

# HW 3: Transportation Problem & Game Theory

Due: Oct 16, 2024

## Problem 1

Consider the tableau given below:

	1	2	3	
I	3	1	6	5
II	5	2	3	4
III	1	7	8	1
	1	2	7	

Supplies

Demands

- a. Use the northwest corner rule to find an initial shipment plan. Find the cost associated with this plan.

- b. Use the idea of indicator values to determine whether a cheaper plan than the one you found in (a) above exists. Be sure to show all work.

- c. Use the stepping-stone method to find the optimal shipment plan (i.e., the cheapest plan). What is the cost of this plan? Show all steps and explain how you know that you have found the cheapest plan.

## Problem 2

A company supplies water from its three water purification plants (P1, P2, and P3) to four different companies (C1, C2, C3, and C4) that resell the water to office buildings. The transportation costs (in thousands of dollars) from each plant to each company are given in the following table:

	C1	C2	C3	C4
P1	10	6	9	16
P2	12	9	7	8
P3	8	9	5	14

Additionally, each supplier has a supply limit, and each consumer has a demand requirement as listed below:

- P1 can supply 20 units.
- P2 can supply 25 units.
- P3 can supply 15 units.
- C1 demands 20 units.
- C2 demands 15 units.
- C3 demands 10 units.
- C4 demands 15 units.

- a. Create a TP tableau to model the scenario. Be sure to label the tableau accordingly.

- b. Determine how many units should be transported from each supplier to consumers while minimizing the total transportation cost. What would be the minimum transportation cost? Be sure to show/explain your work.

### Problem 3

Sweet Melodies Band is planning to hold a concert and all tickets are already sold out. Since the weather is unpredictable, the band must decide in advance on three options: to hold the concert indoors, outdoors, or set up seats both indoors and outdoors. If the show is held outdoors, the band will make a profit of \$23,000 when there is no rain and a loss of \$17,000 if it rains. If the show is held indoors, the band will make a \$16,000 profit whether it rains or not. If they decide to set up some seats indoors and some outdoors, the band will make \$13,000 if it rains and \$21,000 if it doesn't rain.

- a. Create a payoff matrix to model this scenario. Be sure to label the matrix accordingly. Use "Band Decision" as player 1 (i.e., rows) and "Weather" as player 2 (i.e., columns).

- b. Find the optimum strategy for the band.

c. Is the game strictly determined? How do you know?

d. Is the game fair? How do you know?

e. Suppose the weather forecast shows that there is a 60% chance of rain. What would be the best decision for the band (i.e., what strategy would maximize the band's profit)?