Problem H. Video Reviews - 2

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds (5 seconds for Java)
Memory limit:	64 mebibytes

Easy problem, just binary search the answer.
Oh wait...

You

The studio "Lodka Gaming" is engaged in advertising of their new game ".C.O.N.T.E.S.T: Unexpected Behaviour". The studio's marketer is planning to communicate with n videobloggers one by one (*in the predetermined order, starting from the 1-st and ending with the n-th*), offering them to record a video review on the game. All people are different and videobloggers are as well, therefore the i-th videoblogger will record a review in two cases: either he is interested in this game, or there are already at least a_i video reviews on this game.

The studio wants to have at least m video reviews in the Internet. The game designer of "Lodka Gaming" understands these video reviews possibly would not appear by themselves, so he wants to *convince* some video bloggers that they are actually interested in this game. Which minimal number of videobloggers are needed to be *convinced*?

Input

The first line contains two integers n and m ($1 \le n \le 5 \cdot 10^7, 1 \le m \le n$) — the number of videobloggers and the required number of video reviews.

As n can be too large, the a_i values will be generated by linear congruential random number generators.

The second line contains two integers a_1 and k ($0 \le a_i \le 5 \cdot 10^7, 0 \le k \le 10^5$).

Each of the following k lines contains 4 integers c_j, x_j, y_j and z_j ($1 \le c_j < 5 \cdot 10^7, 1 \le z_j \le 5 \cdot 10^7, 1 \le x_j < z_j, 0 \le y_j < z_j$). z_j are prime numbers. All a_i, except the first one, will be generated using these numbers. The first c_1 of them will be generated using the formula $a_i = (x_1 \cdot a_{i-1} + y_1) \mod z_1$, the next c_2 — using the formula $a_i = (x_2 \cdot a_{i-1} + y_2) \mod z_2$, and so on. It is guaranteed that the sum of all c_j is $n - 1$.

Output

Output a single integer — the minimal number of videobloggers who have to be *convinced* to record a video review on the game in order to achieve at least m total video reviews in the Internet.

Examples

standard input	standard output
7 4 2 6 1 1 49999990 49999991 1 1 2 49999991 1 1 0 49999991 1 1 1 49999991 1 1 49999989 49999991 1 1 1 49999991	1
7 4 2 5 1 1 96 97 1 1 2 97 1 1 0 97 1 1 1 97 2 1 96 97	2

Note

In the first sample, $a = [2, 1, 3, 3, 4, 2, 3]$.

In the second sample, $a = [2, 1, 3, 3, 4, 3, 2]$.