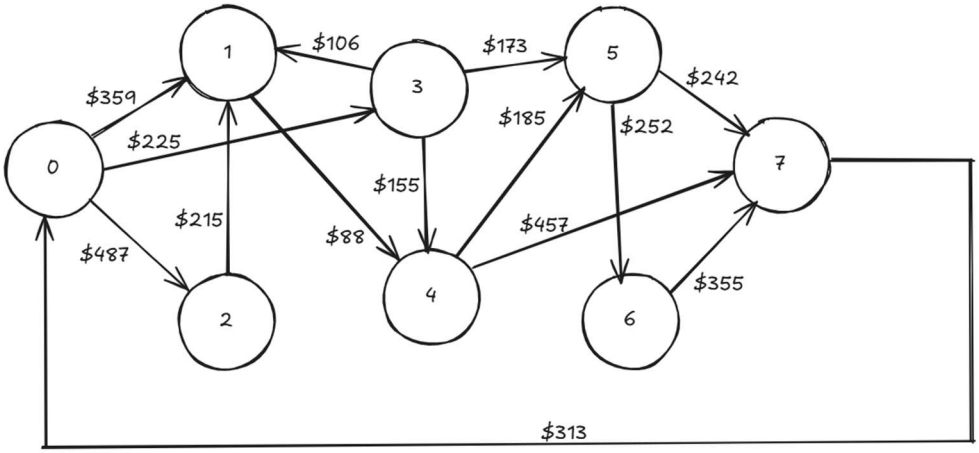
Module 07 – Maximal Flow

Exploratory Data Analysis



	A	B	C	D	E	F
1	to	from	capacity_of_molten_chocolate		location_id	location_name
2	0	1	359		0	Candyfloss Countryside
3	0	2	487		1	Dulce de Leche Dunes
4	0	3	225		2	Marshmallow Meadows
5	1	4	88		3	Marzipan Metropolis
6	2	1	215		4	Meringue Mountains
7	3	1	106		5	Popping Candy Plains
8	3	4	155		6	Rainbow Ribbon Roads
9	3	5	173		7	Whipped Wonderland
10	4	7	457			
11	4	5	185			
12	5	7	242			
13	5	6	252			
14	6	7	355			

Model Formulation

MAX: X70

Subject to: X70 – X01 – X02 – X03
X01 – X21 – X31
X02 + X21
X03 - X31 – X34 – X35
X14 – X34 + X47 + X45
X35 – X45 + X57 + X56
X56 + X67
X47 – X57 – X67 + X70

With the following bounds on the decision variables:
0 <= X01 <= 359
0 <= X02 <= 487
0 <= X03 <= 225
0 <= X14 <= 88

0 <= X21 <= 215
0 <= 31 <= 106
0 <= 34 <= 155
0 <= 35 <= 173
0 <= 47 <= 457
0 <= 45 <= 185
0 <= 57 <= 242
0 <= 56 <= 252
0 <= 67 <= 355
0 <= 70 <= INF.

Model Optimized for Maximal Flow

Total Transportation Cost --> $313.00

Ship		From		To	Unit Cost
88	0	Candyfloss Countryside	1	Dulce de Leche Dunes	$ 359.00
0	0	Candyfloss Countryside	2	Marshmallow Meadows	$ 487.00
225	0	Candyfloss Countryside	3	Marzipan Metropolis	$ 225.00
88	1	Dulce de Leche Dunes	4	Meringue Mountains	$ 88.00
0	2	Marshmallow Meadows	1	Dulce de Leche Dunes	$ 215.00
0	3	Marzipan Metropolis	1	Dulce de Leche Dunes	$ 106.00
52	3	Marzipan Metropolis	4	Meringue Mountains	$ 155.00
173	3	Marzipan Metropolis	5	Popping Candy Plains	$ 173.00
140	4	Meringue Mountains	7	Whipped Wonderland	$ 457.00
0	4	Meringue Mountains	5	Popping Candy Plains	$ 185.00
0	5	Popping Candy Plains	7	Whipped Wonderland	$ 242.00
173	5	Popping Candy Plains	6	Rainbow Ribbon Roads	$ 252.00
173	6	Rainbow Ribbon Roads	7	Whipped Wonderland	$ 355.00
313	7	Whipped Wonderland	0	Candyfloss Countryside	$99,999,999

	Nodes	Inflow	Outflow	Net flow	Supply/Demand
0	Candyfloss Countryside	313	313	0	0
1	Dulce de Leche Dunes	88	88	0	0
2	Marshmallow Meadows	0	0	0	0
3	Marzipan Metropolis	225	225	0	0
4	Meringue Mountains	140	140	0	0
5	Popping Candy Plains	173	173	0	0
6	Rainbow Ribbon Roads	173	173	0	0
7	Whipped Wonderland	313	313	0	0

This explains that the optimal solution is $313. This shows that the maximum flow from 7 to 0 is $313.

Model with Stipulation

Units reach each node:

Units		Nodes
313	0	Candyfloss Countryside
88	1	Dulce de Leche Dunes
0	2	Marshmallow Meadows
225	3	Marzipan Metropolis
140	4	Meringue Mountains
173	5	Popping Candy Plains
173	6	Rainbow Ribbon Roads
313	7	Whipped Wonderland

Ship		From		To	Unit Cost
88	0	Candyfloss Countryside	1	Dulce de Leche Dunes	$ 359.00
0	0	Candyfloss Countryside	2	Marshmallow Meadows	$ 487.00
225	0	Candyfloss Countryside	3	Marzipan Metropolis	$ 225.00
88	1	Dulce de Leche Dunes	4	Meringue Mountains	$ 88.00
0	2	Marshmallow Meadows	1	Dulce de Leche Dunes	$ 215.00
0	3	Marzipan Metropolis	1	Dulce de Leche Dunes	$ 106.00
52	3	Marzipan Metropolis	4	Meringue Mountains	$ 155.00
173	3	Marzipan Metropolis	5	Popping Candy Plains	$ 173.00
140	4	Meringue Mountains	7	Whipped Wonderland	$ 457.00
0	4	Meringue Mountains	5	Popping Candy Plains	$ 185.00
0	5	Popping Candy Plains	7	Whipped Wonderland	$ 242.00
173	5	Popping Candy Plains	6	Rainbow Ribbon Roads	$ 252.00
173	6	Rainbow Ribbon Roads	7	Whipped Wonderland	$ 355.00
313	7	Whipped Wonderland	0	Candyfloss Countryside	$99,999,999

Something that would help increase the optimal solution would be to increase the unit cost per arcs.