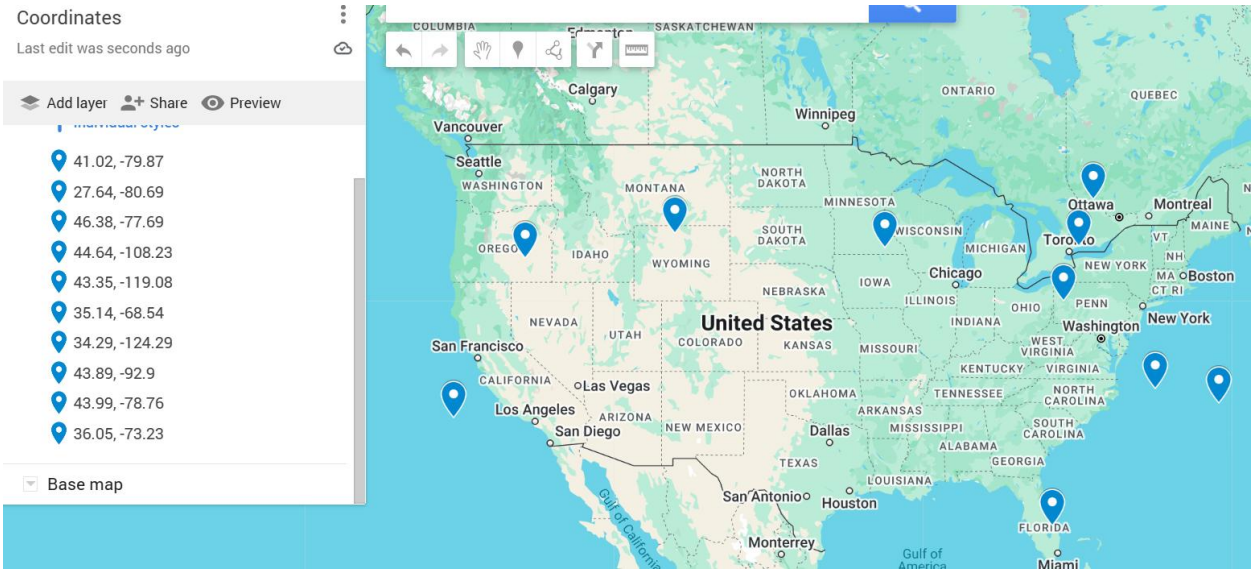
Module 09 – Fixed Charge Problem

Exploratory Data Analysis

In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

- *Make a visual graph of your data on a map (coordinates should be within US borders)*
  - https://mymaps.google.com/
  - Find a map with latitude/longitude and place them approximately
  - Any alternative that gives the same effect

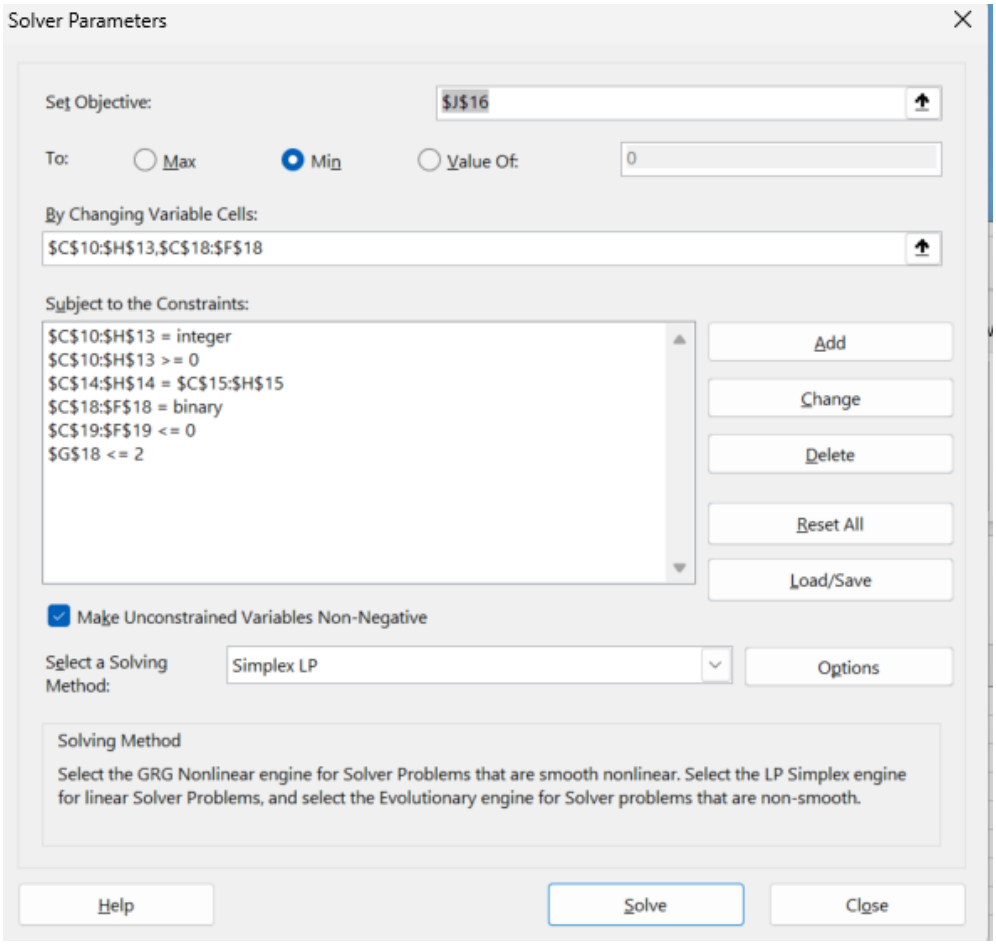


Model Formulation

Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints.

MIN: 2708X_1 +2774X_4 + 17.21*919 +15.9*922 +4.08*730+11.6*657 +12.14*720+26.41*931

All units have to be greater than 0 and an integer.
Sum=Demand
Linking constraints are less than or equal to 0
Binary variables are a binary number
2 or less warehouses used



Model Optimized for Min Costs to Supply DCs

Implement your formulation into Excel and be sure to make it neat. This section should include:

- *A screenshot of your optimized final model (formatted nicely, of course)*
- *A text explanation of what your model is recommending*

WH v DC	1	2	3	4	5	6
1	41.54	17.21	51.15	15.9	4.08	11.6
2	54.1	19.65	50.25	28.46	18.28	15.9
3	44.42	20.39	58.69	17.7	3.46	14.8
4	12.14	49.19	26.41	16.08	30.12	43.6

WH v DC	1	2	3	4	5	6	Total Units	
1	0	919	0	922	730	657	3228	X1
2	0	0	0	0	0	0	0	X2
3	0	0	0	0	0	0	0	X3
4	720	0	931	0	0	0	1651	X4
SUM	720	919	931	922	730	657		
Demand	720	919	931	922	730	657		
							Total Cost ->	$ 79,892
Binary Variables	1	0	0	1	2			
Linking Constraints	-1651	0	0	-3228				
Setup Cost	$ 2,708	$ 1,665	$ 2,255	$ 2,774				
Actual Cost	$ 2,708	$ -	$ -	$ 2,774				
	Max if 1	96	91	84	100			
WH 1	4879	4879	4879	4879	4879	4879		
	41.54	17.21	51.15	15.9	4.08	11.6		
	118	284	96	307	1196	421		
WH 2	4879	4879	4879	4879	4879	4879		
	54.1	19.65	50.25	28.46	18.28	15.9		
	91	249	98	172	267	308		
WH 3	4879	4879	4879	4879	4879	4879		
	44.42	20.39	58.69	17.7	3.46	14.8		
	110	240	84	276	1411	330		
WH 4	4879	4879	4879	4879	4879	4879		
	12.14	49.19	26.41	16.08	30.12	43.6		
	402	100	185	304	162	112		

My model is recommending that warehouses 1 and 4 be used to incur the least cost of $79,892. To incur the least cost there must be 3,228 units allocated to warehouse 1 split between DC 2 with 919 units, DC 4 with 922 units, DC 5 with 730 units, and DC 6 with 657 units. There are also 1,651 units allocated to warehouse 4, allocated between DC 1 with 720 units and DC 3 with 931 units.

Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

Please perform 2 out of the 3 scenarios below with a short text description on what changed:

1. *Instead of only being able to open 2 warehouses, what happens to our objective function when we only can open 1 warehouse?*

The total cost increases to $121,319 and all 4,879 units are from warehouse 1split between DC 1 with 720 units, DC 2 with 919 units, DC 3 with 931 units, DC 4 with 922 units, DC 5 with 730 units, and DC 6 with 657 units.

2. *Right now, we have $1 per unit shipped over the distance between the warehouse and the DC. What happens to our objective function when we increase this to $30? Does your DC assignment change at all?*

   Dc assignment stays the same the only thing that changes is the objective function as cost increases to $2,237,796.

3. *For distance between each location, we used Manhattan distance but what happens to our model if we use Euclidean distance instead? Did the change impact the model at all? Do you feel this is a better distance metric to use in this scenario?*