

# CO327 (2022Spring) Assignment 2

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- Assignment deadline: May-25 23:55.
- Submit your electronic copy (in a single PDF) to the dropbox in Waterloo LEARN.

## 1 Formulation: transportation problem (10 points)

You have a company manufacturing piano. You have 2 factories located at cities F1 and F2 and 3 retail centers located at C1, C2 and C3. The monthly demand at the retail centers are 8, 5 and 2 respectively while the monthly supply at the factories are 6 and 9 respectively. Note that the total supply equals the total demand. You are also given the cost of transportation of 1 piano between any factory and any retail center.

	C1	C2	C3
F1	5	5	3
F2	6	4	1

Table 1: Cost of transportation.

Your goal is to determine the quantity to be transported from each factory to each retail center so as to meet the demand at minimum total shipping cost. Formulate this problem as a linear program/integer program **in standard form**. State clearly your decision variable(s), objective function and constraint(s). Note that you do not need to solve the program.

## 2 Cargo plane loading (17 points)

You own a logistic company and you have a cargo plane with 1000 meter<sup>3</sup> of space available. Five suppliers approach you and want you to deliver their cargo to their desired destination. After negotiating with these suppliers, you can choose from a set of 5 cargo to load the plane. The table on the right lists the volume and profit from shipping each of the cargo.

Cargo type	Volume	Profit
1	410	200
2	600	60
3	220	20
4	450	40
5	330	30

Now, suppose there are at most 1 cargo available from each supplier, and:

**2.1** we are allowed to take any portion of each cargo up to the total volume, with the profit adjusted accordingly (that is, if you take half of the cargo, it yields half the profit). Formulate this problem as a linear program. State clearly your decision variable(s), objective function and constraint(s).

\*You do not need to solve the program.

**2.2** we must take all of the cargo or none of it. Model such cargo plane loading problem as an linear integer program. Solve this problem by brute force: enumerating all the possible solutions and find the best one.

END of assignment 2.