Math Class

Time Limit: 18000/9000 MS (Java/Others) Memory Limit: 524288/524288 K (Java/Others)
Total Submission(s): 0 Accepted Submission(s): 0

Problem Description

Now it's time after math class!

The teacher taught Baby Volcano what can do with polynomials and how to use polynomials.The teacher said that a polynomial of degree n can be written as $f(x)=\sum_{i=0}^{n}a_ix^i$. Also,you can regard it as a function,and replace x with some number a in order to get a special value called $f(a)$

Today's math homework is to calculate $f(a)$ of a polynomial of degree n,$f(x)$.Because the answer is extremely large,Baby Volcano is only asked to write $f(x) \bmod p$ on the paper,where p is a prime number.

Baby Volcano writes number $f(0) \bmod p, f(1) \bmod p, \cdots, f(n) \bmod p$ on a textbook quickly. After a while,however,he lost $f(x)$ and can't continue with his homework.

Baby Volcano want to find $f(x)$,But he is too small to solve it.Baby Volcano needs your help!

Input

The first line contains one integer $T(1 \le T \le 50)$ stand for the test cases you should solve.

For each test cases,the first line contains two integer $n,p(1 \le n < p-1, 3 \le p \le 5 \times 10^5)$.

The next line contains $n+1$ integer,the i-th stand for $f(i-1)$.

The input garantees that $\sum p \le 10^6$,p is prime,$0 \le f(i) < p$.

Output

For each test case, you should firstly output "Case #t: "(without quotes), where t is the index of this test case.

In the next line,you should output a single line contains $n+1$ integer.The i-th stands for $a_{i-1} \bmod p$.

It can be proved that there is only one solution if you modulo the coefficient by p,so there is and only one acceptable output.

Sample Input

```
3
2 10007
1 4 9
3 10007
1 8 27 64
12 10007
1 1 4 5 1 4 1 9 1 9 8 1 0
```

Sample Output

```
Case #1:
1 2 1
Case #2:
1 3 3 1
Case #3:
1 8594 9725 4829 7653 7268 9644 5003 6141 3793 9624 5125 2657
```

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