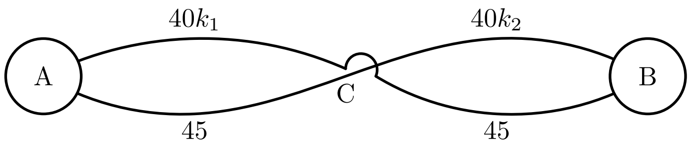
Problem B. Braess's Paradox

Input file:	braess.in
Output file:	braess.out
Time limit:	2 seconds
Memory limit:	256 megabytes

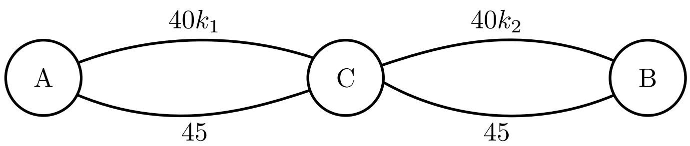
Little known Braess's paradox illustrates the fact that adding more roads and interchanges to the road system can actually make travel time worse for *all* drivers that use corresponding routes. An example shown on the picture below is adapted from Wikipedia. Consider two cities A and B and people driving from city A where they live to city B where they work. There are two roads between the cities that intersect in the middle at a point C, but have no interchange and it is impossible to get from one road another at this point.

The trip by the road one from A to C takes $40k_1$ minutes where k_1 is the fraction of the drivers that use this road. So, for example, if half of the drivers use road one, the trip would take 20 minutes. The trip on the road one from C to B takes 45 minutes regardless of its load. The parts of the road two have the same properties, but other way round. A trip from A to C by the road two takes 45 minutes, and the trip from C to B takes $40k_2$ minutes ($k_1 + k_2 = 1$).



Now it is optimal that half of the drivers use road one and half of the drivers use road two, since in any other situation it would take longer to drive along one of the roads and it would be beneficial for some of the drivers who use a longer route to switch to a shorter route until they become equally long. So all drivers get to their destination in 65 minutes.

If the interchange is built at point C which allows to switch between the roads there, the situation would change in the following way. Now it is always better to drive along the road one from A to C and drive along the road two from C to B, regardless of the road load. Therefore all drivers would choose this route, and now for *all* drivers the trip takes 80 minutes instead of 65.



In this problem we consider a generalized version of the above paradox. Consider two cities A and B connected by two roads that intersect at $n-1$ points that divide each of the roads into n parts. For the i-th part of the road one the time it takes to travel along it is $a_i k_{i,1} + b_i$ minutes where $k_{i,1}$ is the fraction of the drivers that choose to drive this part by road one ($0 \le k_{i,1} \le 1$). Similarly, the time to drive along the i-th part of the second road is $c_i k_{i,2} + d_i$ ($k_{i,2}$ is the fraction of the drivers that use this part of the road two, $k_{i,1} + k_{i,2} = 1$).

Traffic authorities are planning to build interchanges at some of the road intersections that would allow to switch between the roads at these points. Then the drivers would selfishly choose optimal routes: the drivers one after another consider their current route and switch to a better route if it exists. The process continues until for no drivers it is preferential to change their route. It can be proved that this situation will always be reached in constraints of this problem. Since all drivers are equal, they will all have the same trip duration from A to B, this time is called the *equilibrium time*. We assume that there are so many drivers that $k_{i,j}$ can be any floating point value from 0 to 1.

You have to check the current situation, the situation if all possible interchanges are built and also find two ways to build zero or more interchanges. The first way must minimize the equilibrium time for the drives, the second one must maximize it.

Input

The first line of the input file contains n ($2 \le n \le 5000$). The following n lines contain four integers each: a_i, b_i, c_i and d_i ($0 \le a_i, b_i, c_i, d_i \le 1000$).

Output

Output four floating point numbers, one on a line:

- equilibrium time if no interchanges are built;
- equilibrium time if interchanges are built at all intersections;
- minimal possible equilibrium time;
- maximal possible equilibrium time.

Your answer must have absolute or relative error at most 10^{-9}.

Examples

braess.in	braess.out
2 40 0 0 45 0 45 40 0	65.0 80.0 65.0 80.0