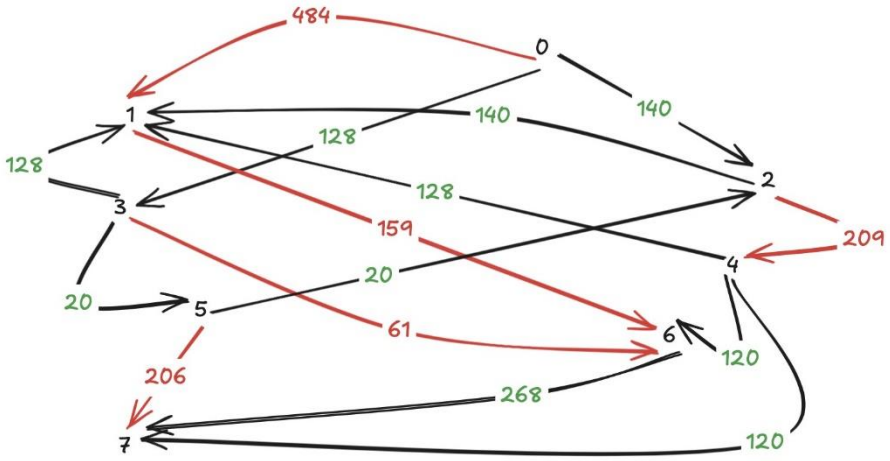
Module 07 – Maximal Flow

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/Word

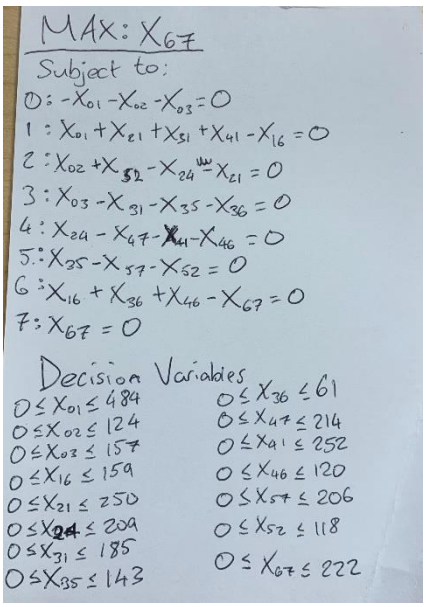


Model Formulation

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.

Maximal Flow ->					268
Units of Flow	Links				Upper Bound
	From		To		
0	0	Buttercream Beach	1	Cherry Jubilee Junction	484
140	0	Buttercream Beach	2	Creme Brulee Cliffs	124
128	0	Buttercream Beach	3	Dulce de Leche Dunes	157
0	1	Cherry Jubilee Junction	6	Tangerine Taffy Tropics	159
140	2	Creme Brulee Cliffs	1	Cherry Jubilee Junction	250
0	2	Creme Brulee Cliffs	4	Fizzwhiz Fjord	209
128	3	Dulce de Leche Dunes	1	Cherry Jubilee Junction	185
20	3	Dulce de Leche Dunes	5	Licorice Labyrinth	143
0	3	Dulce de Leche Dunes	6	Tangerine Taffy Tropics	61
120	4	Fizzwhiz Fjord	7	Tartberry Thicket	214
128	4	Fizzwhiz Fjord	1	Cherry Jubilee Junction	252
120	4	Fizzwhiz Fjord	6	Tangerine Taffy Tropics	120
0	5	Licorice Labyrinth	7	Tartberry Thicket	206
20	5	Licorice Labyrinth	2	Creme Brulee Cliffs	118
268	6	Tangerine Taffy Tropics	7	Tartberry Thicket	222

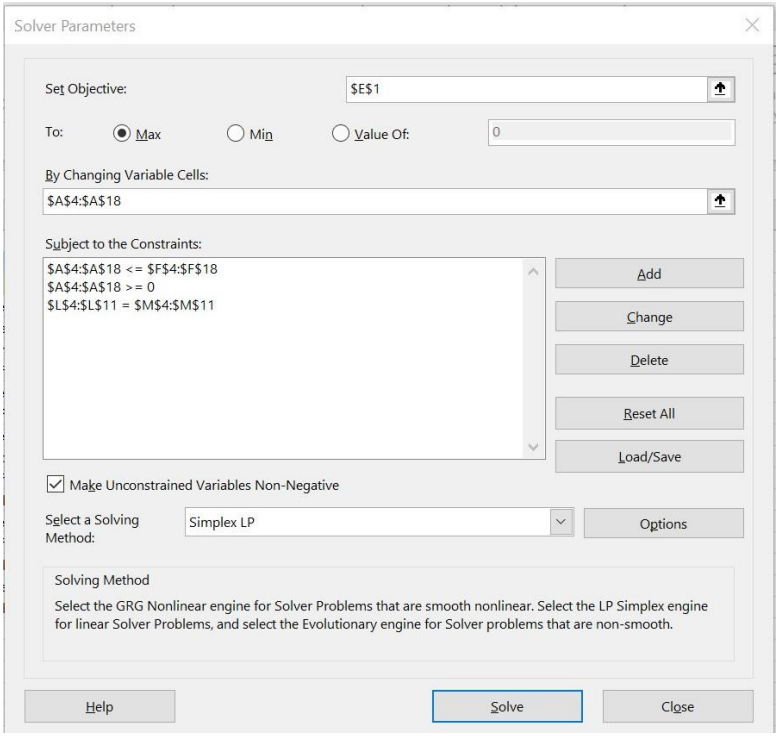
	Nodes	Inflow	Outflow	Net Flow	Supply / Demand
0	Buttercream Beach	268	268	0	0
1	Cherry Jubilee Junction	396	396	0	0
2	Creme Brulee Cliffs	160	160	0	0
3	Dulce de Leche Dunes	128	128	0	0
4	Fizzwhiz Fjord	368	368	0	0
5	Licorice Labyrinth	20	20	0	0
6	Tangerine Taffy Tropics	268	268	0	0
7	Tartberry Thicket	388	388	0	0



Model Optimized for Maximal Flow

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



The model recommends a maximum flow of 268 units through the network. The main bottlenecks are the links from node 6 to node 7, node 1 to node 6, and node 0 to node 2, which have reached their capacity limits and restrict further flow.

Model with Stipulation

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

- Using a copy of the network, show how many units pass through each edge
- Identify the edges that are underutilized and those that are at capacity with different colors (you can also color the nodes **RED** for underutilized and **GREEN** for at capacity)`
  - An edges is underutilized if edges go to it that aren't at capacity
  - An edges is at capacity when it has edges that are at capacity (especially if they are all at capacity)
- Write a brief statement on what would help increase the optimal solution

Increasing the capacities of the main bottlenecks, like the links from node 6 to node 7, node 1 to node 6, and node 0 to node 2, would help increase the maximum flow.