Exercise:

Türk Kızılayı serves as a medical supplier for Turkey. Therefore, it needs to analyze the annual transportation cost (TC), and minimize it. Suppose that Ankara, İzmir, İstanbul, Gaziantep, Erzurum, Samsun, Antalya, and Batman are the main depot centers in Turkey. Further transportation from these depots are neglected in this scope.

Table-1: Information on depot centers

Depot center	W_i	C_i (TL/km)	X_i coordinate	Y_i coordinate
Ankara	8	0.02	32	39
İzmir	4	0.05	27	38
İstanbul	10	0.02	28	41
Gaziantep	7	0.03	37	37
Erzurum	6	0.03	41	39
Samsun	5	0.03	36	41
Antalya	1	0.05	30	36
Batman	7	0.03	41	37

In Table-1, one may see the related information on depot centers. Here, the column Wi specifies the weight of that depot center. In other words, if that depot center is important then it will take a higher weight value than the others. For instance, İstanbul has the highest weight of all, where Antalya has the least. This weight value represents the population in and around that city, possible natural disasters or wars, etc.

The annual transportation cost to be minimized can be calculated as follows:

$$TC = \sum_i W_i C_i d_i,$$

where di represents the rectilinear distance between the depot and the cities. The optimal location can be found by center of gravity method, which solves the two equations below for $\bar{X}$ and $\bar{Y}$:

$$\bar{X} = \frac{\sum_i \frac{W_i C_i X_i}{d_i}}{\sum_i \frac{W_i C_i}{d_i}}, \bar{Y} = \frac{\sum_i \frac{W_i C_i Y_i}{d_i}}{\sum_i \frac{W_i C_i}{d_i}}$$

In this question, you are asked to converge to optimal solution using the above data and methods. The algorithm should ask for initial $\bar{X}$ and $\bar{Y}$ coordinates and the number of iterations as follows:

Enter initial X coordinate: 0
Enter initial Y coordinate: 0
Enter number of iterations: 5

Then the methods explained above should be applied to the data and at each iteration the resulting solution should be presented as follows:
Iteration-1: X coordinate: 30, Y coordinate: 30, TC: 100
Iteration-2: X coordinate: 30, Y coordinate: 30, TC: 100
. . .
Iteration-5: X coordinate: 30, Y coordinate: 30, TC: 100
The resulting location is found as (30,30) after 5 iterations with total cost of 100.

Please note that the numbers displayed in the representative outputs are not correct.