Lesson #4 Homework

The Guinness Brewery Company has two breweries (Dublin-B and Kilarny) and three markets (Dublin-M, Galway, and Cork). They have two warehouse locations (Kilgore and Sligo), but don't necessarily have to use both. They have transportation costs (dollars/case) for moving cases of beer from brewery to warehouse, and from warehouse to market (see the table below). Note that it is possible to transport cases directly from the brewery to the market in Dublin (Dublin-B to Dublin-M). Otherwise, the cases must visit a warehouse before being transported to a market. Each warehouse has a monthly operating cost, as well as a maximum capacity.

	Transportation Costs				
	DublinB (B)	Kilarny (B)	Dublin-M (M)	Galway (M)	Cork (M)
Kilgore (W)	15	10	16	12	11
Sligo (W)	20	25	21	9	28
Dublin-B (B)	—	—	18	—	—

Brewery	Supply
Dublin-B	400
Kilarny	500

Market	Demand
Dublin-M	500
Galway	200
Cork	100

a. Draw of the Guinness transportation network. Label all arcs with the appropriate costs. Label all nodes with the appropriate supply and demand values.

b. Write a **concrete** mathematical programming model to minimize the cost of Guinness's monthly transportation cost. Clearly describe all decision variables, constraints, and the objective.

c. Write the **abstract** mathematical programming model for solving the Guinness transportation problem. Clearly define and describe all sets, parameters, and decision variables.

d. Implement your abstract model using Pyomo. Report your optimal variable values and your optimal objective function value