Problem E. Set

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Chiaki is going to create n sets $S_0, S_1, \ldots, S_{n-1}$ under the following restrictions:

- $|S_i| = m$.
- $|S_i \setminus S_{(i-1+n) \bmod n}| \geq l_i$.
- $|S_0 \cup S_1 \cup \cdots \cup S_{n-1}| = v$ should be minimized.

Note that $|S|$ is the size of set S, and $A \setminus B$ is set difference which is defined as $\{x : x \text{ in } A \text{ and } x \text{ not in } B\}$.

Given the numbers n, m, and l_i, find the minimum possible value of v.

Input

There are multiple test cases. The first line of the input contains an integer T, indicating the number of test cases. For each test case:

The first line contains two integers n and m ($2 \leq n \leq 10^6$, $0 \leq m \leq 10^{18}$): the number of sets and the size of each set.

The second line contains n integers $l_0, l_1, \ldots, l_{n-1}$ ($0 \leq l_i \leq 10^{18}$).

It is guaranteed that the sum of n in all test cases will not exceed 10^6.

Output

For each test case, output a single line with an integer denoting the minimum value of $v = |S_0 \cup S_1 \cup \cdots \cup S_{n-1}|$. If the restrictions cannot be satisfied, output -1 instead.

Example

standard input	standard output
2 3 1 1 1 1 3 2 1 1 1	3 3