6589 Captain Obvious and the Rabbit-Man

"It's you, Captain Obvious!" — cried the evil Rabbit-Man — "you came here to foil my evil plans!"

"Yes, it's me." — said Captain Obvious.

"But... how did you know that I would be here, on 625 Sunflower Street?! Did you crack my evil code?"

"I did. Three days ago, you robbed a bank on 5 Sunflower Street, the next day you blew up 25 Sunflower Street, and yesterday you left quite a mess under number 125. These are all powers of 5. And last year you pulled a similar stunt with powers of 13. You seem to have a knack for Fibonacci numbers, Rabbit-Man."

"That's not over! I will learn... **arithmetics!**" — Rabbit-Man screamed as he was dragged into custody — "You will **never** know what to expect... Owww! Not my ears, you morons!"

"Maybe, but right now you are being arrested." — Captain added proudly.

Unfortunately, Rabbit-Man has now indeed learned some more advanced arithmetics. To understand it, let us define the sequence F_n (being not completely unlike the Fibonacci sequence):

$F_1 = 1$,
$F_2 = 2$,
$F_n = F_{n-1} + F_{n-2}$ for $n \geq 3$.

Rabbit-Man has combined all his previous evil ideas into one master plan. On the i-th day, he does a malicious act on the spot number $p(i)$, defined as follows:

$p(i) = a_1 \cdot F_1^i + a_2 \cdot F_2^i + \ldots + a_k \cdot F_k^i$.

The number k and the integer coefficients $a_1, \ldots, a_k$ are fixed. Captain Obvious learned k, but does not know the coefficients. Given $p(1), p(2), \ldots, p(k)$, help him to determine $p(k+1)$. To avoid overwhelmingly large numbers, do all the calculations modulo a fixed prime number M. You may assume that $F_1, F_2, \ldots, F_n$ are pairwise distinct modulo M. You may also assume that there always exists a unique solution for the given input.

Input

The first line of input contains the number of test cases T. The descriptions of the test cases follow:

The first line of each test case contains two integers k and M, $1 \leq k \leq 4000$, $3 \leq M \leq 10^9$. The second line contains k space-separated integers — the values of $p(1), p(2), \ldots, p(k)$ modulo M.

Output

Print the answers to the test cases in the order in which they appear in the input. For each test case print a single line containing one integer: the value of $p(k+1)$ modulo M.

Explanation: the first sequence is simply $5^i \bmod 619$, therefore the next element is $5^5 \bmod 619 = 30$. The second sequence is $2 \cdot 1^i + 3^i \bmod 101$.

Sample Input

```
2
4 619
5 25 125 6
3 101
5 11 29
```

Sample Output

```
30
83
```