Passing Game

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

There are n footballers numbered $1, 2, \ldots, n$, on a line. The ith is on the position x_i. Initially, the footballer 1 has a football. The footballers are not allowed to move, but they can pass the football to one another. They know the positions of each other. Their aim is to make the ball reach the footballer n in minimum time possible. Different footballers have different kicking speeds. Formally, the ith footballer can kick the ball at a speed of $1/s_i$.

In other words, it takes $s_i \cdot |x_i - x_j|$ time for a direct pass from footballer i to reach footballer j. They are not allowed to change the direction of the ball more than k times. The direction of the ball is said to change in a pair of consecutive direct passes $a \to b$ followed by $b \to c$ if a and c are on the same side of b (both to the left or both to the right). Note that the first pass does not count as a change of direction.

What is the minimum time required for the ball to reach footballer n?

Input

The first line of input contains an integer T, the number of test cases. The descriptions of T test cases follow.

The first line of each testcase contains n and k, the number of footballers, and the maximum number of times they are allowed to change the direction of the ball.

The second line contains n space separated integers, $x_1, x_2, \ldots, x_n$, denoting the positions of the footballers.

The third line contains 'n' space separated integers, $s_1, s_2, \ldots, s_n$, where 's[i]' denotes the inverse of the speed with which the footballer 'i' can kick the football.

- $1 \le T \le 10^5$

- $1 \le n \le 3 \times 10^5$

- $0 \le k \le n$

- The sum of n over all test cases does not exceed 3×10^5.

- $1 \le x_i, s_i \le 10^9$ for all $1 \le i \le n$

- For $i \ne j$, $x_i \ne x_j$

Output

For each test case, print the minimum time required to make the ball reach the footballer n, on a new line.

Example

standard input	standard output
2 4 2 3 2 1 6 3 1 1 3 2 0 1 2 1 2	7 1

Note

In the first test case, it is optimal to pass the ball from player 1 to player 2, and then from player 2 to player 4. Note that, the direction of the ball is changed exactly once. The time taken is $3 \cdot (3-2) + 1 \cdot (6-2) = 7$.

In the second test case, there is only one solution, pass the ball directly from player 1 to player 2.