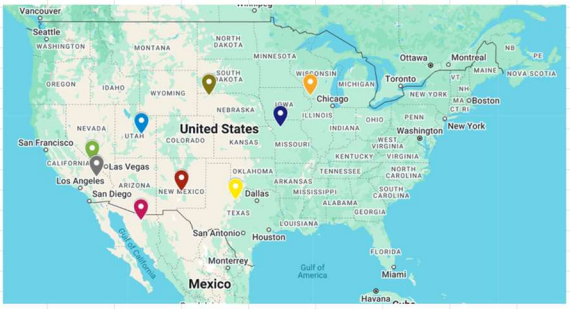
# Module 12 – Location Graph

## Exploratory Data Analysis

| Store_name | Lat | Long | Last_year_demand | Expected_yoy_change |
|---|---|---|---|---|
| Candyfloss Countryside | 39.32 | -110.96 | 1271.17 | 0.11 |
| Dulce de Leche Dunes | 33.71 | -106.12 | 1700.93 | 0.07 |
| Marshmallow Meadows | 42.82 | -90.46 | 2161.54 | -0.09 |
| Meringue Mountains | 32.87 | -99.51 | 1108.04 | 0.12 |
| Pixie Stix Plateau | 40 | -94.02 | 1945.05 | -0.09 |
| Pudding Peaks | 36.65 | -116.91 | 1486.96 | -0.08 |
| Rainbow Ribbon Roads | 30.77 | -110.97 | 1506.6 | 0.06 |
| Vanilla Valley | 42.79 | -102.72 | 1623.85 | 0.09 |

| Estimated DC Location | Lat | Long |
|---|---|---|
| New DC | 37.36625 | -103.959 |




## Model Formulation

MIN: squareroot((38.56-39.32)^2)+((-98.15- -110.96)^2)) + squareroot((38.56-33.71)^2)+((-98.15- -106.12)^2)) + squareroot((38.56-42.82)^2)+((-98.15- -90.46)^2))+squareroot((38.56-32.87)^2)+((-98.15- -99.51)^2)) + squareroot((38.56-40)^2)+((-98.15- -94.02)^2)) + squareroot((38.56-36.65)^2)+((-98.15- -116.91)^2)) + squareroot((38.56-30.77)^2)+((-98.15- -110.97)^2)) + squareroot((38.56-42.79)^2)+((-98.15- -102.72)^2))

## Model Optimized for Distance Reduction from DC to Store

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Objective | 49.95307 | | Lat | Long | | | |
| | | | | | | New DC: | 38.5600066 | -98.1550904 | | | |
| | Store Location | | Current DC | | | New DC | | | Model Decision | |
| Store_name | Lat | Long | Lat | Long | Current DC Distance | Lat | Long | New DC Distance | Use New? | Distance |
| Candyfloss Countryside | 39.32 | -110.96 | 35.16 | -116.38 | 6.832422704 | 38.5600066 | -98.1550904 | 12.82744327 | FALSE | 6.832423 |
| Dulce de Leche Dunes | 33.71 | -106.12 | 35.16 | -116.38 | 10.36195445 | 38.5600066 | -98.1550904 | 9.325360585 | TRUE | 9.325361 |
| Marshmallow Meadows | 42.82 | -90.46 | 35.16 | -116.38 | 27.02817049 | 38.5600066 | -98.1550904 | 8.795564736 | TRUE | 8.795565 |
| Meringue Mountains | 32.87 | -99.51 | 35.16 | -116.38 | 17.02471733 | 38.5600066 | -98.1550904 | 5.849098714 | TRUE | 5.849099 |
| Pixie Stix Plateau | 40 | -94.02 | 35.16 | -116.38 | 22.87783207 | 38.5600066 | -98.1550904 | 4.37864741 | TRUE | 4.378647 |
| Pudding Peaks | 36.65 | -116.91 | 35.16 | -116.38 | 1.581455026 | 38.5600066 | -98.1550904 | 18.85191664 | FALSE | 1.581455 |
| Rainbow Ribbon Roads | 30.77 | -110.97 | 35.16 | -116.38 | 6.967079733 | 38.5600066 | -98.1550904 | 14.99687009 | FALSE | 6.96708 |
| Vanilla Valley | 42.79 | -102.72 | 35.16 | -116.38 | 15.64648523 | 38.5600066 | -98.1550904 | 6.223443082 | TRUE | 6.223443 |

My optimal solution for this problem is an objective function of 49.95. The new DC optimal location is Latitude 38.56 and Longitude -98.15.

## Model with Stipulation

| | | | | Objective | 13029.4412 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Store Demand | | Forecast | | | | | | |
| Store_name | Lat | Long | Last_year_demand | Expected_yoy_change | Next_year_demand | Use New? | | | | | |
| Candyfloss Countryside | 39.32 | -110.96 | 1271.17 | 0.11 | 1410.9987 | FALSE | | | | | |
| Dulce de Leche Dunes | 33.71 | -106.12 | 1700.93 | 0.07 | 1819.9951 | TRUE | | | TRUE | 106.74 | |
| Marshmallow Meadows | 42.82 | -90.46 | 2161.54 | -0.09 | 1967.0014 | TRUE | | | FALSE | 192.19 | |
| Meringue Mountains | 32.87 | -99.51 | 1108.04 | 0.12 | 1241.0048 | TRUE | | | | 85.45 | |
| Pixie Stix Plateau | 40 | -94.02 | 1945.05 | -0.09 | 1769.9955 | TRUE | | | | | |
| Pudding Peaks | 36.65 | -116.91 | 1486.96 | -0.08 | 1368.0032 | FALSE | | | | | |
| Rainbow Ribbon Roads | 30.77 | -110.97 | 1506.6 | 0.06 | 1596.996 | FALSE | | | | | |
| Vanilla Valley | 42.79 | -102.72 | 1623.85 | 0.09 | 1769.9965 | TRUE | | | | | |

This is now recommending that the objective function is 13,029.4412 and that next year's demand is now predicted.