Four Kubic Theorem 2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

Little Cyan Fish is a student studying at the Powerful Kubic University (PKU). In 2023, Little Cyan Fish took the course Introduction to the Kubic Theory taught by Prof. Kubic. After proving the Four Kubic Theorem, Little Cyan Fish became a teaching assistant for this course. In the final exam of this course, Little Cyan Fish prepared the following interesting little problem:

- Given a prime p and four integers a_1, a_2, a_3, a_4 between 1 and $p-1$.
- Solve the equation $a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 \equiv m \pmod{p}$, where $x_i \geq 0$.

This problem is too simple for you, who have taken Introduction to the Kubic Theory. Therefore, Little Cyan Fish gives you another four integers b_1, b_2, b_3, b_4. Little Cyan Fish wants your solution to minimize the value of $b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4$ while satisfying the above equation.

Input

There are multiple test cases. The first line of the input contains a single integer T ($1 \leq T \leq 10^4$), indicating the number of test cases.

For each test case, the first line of the input contains two integers p and m ($2 \leq p \leq 1.01 \times 10^9$, $0 \leq m < p$, guaranteed that p is a prime).

The next line contains four integers a_1, a_2, a_3, a_4 ($1 \leq a_1, a_2, a_3, a_4 < p$).

The next line contains four integers b_1, b_2, b_3, b_4 ($1 \leq b_1, b_2, b_3, b_4 \leq 10^9$).

It is guaranteed that the sum of $\lceil \sqrt{p} \rceil$ over all test cases does not exceed 2^{17}.

Output

For each test case, output a single line containing one integer, indicating the minimum value of $b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4$.

Example

standard input	standard output
3 101 99 1 2 3 4 5 6 7 8 998244353 114514 1919 811 123 777 1000000000 1000000000 1000000000 1000000000 1000000007 767336601 142205992 920557330 725753607 763861942 1 1 1 1	199 76000000000 187