Problem 5 (Coding). [20 points] Three warehouses provide four products to two neighborhoods. The supply and demand of each product are given in the following two tables.

Product	A	B	C	D
Warehouse 1	100	200	500	1000
Warehouse 2	300	200	200	500
Warehouse 3	200	300	500	200

Product	A	B	C	D
Neighborhood 1	400	100	600	800
Neighborhood 2	200	500	500	900

One unit of any product takes one unit of transportation volume. The transportation capacity and distances from each warehouse to each neighborhood are given in the following tables.

Transportation Capacity	Warehouse 1	Warehouse 2	Warehouse 3
Neighborhood 1	800	700	800
Neighborhood 2	1000	700	500

Transpotation Distance	Warehouse 1	Warehouse 2	Warehouse 3
Neighborhood 1	1.0	2.0	4.0
Neighborhood 2	6.0	3.0	3.0

Please solve a linear programming problem to minimize the total transportation distance

$$\text{Total distance} = \sum_{\text{Route}} \text{distance of the route} \times \text{transportation quantity of the route}$$

while satisfying the supply, demand and capacity constraint, i.e., the demand of each neighborhood should be fully satisfied, the transportation quantity of each product from each warehouse cannot exceed the supply, and the transportation capacity of each route should not be exceeded.