T & A problems

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SCENARIO 1 – Transportation Problem

- Maxie and Bianca own Umbrella Corporation, LLC, and they are the top producers of high quality Johns Hopkins Basketball jerseys. Despite prior team records, these jerseys are in hot demand.

- Maxie and Bianca operate two factories, Factory 1 and Factory 2. They have large orders from retail stores in three locations: Store A, Store B, and Store C. The transportation costs from Factory 1 to the three stores are $22, 14, and $30 per jersey, respectively. The transportation costs from Factory 2 to the three stores are $16, $20, and $24 per jersey respectively. Factory 1 can produce at most 100 jerseys in a week. Factory 2 can produce at most 120 jerseys in a week. Stores A, B and C demand 80, 60, and 70 jerseys each week.

- The manufacturing costs are $6.00 per jersey at Factory 1 and $6.25 per jersey at Factory 2.

- Maxie and Bianca are savvy businesswomen and want to minimize their costs. Find the number of jerseys that should be shipped from each factory to each store such that the total costs from transportation and manufacturing are minimized.

TRANSPORTATION TEMPLATE

data table:	Store A	Store B	Store C	output
factory 1	$22	$14	$30	100
factory 2	$16	$20	$24	120
demand	80	60	70	

manufacturing cost:	per jersey	total:
factory 1:	$6	$540
factory 2:	$6.25	$750

shipment table:	Store A	Store B	Store C	output
factory 1	30	60	0	90
factory 2	50	0	70	120
demand	80	60	70	

total costs (Min): $5,270

QUESTIONS

- How many jerseys should **Factory 1** ship to each store?

- **Answer:** 30 jerseys to Store A, 60 jerseys to Store B, and 0 jerseys to Store C.

- How many jerseys should **Factory 2** ship to each store?

- **Answer:** 50 jerseys to Store A, 0 jerseys to Store B, and 70 jerseys to Store C.

- What is the **total minimal cost** (including shipping and production), to the nearest dollar?

- **Answer:** $5270

SUMMARY

- There are two optimal solutions to this problem:

- One option is to ship 30 jerseys from Factory 1 to Store A, 60 jerseys from Factory 1 to Store B, 0 jerseys from Factory 1 to Store C, 50 jerseys from Factory 2 to Store A, 0 jerseys from Factory 2 to Store B, and 70 jerseys from Factory 2 to Store C.

- Another option is to ship 0 jerseys from Factory 1 to Store A, 60 jerseys from Factory 1 to Store B, 30 jerseys from Factory 1 to Store C, 80 jerseys from Factory 2 to Store A, 0 jerseys from Factory 2 to Store B, and 40 jerseys from Factory 2 to Store C.

- Either option gives the total minimal cost of $5270.

SCENARIO 2 – Assignment Problem

- Maxie is leaving the Johns Hopkins Basketball jersey making business and is closing three of her factories. She would like to reassign all 235 of her best workers to Bianca's remaining factories.

Closing Plant	No. of Workers to Transfer
1	60
2	105
3	70
Total	235

SCENARIO 2 CONT'D.

- However, demand for skilled labor in the basketball jersey making market has decreased.

- Bianca has three open plants that have openings, but not enough for all 235 employees looking to be transferred. The below table summarizes Bianca's current needs:

Open Plant	No. of Open Positions
A	45
B	90
C	35
Total	170

SCENARIO 2 CONT'D.

- Each worker who fills an open position on the assembly line will increase the number of basketball jerseys produced per day at each plant as shown in the following table:

- Determine how to assign workers from the closing plants to the open plants in order to maximize product output.

From:	To		
	A	B	C
1	5	8	6
2	10	9	12
3	7	6	10

ASSIGNMENT TEMPLATE

From:	To			Transferable workers
	A	B	C	
1	5	8	6	60
2	10	9	12	105
3	7	6	10	70
Open Positions:	45	90	35	

From:	To			Transferable workers
	A	B	C	
1	0	60	0	60
2	45	30	30	105
3	0	0	5	5
Open Positions:	45	90	35	

total output (max): 1610

QUESTIONS

- How should the workers from **Plant 1** be reassigned?
- **Answer:** Send 0 workers to Plant A, 60 workers to Plant B, and 0 workers to Plant C.

- How should the workers from **Plant 2** be reassigned?
- **Answer:** Send 45 workers to Plant A, 30 workers to Plant B, and 30 workers to Plant C.

- How should the workers from Plant 3 be reassigned?
- **Answer:** Send 0 workers to Plant A, 0 workers to Plant B, and 5 workers to Plant C.

- What is the total increase in product in the three open plants based on these assignments? **Answer:** 1610 jerseys per day.

SUMMARY

- All 60 workers from Plant 1 are reassigned to Plant B.

- All 105 workers from Plant 2 are reassigned: 45 workers go to Plant A, 30 workers go to Plant B, and 30 workers go to Plant C.

- 5 workers from Plant 3 are reassigned to Plant C. The rest of the workers from Plant C are dismissed.

THANK YOU