and gets happy after making exactly N train trips and returning back to home.

Ant lives in the city 1 from where she begins her journey. She asks you to find the number of ways she can make N train trips and come back to home.

Since the number of ways can be huge, print that number modulo  $10^9 + 7$ .

#### Input

First line contains T, the number of test cases.

Then T lines follow.

Each line contains a single integer n, representing the number of train trips the ant needs to make.

#### Output

For each test case, print a single line containing the answer to the problem.

#### Constraints

$1 \leq T \leq 1000$

$0 \leq n \leq 10^{18}$

#### Sample Input

```
3
0
3
4
```

#### Sample Output

```
1
0
6
```

#### Explanation

In first case, ant has to make 0 trips. So the ant stays at city 1 and has only 1 option.

In second case, ant has to make 3 trips. No matter what combination we try, we can never reach back to city 1 back after 3 trips. So answer is 0.

In third case, ant makes 4 trips. There are 6 ways in which it can reach back to city 1.

Way 1: 1->2->1->2->1

Way 2: 1->2->3->2->1

Way 3: 1->5->1->5->1

Way 4: 1->5->4->5->1

Way 5: 1->5->1->2->1

Way 6: 1->2->1->5->1

**Note:** Your code should be able to convert the sample input into the sample output. However, this is not enough to pass the challenge, because the code will be run on multiple test cases. Therefore, your code must solve this problem statement.

Time Limit: 1.0 sec(s) for each input file

### Question 12

Max. Marks 100.00 ⓘ

#### AND Sum

Given an array of N numbers, you have to report the Sum of bitwise AND of all possible subsets of this array. As answer can be large, report it after taking mod with  $10^9+7$ .

#### Input:

First line contains a number T denoting the number of test cases.

First line of each test case contains a number N denoting the number of elements in the array.

Second line contains the N elements of the array.

#### Output:

For each test case output a single number denoting the Sum of bitwise AND of all possible subsets of the given array.

#### Input Constraints:

$1 \leq T \leq 10$

$1 \leq N \leq 10^5$

$1 \leq a[i] \leq 10^9$

#### Sample Input

```
1
3
1 2 3
```

#### Sample Output

```
9
```

#### Explanation

For [1, 2, 3], all possible subsets are {1}, {2}, {3}, {1,2}, {1,3}, {2,3}, {1,2,3}

The sum of AND of these subsets are,  $1 + 2 + 3 + 0 + 1 + 2 + 0 = 9$ .

So, the answer would be 9.