C. Make It Beautiful

time limit per test: 2 seconds
memory limit per test: 512 megabytes

You are given an array a of n integers. We define the beauty of a number x to be the number of 1 bits in its binary representation. We define the beauty of an array to be the sum of beauties of the numbers it contains.

In one operation, you can select an index i $(1 \leq i \leq n)$ and increase a_i by 1.

Find the maximum beauty of the array after doing **at most** k operations.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \leq t \leq 5000$). The description of the test cases follows.

The first line of each test case contains two integers n and k ($1 \leq n \leq 5000, 0 \leq k \leq 10^{18}$) — the length of the array and the maximal number of operations.

The second line of each test case contains n integers $a_1, a_2, \ldots a_n$ ($0 \leq a_i \leq 10^9$) —denoting the array a.

It is guaranteed that the sum of n over all test cases does not exceed 5000.

Output

For each test case, output a single integer, the maximum beauty after at most k operations.

Example

input Copy

```
5
5 2
0 1 7 2 4
5 3
0 1 7 2 4
1 1
3
3 0
2 0 3
1 100000000000
0
```

output Copy

```
8
9
2
3
36
```

Note

In the first test case, $a = [0, 1, 7, 2, 4]$.

- apply the first operation at $i = 1$, the new array is $a = [1, 1, 7, 2, 4]$
- apply the second operation at $i = 4$, the new array is $a = [1, 1, 7, 3, 4]$

The beauty of this array is $1 + 1 + 3 + 2 + 1 = 8$. One of the other valid solutions with the same beauty is $[0, 1, 7, 3, 5]$.

In the third test case, $a = [3]$. Since you are not required to use exactly k operations, it is optimal to do none.

Codeforces Round 1030 (Div. 2)
Finished
Practice

→ Virtual participation

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

Start virtual contest

→ Clone Contest to Mashup

You can clone this contest to a mashup.

Clone Contest

→ Submit?

Language: GNU G++20 13.2 (64 bit, win

Choose file: Choose File No file chosen

Submit

→ Last submissions

Submission	Time	Verdict
324125697	Jun/12/2025 19:16	Accepted
324111272	Jun/12/2025 18:49	Wrong answer on pretest 2

→ Problem tags

bitmasks data structures greedy math *1300

No tag edit access

→ Contest materials

- Announcement (en)
- Tutorial (en)