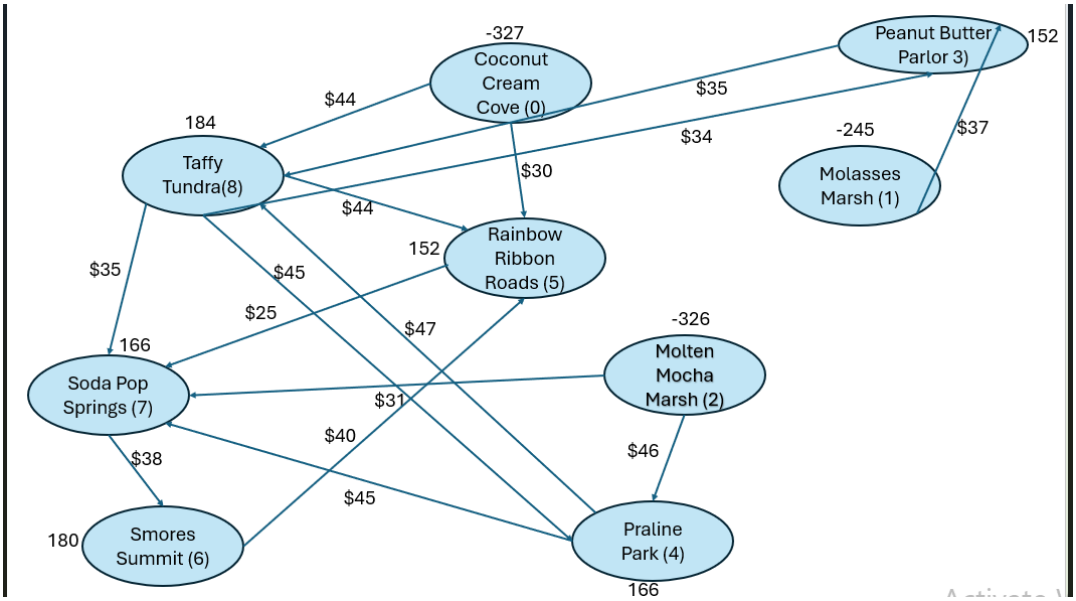
Module 06 – Transshipment Problem

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 like what we saw for the sample problem*
    - https://excalidraw.com
    - https://mermaid.live
    - https://dreampuf.github.io/GraphvizOnline
    - Powerpoint



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.
Hint: This one differs a bit from the sample problem in terms of Balance-of-Flow

- Decision Variables:
    - Represents routes from location to location
    - Ex: X87 is the amount of units shipped from Taffy Tunra to Soda Pop Springs
- Objective Function:
    - Is minimizing the total transportation cost
    - Multiplies the units shipped by the cost per mile for each route
    - MIN 44X05+30X08+37X13+46X24+31X27+35X38+45X47+47X48+25X57+40X65 +38X76+34X83+45X84+44X85+35X87
- Constraints:
    - The amount of units in each route must be greater than or equal to zero

- The Net Flow must be less than or equal to the units demanded for each location
- -X05-X08>=327
- -X13>=245
- -X24-X27>=326
- X13-X38+X38>=152
- -X42-X47+X48-X48>=166
- -X50+X56+X57+X58>=184
- X65-X67>=180
- X72+X74-X75-X76-X78>=166
- X80+X38-X38+X84-X84-X87>=184

Model Optimized for Minimal Transportation Cost

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2										Total Transportation Cost ->	$	36,430.00			
3															
4															
5		Ship		From		To	Cost per Mile			Nodes	Inflow	Outflow	Net Flow	Supply/Demand	
6		0	0	Coconut Cream Cove	5	Rainbow Ribbon Roads	$ 44			0 Coconut Cream Cove	0	327	-327	-327	
7		327	0	Coconut Cream Cove	8	Taffy Tundra	$ 30			1 Molasses Marsh	0	245	-245	-245	
8		245	1	Molasses Marsh	3	Peanut Butter Parlor	$ 37			2 Molten Mocha Marsh	0	326	-326	-326	
9		82	2	Molten Mocha Marsh	4	Praline Park	$ 46			3 Peanut Butter Parlor	245	93	152	152	
10		244	2	Molten Mocha Marsh	7	Soda Pop Springs	$ 31			4 Praline Park	166	0	166	166	
11		93	3	Peanut Butter Parlor	8	Taffy Tundra	$ 35			5 Rainbow Ribbon Roads	152	0	152	152	
12		0	4	Praline Park	7	Soda Pop Springs	$ 45			6 Smores Summit	78	0	78	180	
13		0	4	Praline Park	8	Taffy Tundra	$ 47			7 Soda Pop Springs	244	78	166	166	
14		0	5	Rainbow Ribbon Road	7	Soda Pop Springs	$ 25			8 Taffy Tundra	420	236	184	184	
15		0	6	Smores Summit	5	Rainbow Ribbon Roads	$ 40								
16		78	7	Soda Pop Springs	6	Smores Summit	$ 38								
17		0	8	Taffy Tundra	3	Peanut Butter Parlor	$ 34								
18		84	8	Taffy Tundra	4	Praline Park	$ 45								
19		152	8	Taffy Tundra	5	Rainbow Ribbon Roads	$ 44								
20		0	8	Taffy Tundra	7	Soda Pop Springs	$ 35								
21															
22															
23															
24															

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

The model is recommending the amount of units that should be transported in each route in order to minimize the total transportation cost.

Model with Stipulation

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

Follow these steps to complete this section:

1. *Describe the necessity of the Balance-of-Flow for this problem type*

The balance of flow condition is important to ensure that the total supply from the sources is equal to the demand at each destination. The condition prevents solutions that are not

optimal because it helps maintain a proper distribution of product across the transportation network.

2. *What happens when you change your model to make Total Supply > Total Demand (i.e. add 115 units to one of the sources)*

   It creates an imbalance that would not be able to satisfy both the supply and demand constraints.

3. *What happens when you rerun your model?*

The solver could not find a feasible solution

4. *What do you need to change to make your model work again?*

The demand would need to be made greater than the supply.

5. *Make the changes and report on your findings.*
    a. *PS there is a small chance that the source you added 115 to may make your model infeasible. If so, add the 115 units to a different source.*

The total transportation costs increases.