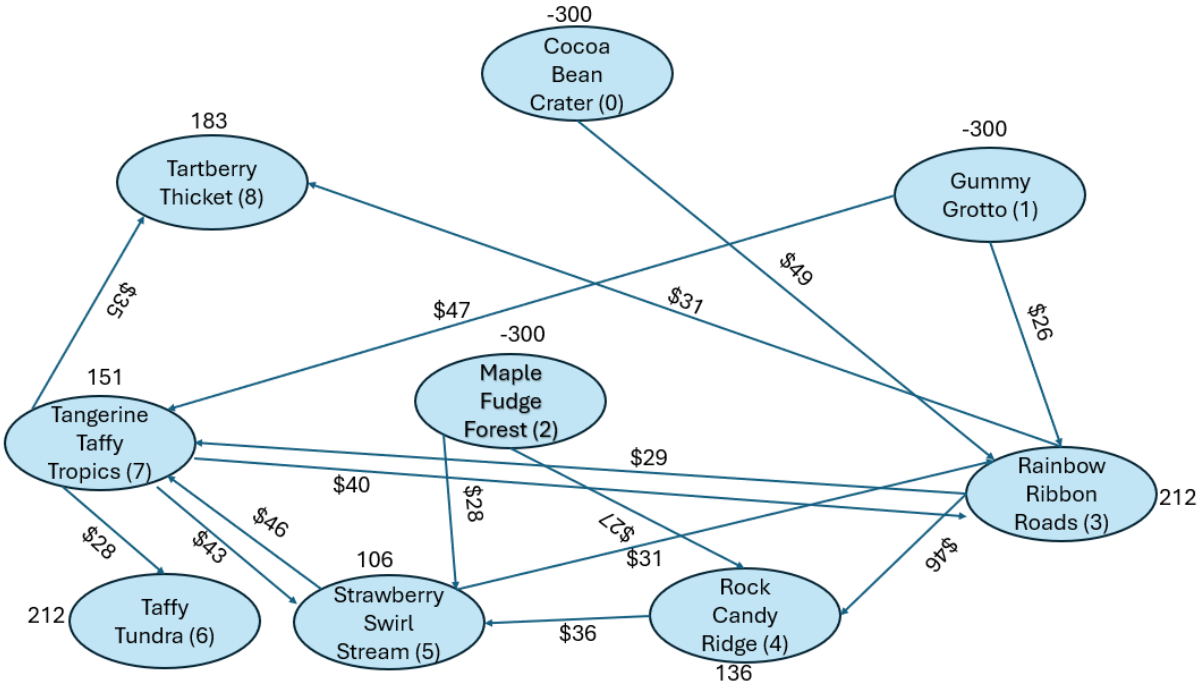
Module 06 – Transshipment Problem

Exploratory Data Analysis



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

Min:
+49X03+26X13+47X17+27X24+28X25+46X34+29X37+31X38+36X45+31X53+46X57+
40X73+43X75+28X76+35X78

Subject To:
-X03>=-300} Flow Constraint for Node 0
-X13-X17>=-300} Flow Constraint for Node 1
-X25-X24>=-300} Flow Constraint for Node 2
+X03+X13+X73-X34-X37-X38>=212} Flow Constraint for Node 3
+X24+X34-X45>=136} Flow Constraint for Node 4
+X25+X45+X75-X53-X57>=106} Flow Constraint for Node 5
+X76>=212} Flow Constraint for Node 6
+X17+X37+X57-X73-X75-X76>=151} Flow Constraint for Node 7
+X38+X78>=183} Flow Constraint for Node 8

Nonnegativity:
Xi>=0

Model Optimized for Minimal Transportation Cost

This model shows the optimal way to fill most of the demands from the nodes we were given while reducing the total transportation costs.

Total Transportation Cost ->	$ 46,546.00

Ship	From		To		Unit Cost
300	0	Cocoa Bean Crater	3	Rainbow Ribbon Roads	49
95	1	Gummy Grotto	3	Rainbow Ribbon Roads	26
205	1	Gummy Grotto	7	Tangerine Taffy Tropics	47
136	2	Maple Fudge Forest	4	Rock Candy Ridge	27
164	2	Maple Fudge Forest	5	Strawberry Swirl Stream	28
0	3	Rainbow Ribbon Roads	4	Rock Candy Ridge	46
0	3	Rainbow Ribbon Roads	7	Tangerine Taffy Tropics	29
183	3	Rainbow Ribbon Roads	8	Tartberry Thicket	31
0	4	Rock Candy Ridge	5	Strawberry Swirl Stream	36
0	5	Strawberry Swirl Stream	3	Rainbow Ribbon Roads	31
58	5	Strawberry Swirl Stream	7	Tangerine Taffy Tropics	46
0	7	Tangerine Taffy Tropics	3	Rainbow Ribbon Roads	40
0	7	Tangerine Taffy Tropics	5	Strawberry Swirl Stream	43
112	7	Tangerine Taffy Tropics	6	Taffy Tundra	28
0	7	Tangerine Taffy Tropics	8	Tartberry Thicket	35

Nodes		Inflow	Outflow	Net Flow	Supply/Demand
0	Cocoa Bean Crater	0	300	-300	-300
1	Gummy Grotto	0	300	-300	-300
2	Maple Fudge Forest	0	300	-300	-300
3	Rainbow Ribbon Roads	395	183	212	212
4	Rock Candy Ridge	136	0	136	136
5	Strawberry Swirl Stream	164	58	106	106
6	Taffy Tundra	112	0	112	212
7	Tangerine Taffy Tropics	263	112	151	151
8	Tartberry Thicket	183	0	183	183

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* - Balance-of-Flow condition is crucial to ensure that the total supply from all sources matches the total demand at all destinations. This condition prevents infeasible or inefficient solutions by maintaining a proper distribution of goods across the network. Here's why it's necessary
2. *What happens when you change your model to make Total Supply > Total Demand (i.e. add 115 units to one of the sources)* The model requires that all goods be allocated, but there are more goods available than needed. This **lack of balance** makes it impossible to satisfy both supply and demand constraints simultaneously.
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?* Change it so Demand>Supply
5. *Make the changes and report on your findings.* The total transportation cost increases.