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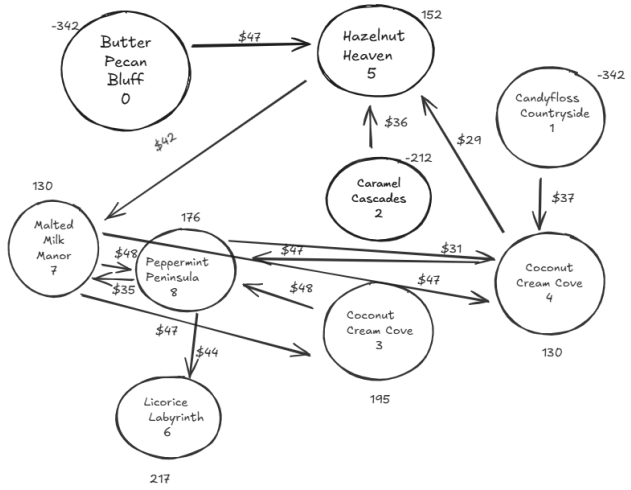
Module 06 – Transshipment Problem

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

MIN: $+30x_{05}+37x_{14}+36x_{25}+48x_{38}+29x_{49}+27x_{48}+42x_{57}+47x_{73}+47x_{74}+48x_{78}+31x_{84}+44x_{86}+35x_{87}$

Subject to:

$-X_{05} \geq -342$

$-X_{14} \geq -342$

$-x_{25} \geq -212$

$-X_{38}+X_{73} \geq 195$

$-X_{45}-X_{48}+X_{14}+X_{74}+X_{84} \geq 130$

$-X_{57}+X_{05}+X_{25}+X_{45} \geq 152$

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$$+X_{86} \geq 217$$
$$-X_{74}-X_{78}+X_{57}+X_{87} \geq 130$$
$$-X_{84}-X_{87}+X_{38}+X_{48}+X_{78} \geq 176$$

Model Optimized for Minimal Transportation Cost

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*
- *Update your graph from the EDA section to bold/color the links being used (and show how much is going through that link)*

Ship	From		To		Unit Cost
342	0	Butter Pecan Bluff	5	Hazelnut Haven	$47
342	1	Candyfloss Countryside	4	Frosted Fluff Fields	$37
212	2	Caramel Cascades	5	Hazelnut Haven	$36
0	3	Coconut Cream Cove	8	Peppermint Peninsula	$48
0	4	Frosted Fluff Fields	5	Hazelnut Haven	$29
212	4	Frosted Fluff Fields	8	Peppermint Peninsula	$27
402	5	Hazelnut Haven	7	Malted Milk Manor	$42
195	7	Malted Milk Manor	3	Coconut Cream Cove	$47
0	7	Malted Milk Manor	4	Frosted Fluff Fields	$47
77	7	Malted Milk Manor	8	Peppermint Peninsula	$48
0	8	Peppermint Peninsula	4	Frosted Fluff Fields	$31
113	8	Peppermint Peninsula	6	Licorice Labyrinth	$44
0	8	Peppermint Peninsula	7	Malted Milk Manor	$35

	Nodes	Inflow	Outflow	Net Flow	Supply/Demand
0	Butter Pecan Bluff	0	342	-342	-342
1	Candyfloss Countryside	0	342	-342	-342
2	Caramel Cascades	0	212	-212	-212
3	Coconut Cream Cove	195	0	195	195
4	Frosted Fluff Fields	342	212	130	130
5	Hazelnut Haven	554	402	152	152
6	Licorice Labyrinth	113	0	113	217
7	Malted Milk Manor	402	272	130	130
8	Peppermint Peninsula	289	113	176	176

Total Transportation Cost	$ 76,801.00

The Model is recommending us not to use 3-8,4-5,7-4,and 8-4 because the shipments are all set to 0

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

3. ***What happens when you rerun your model?*** *Total transportation cost increases by around $24,000 dollars, a big change. Also, the warehouse location sum is over 1000, while the retail supply demand remains 1000.*

4. ***What do you need to change to make your model work again?*** *Lower supply demand by 115 units again.*
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.*

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Ship	From		To		Unit Cost
457	0	Butter Pecan Bluff	5	Hazelnut Haven	$47
342	1	Candyfloss Countryside	4	Frosted Fluff Fields	$37
201	2	Caramel Cascades	5	Hazelnut Haven	$36
0	3	Coconut Cream Cove	8	Peppermint Peninsula	$48
0	4	Frosted Fluff Fields	5	Hazelnut Haven	$29
393	4	Frosted Fluff Fields	8	Peppermint Peninsula	$27
506	5	Hazelnut Haven	7	Malted Milk Manor	$42
195	7	Malted Milk Manor	3	Coconut Cream Cove	$47
181	7	Malted Milk Manor	4	Frosted Fluff Fields	$47
0	7	Malted Milk Manor	8	Peppermint Peninsula	$48
0	8	Peppermint Peninsula	4	Frosted Fluff Fields	$31
217	8	Peppermint Peninsula	6	Licorice Labyrinth	$44
0	8	Peppermint Peninsula	7	Malted Milk Manor	$35

	Nodes	Inflow	Outflow	Net Flow	Supply/Demand
0	Butter Pecan Bluff	0	457	-457	-457
1	Candyfloss Countryside	0	342	-342	-342
2	Caramel Cascades	0	201	-201	-212
3	Coconut Cream Cove	195	0	195	195
4	Frosted Fluff Fields	523	393	130	130
5	Hazelnut Haven	658	506	152	152
6	Licorice Labyrinth	217	0	217	217
7	Malted Milk Manor	506	376	130	130
8	Peppermint Peninsula	393	217	176	176

Total Transportation Cost	$ 100,452.00