

Department of Mathematics
SA 405 - Advanced Mathematical Programming
Quiz 2

Name: _____

Luxurious Pillows INC has two fulfillment centers in Seattle and Los Angeles. They ship pillows to the DMV area through either a warehouse in Chicago or Dallas for the costs given in the table below.

	Transportation Costs				
	Chicago	Dallas	Washington DC	Baltimore	Annapolis
Seattle	15	25	-	-	-
Los Angeles	20	18	-	-	-
Chicago	-	-	17	15	20
Dallas	-	-	22	13	12

The fulfillment centers in Seattle and Los Angeles have supplies of 500 and 600 pillows, respectively. Likewise, DC, Baltimore, and Annapolis have demands of 300, 600, and 400; respectively. They want to meet demand at as low of a cost as possible.

1. (25 points) Draw the network diagram for this problem. Be sure to indicate the supply/demand of each node.

2. For the next questions, consider the following sets and variables:

Sets

Let N be the set of nodes

Let E be the set of edges

Variables

Let $x_{i,j}$ be the flow along edge (i, j) for all $(i, j) \in E$.

(a) (20 points) With these decision variables, write the (concrete) objective function for this model.

(b) (15 points) With these decision variables, write the (concrete) flow balance constraint for Dallas.

(c) (20 points) With these sets and decision variables, write the (parameterized) balance of flow constraints for this model. Be sure to clearly define any new sets, variables, or parameters used.

3. (20 points) Suppose that $I = \{1, 2, 3\}$ and $C = \{A, B\}$. Expand the following set of constraints so that they are written with no index sets (i.e., convert these constraints from parameterized to concrete form).

$$\sum_{i \in I} r_c x_{i,c} \geq u_c \text{ for all } c \in C$$