Problem

Sticks 2

Time limit: 6 seconds

Little Cyan Fish has n sticks, where the length of the i-th stick is 2^{a_i}.

He wants to place all sticks consecutively on a number line from left to right, starting no earlier than position m. Formally, given a sequence $a_1, a_2, \ldots, a_n$ and a starting bound m, let l_i and r_i denote the left and right endpoints of the i-th placed stick, respectively. A placement is *valid* if all of the following conditions hold:

- $l_1 \geq m$;
- $r_i = l_i + 2^{a_i}$ for every $1 \leq i \leq n$;
- l_i is divisible by 2^{a_i} for every $1 \leq i \leq n$;
- $r_i \leq l_{i+1}$ for every $1 \leq i < n$.

For a fixed ordering $a_1, a_2, \ldots, a_n$, define $f(a)$ as the minimum possible value of r_n over all valid placements.

Before placing the sticks, Little Cyan Fish may rearrange $a_1, a_2, \ldots, a_n$ in any order he wishes. Find the maximum possible value of $f(a)$ over all such rearrangements.

Input

There are multiple test cases. The first line of the input contains a single integer T ($1 \leq T$), indicating the number of test cases.

For each test case, the first line contains two integers n and m ($1 \leq n \leq 2 \times 10^5$, $0 \leq m < 2^{100}$). The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \leq a_i < 100$).

It is guaranteed that the sum of n over all test cases does not exceed 2×10^5.

Output

For each test case, output a single integer, indicating the maximum possible value of $f(a)$ after rearranging $a_1, a_2, \ldots, a_n$.

Sample Input 1

```
2
3 0
1 2 3
5 14
0 2 2 3 3
```

Sample Output 1

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20
52
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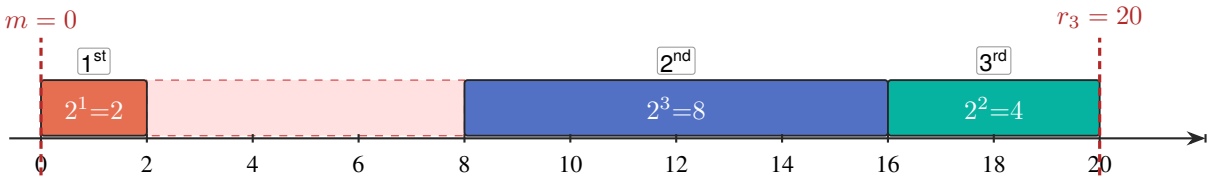
In the first sample, Little Cyan Fish can rearrange the sticks to have lengths $2^1, 2^3, 2^2$. Placing them at intervals $[0, 2]$, $[8, 16]$, and $[16, 20]$ is valid, so this rearrangement has $f(a) = 20$. This is the maximum possible value.



In the second sample, one optimal rearrangement has stick lengths $4, 8, 1, 8, 4$. The figure shows a valid placement ending at 52, so the answer is 52.