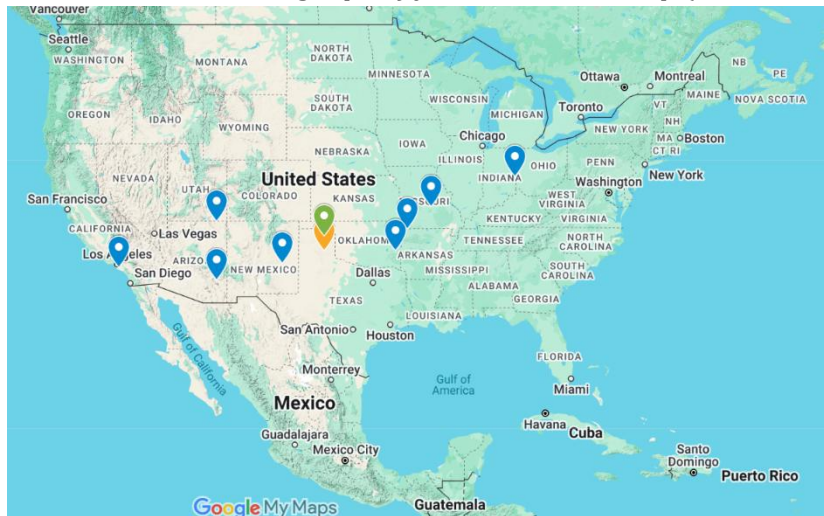


Module 12 – Location Graph

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)



- Module 12
- Individual styles
- Candy Button Bay
 - Eclair Empire
 - Maple Fudge Forest
 - Nougat Nook
 - Pineapple Pop Paradise
 - Pixie Stix Plateau
 - Rainbow Ribbon Roads
 - Rocky Candy Ridge
 - Current DC
 - New DC

- Use your available data to determine a good starting coordinate for the DC

I Used both options for finding the New DC by averaging the Lat and Long Distances

Model Formulation

Try to 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. Hint: Linking constraints aren't needed since we are using Nonlinear GRG but refer to the associated PowerPoint in your data if you need help.

Module 12

$$\text{Min} = \sqrt{(34.13 - x_1)^2 + (109.55 - y_1)^2} + \sqrt{(35.54 - x_1)^2 + (-95.55 - y_1)^2} + \sqrt{(36.5 - x_1)^2 + (-94.72 - y_1)^2} + \sqrt{(40.81 - x_1)^2 + (-85.64 - y_1)^2} + \sqrt{(33.41 - x_1)^2 + (-119.74 - y_1)^2} + \sqrt{(37.91 - x_1)^2 + (-110.29 - y_1)^2} + \sqrt{(33.59 - x_1)^2 + (-110.6 - y_1)^2} + \sqrt{(38.43 - x_1)^2 + (-92.52 - y_1)^2}$$

Constraints

$$\sqrt{(34.13 - x_1)^2 + (109.55 - y_1)^2} \leq 3.62$$

$$\sqrt{(35.54 - x_1)^2 + (-95.55 - y_1)^2} \leq 6.74$$

$$\sqrt{(36.5 - x_1)^2 + (-94.72 - y_1)^2} \leq 5.91$$

$$\sqrt{(40.81 - x_1)^2 + (-85.64 - y_1)^2} \leq 16.52$$

$$\sqrt{(33.41 - x_1)^2 + (-119.74 - y_1)^2} \leq 18.48$$

$$\sqrt{(37.91 - x_1)^2 + (-110.29 - y_1)^2} \leq 9.06$$

$$\sqrt{(33.59 - x_1)^2 + (-110.6 - y_1)^2} \leq 9.47$$

$$\sqrt{(38.43 - x_1)^2 + (-92.52 - y_1)^2} \leq 9.40$$

Model Optimized for Distance Reduction from DC to Store

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

(Original) without the different averages.

						New DC			Model Decision		
Store Name	Store Location		Current DC		Current DC Dist						
	Lat	Long	Lat	Long		Lat	Long	New DC Dist		Dist	
Candy Button Bay	34.13	-104.55	35.98	-101.44	3.62	36.3525	-101.701	3.61	Yes		3.61
Eclair Empire	36.5	-94.72	35.98	-101.44	6.74	36.3525	-101.701	6.98	No		101.51
Maple Fudge Forest	35.54	-95.55	35.98	-101.44	5.91	36.3525	-101.701	6.20	No		101.95
Nougat Nook	40.81	-85.64	35.98	-101.44	16.52	36.3525	-101.701	16.67	No		94.87
Pineapple Pop Paradise	33.41	-119.74	35.98	-101.44	18.48	36.3525	-101.701	18.28	Yes		124.31
Pixie Stix Plateau	37.91	-110.29	35.98	-101.44	9.06	36.3525	-101.701	8.73	Yes		116.62
Rainbow Ribbon Roads	33.59	-110.6	35.98	-101.44	9.47	36.3525	-101.701	9.32	Yes		115.59
Rock Candy Ridge	38.93	-92.52	35.98	-101.44	9.40	36.3525	-101.701	9.54	No		100.38
				Total	79.18631561						

This model is comparing current DC distances with the new DC distances and highlighting which distances would be closer compared to the current distances. **Yes** for a change to new DC and **No** that the current is closer.

Model with Stipulation

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

You should notice that while distance is minimized between each store and each DC, there is a discrepancy between how much demand is serviced between each DC (i.e. one DC may service a lot more demand than others). Please:

- Choose one:
 - Implement a change that picks a location for the new DC to distance **AND** load. You can do this by multiplying distance by demand if a store is serviced by a particular DC.

I was able to find a new distance (listed in red in the map from the original model) Instead of averaging them all I found the average of the stores that are furthest from the current DC. This gave me the new DC center in red. My calculations weighted by distance are listed below with the new calculations.



New Model with different averages:

						New DC			Model Decision	
Store Name	Store Location		Current DC		Current DC Dist					
	Lat	Long	Lat	Long		Lat	Long	New DC Dist		Dist
Candy Button Bay	34.13	-104.55	35.98	-101.44	3.62	39.21667	-96.15	9.82	No	3.61
Eclair Empire	36.5	-94.72	35.98	-101.44	6.74	39.21667	-96.15	3.07	Yes	101.51
Maple Fudge Forest	35.54	-95.55	35.98	-101.44	5.91	39.21667	-96.15	3.73	Yes	101.95
Nougat Nook	40.81	-85.64	35.98	-101.44	16.52	39.21667	-96.15	10.63	Yes	94.87
Pineapple Pop Paradise	33.41	-119.74	35.98	-101.44	18.48	39.21667	-96.15	24.29	No	124.31
Pixie Stix Plateau	37.91	-110.29	35.98	-101.44	9.06	39.21667	-96.15	14.20	No	116.62
Rainbow Ribbon Roads	33.59	-110.6	35.98	-101.44	9.47	39.21667	-96.15	15.51	No	115.59
Rock Candy Ridge	38.93	-92.52	35.98	-101.44	9.40	39.21667	-96.15	3.64	Yes	100.38
			Total		79.18631561					

Distance*Demand

Store Name	last_year_demand	Current Distance	New Distance	Current (Distance*Demand)	New (Distance*Demand)
Candy Button Bay	1962.92	3.6	9.8	7,103	19,276
Eclair Empire	1211.61	6.7	3.1	8,166	3,720
Maple Fudge Forest	2069.66	5.9	3.7	12,224	7,710
Nougat Nook	1440.19	16.5	10.6	23,794	15,309
Pineapple Pop Paradise	1815.05	18.5	24.3	33,541	44,095
Pixie Stix Plateau	1747.31	9.1	14.2	15,827	24,812
Rainbow Ribbon Roads	1405.32	9.5	15.5	13,304	21,792
Rock Candy Ridge	1730.91	9.4	3.6	16,262	6,303