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B. Strange Machine

time limit per test: 1.5 seconds

memory limit per test: 256 megabytes

You are given n machines arranged in a circle, where n is at most 20. Each machine is either of type A or type B. The machines are numbered clockwise from 1 to n, and the type of the i-th machine is denoted by s_i. Each machine takes an integer x and updates it according to its type:

- Type A: Decrease x by 1. Formally, update $x := x - 1$.
- Type B: Replace x with the floor of half its value. Formally, update $x := \left\lfloor \frac{x}{2} \right\rfloor$, where $\lfloor y \rfloor$ denotes the floor of y, which is the greatest integer less than or equal to y.

You are given q queries, each consisting of a single integer a. In each query, you start at machine 1 holding an integer a. Each second, the following two actions occur in order:

1. The current machine updates a according to its type.
2. Then, move one step clockwise to the next machine. Formally

   - If you are at machine i where $1 \le i \le n - 1$, move to machine $i + 1$.
   - If you are at machine n, move to machine 1.

This process continues until your integer a becomes 0. For each query, determine the number of seconds required for a to reach 0.

Note that all queries are independent of each other.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 10^4$). The description of the test cases follows.

The first line of each test case contains two integers n and q ($1 \le n \le 20, 1 \le q \le 10^4$) — the number of machines, and the number of queries, respectively.

The second line of each test case contains a string s ($|s| = n$ and $s_i = $ A or B) — the types of the machines.

The third line of each test case contains q integers $a_1, a_2, \ldots, a_q$ ($1 \le a_i \le 10^9$) — the initial integer of each query.

Note that there are no constraints on the sum of n over all test cases.

It is guaranteed that the sum of q over all test cases does not exceed 10^4.

Output

For each test case, output q integers representing the answers to each query.

Example

input	Copy

```
3
2 2
BA
3 4
1 1
B
20
6 4
BAABBA
2 8 32 95
```

output	Copy

```
2
3
5
2
5
8
11
```

Note

In the first test case, the queries are as follows:

- Query 1: $a = 3$

  1. Start at machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{3}{2} \right\rfloor = 1$.
  2. Move to machine 2. Machine 2 decreases a by 1. Now, $a = 1 - 1 = 0$.

  Therefore, it takes 2 seconds for a to reach 0.

- Query 2: $a = 4$

   1. Start at machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{4}{2} \right\rfloor = 2$.
   2. Move to machine 2. Machine 2 decreases a by 1. Now, $a = 2 - 1 = 1$.
   3. Move back to machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{1}{2} \right\rfloor = 0$.

   Therefore, it takes 3 seconds for a to reach 0.

In the second test case, there is only one query with $a = 20$:

   1. Start at machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{20}{2} \right\rfloor = 10$.
   2. Move to machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{10}{2} \right\rfloor = 5$.
   3. Move to machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{5}{2} \right\rfloor = 2$.
   4. Move to machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{2}{2} \right\rfloor = 1$.
   5. Move to machine 1. Machine 1 replaces a with the floor of half its value. Now, $a = \left\lfloor \frac{1}{2} \right\rfloor = 0$.

Therefore, it takes 5 seconds for a to reach 0.

DeepL 翻译

注

在第一个测试案例中，查询如下：

- 查询 1 ： $a = 3$

   - 从机器 1 开始。机器 1 将 a 替换为其值一半的下限。现在， $a = \left\lfloor \frac{3}{2} \right\rfloor = 1$ 。
   - 移动到机器 2 。机器 2 将 a 减少 1 。现在是 $a = 1 - 1 = 0$ 。

   因此， a 到达 0 需要 2 秒。
- 查询 2 ： $a = 4$

   - 从机器 1 开始。机器 1 将 a 替换为其值一半的下限。现在， $a = \left\lfloor \frac{4}{2} \right\rfloor = 2$ 。
   - 移动到机器 2 。机器 2 将 a 减少 1 。现在是 $a = 2 - 1 = 1$ 。
   - 移回机器 1 。机器 1 将 a 替换为其数值一半的下限。现在是 $a = \left\lfloor \frac{1}{2} \right\rfloor = 0$ 。

   因此， a 到达 0 需要 3 秒。

在第二个测试用例中，只有一个 $a = 20$ 的查询：

1. 从机器 1 开始。机器 1 将 a 替换为其值一半的下限。现在， $a = \left\lfloor \frac{20}{2} \right\rfloor = 10$ 。
2. 移动到机器 1 。机器 1 以 a 值的一半的下限代替 a 值。现在是 $a = \left\lfloor \frac{10}{2} \right\rfloor = 5$ 。
3. 移动到机器 1 。机器 1 将 a 替换为其数值一半的下限。现在是 $a = \left\lfloor \frac{5}{2} \right\rfloor = 2$ 。
4. 移动到机器 1 。机器 1 将 a 替换为其数值一半的下限。现在是 $a = \left\lfloor \frac{2}{2} \right\rfloor = 1$ 。
5. 移动到机器 1 。机器 1 以 a 值的一半的下限代替 a 。现在是 $a = \left\lfloor \frac{1}{2} \right\rfloor = 0$ 。

因此， a 到达 0 需要 5 秒。

GNU G++17 7.3.0

1

▶ 自定义测试数据(自动保存)