Problem 10: PokéRogue Daily Run
10 Points

Problem ID: `pokerogue`
Rank: `3`

Introduction

The (not so) new web browser sensation game is here! In PokéRogue you can catch every single Pokémon with different shiny variants, unlock new egg moves and even fuse your favorite Pokémon to get new ones!

However, for all of this to happen, you need to farm tons of Daily Runs and get the best score possible every single day. Bored of trying to figure out how to get the best score each day, you decide to create a computer program that solves that for you! Neat, isn't it?

Problem Statement

A PokéRogue Daily Run consists of $\mathbf{N}$ stages, each of which can be either a singles battle or a doubles battle. If you choose to activate a lure before a stage (you have unlimited lures), it will be active for the next $\mathbf{K}$ stages—causing them to be doubles battles. All stages for which a lure is not active are singles battles. **You can only start using lures after the first stage, so the first stage will always be a singles battle.** Note that you are able to activate a lure even if another lure is currently active.

If the i^{th} stage is a singles battle, a Pokémon with $\mathbf{A}_i$ health points will appear and it will take you $\mathbf{B}_i$ turns to win the battle and complete the stage (naturally, you never lose). If the stage is instead a doubles battle, then an additional Pokémon with $\mathbf{C}_i$ health points will appear and it will take you $\mathbf{D}_i$ turns **in total** to win the battle against both Pokémon and complete the stage.

Your score for the Daily Run is defined as the sum of health points for all opposing Pokémon you faced in battle divided by the total number of turns it took to complete all stages in the Daily Run.

What is the best score you can achieve? Give the answer as a floating point number with an absolute or relative error of 10^{-5} within the actual answer.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains two space-separated integers $\mathbf{N}$ $\mathbf{K}$ denoting the number of stages in the Daily Run and the number of stages that a lure lasts, respectively.
- The second line contains a sequence of $\mathbf{N}$ space-separated integers $\mathbf{A}_1$ $\mathbf{A}_2$ $\ldots$ $\mathbf{A}_\mathbf{N}$ denoting the number of health points the first Pokémon has in each stage.
- The third line contains a sequence of $\mathbf{N}$ space-separated integers $\mathbf{B}_1$ $\mathbf{B}_2$ $\ldots$ $\mathbf{B}_\mathbf{N}$ denoting the number of turns it would take you to clear each stage if it was a singles battle.
- The fourth line contains a sequence of $\mathbf{N}$ space-separated integers $\mathbf{C}_1$ $\mathbf{C}_2$ $\ldots$ $\mathbf{C}_\mathbf{N}$ denoting the number of health points the additional Pokémon has in each stage if it were doubles.
- The fifth line contains a sequence of $\mathbf{N}$ space-separated integers $\mathbf{D}_1$ $\mathbf{D}_2$ $\ldots$ $\mathbf{D}_\mathbf{N}$ denoting the total number of turns it would take you to clear each stage if it was a doubles battle.

Output Format

For each test case, output a floating point number denoting the best score you can achieve in the Daily Run. Your answer must have an absolute or relative error of at most 10^{-5}.

Constraints

Time Limit: **2 seconds**

$1 \leq \mathbf{T} \leq 10$
$1 \leq \mathbf{K} \leq \mathbf{N} \leq 5 \cdot 10^4$
$1 \leq \mathbf{A}_i, \mathbf{B}_i, \mathbf{C}_i, \mathbf{D}_i \leq 10^6$ for $1 \leq i \leq \mathbf{N}$

Sample Test Cases

Sample Input Download

```
2
4 1
7 2 3 8
1 2 3 4
5 4 6 29
1 2 3 14
4 2
2 20 200 6
1 2 2 1
1 40 40 6
1 1 20 1
```

Sample Output Download

```
2.9999992
38.9999996
```

Sample Explanations

For test case #1, using a lure before the second and third stages causes the sequence of stages in the Daily Run to be: singles, doubles, doubles, singles. This causes the cumulative health points of all your opponents faced to be $\mathbf{A}_1 + (\mathbf{A}_2 + \mathbf{C}_2) + (\mathbf{A}_3 + \mathbf{C}_3) + \mathbf{A}_4 = 7 + (2 + 4) + (3 + 6) + 8 = 30$. The number of turns it takes to complete this variation of the daily run is $\mathbf{B}_1 + \mathbf{D}_2 + \mathbf{D}_3 + \mathbf{B}_4 = 1 + 2 + 3 + 4 = 10$, leading to a score of 3.0. It can be proven that this is the optimal score. The sample output of 2.9999992 is within the 10^{-5} acceptable error of the optimal.

For test case #2, using a lure before the last stage leads to an optimal score of 39.0. The sample output of 38.9999996 is within the 10^{-5} acceptable error of the optimal.