

Lesson 12 Transportation Model Solutions

#1: Solve the linear programming problem using the transportation method LP.

$$\text{Minimize } 8X_{1,1} + 2X_{1,2} + 5X_{1,3} + 2X_{2,1} + X_{2,2} + 3X_{2,3} + 7X_{3,1} + 2X_{3,2} + 6X_{3,3}$$

Subject to

$$X_{1,1} + X_{1,2} + X_{1,3} = 90$$

$$X_{2,1} + X_{2,2} + X_{2,3} = 105$$

$$X_{3,1} + X_{3,2} + X_{3,3} = 105$$

$$X_{1,1} + X_{2,1} + X_{3,1} = 150$$

$$X_{1,2} + X_{2,2} + X_{3,2} = 75$$

$$X_{1,3} + X_{2,3} + X_{3,3} = 75$$

- a. Complete the table below showing the optimal transportation plan.

	Receiver Demand			
Supplier	1	2	3	Supply
1		15	75	90
2	105			105
3	45	60		105
Demand	150	75	75	

- b. What is the minimum cost?

1,050 units of cost

#2: A manufacturer wants to open a third warehouse that will supply three retail stores. The new warehouse will supply 500 units of backyard play-sets per week. Two locations are being considered: N1 and N2. Transportation costs for N1 to stores A, B, and C are \$6, \$8, and \$7 per unit, respectively. Transportation costs for N2 to stores A, B, and C are \$10, \$6, and \$4 per unit respectively. The existing transportation system includes two warehouses: 1 and 2. The costs for the existing transportation system are shown in the following table.

	Store A	Store B	Store C	Capacity
Whse 1	8	3	7	500
Whse 2	5	10	9	400
Demand	400	600	350	

Answer the following questions.

- a. Complete the table below showing the optimal transportation plan for location N1. Identify the minimum cost for this location.

	Receiver Demand				
Supplier	Store A	Store B	Store C	Dummy	Supply
Whse 1		500			500
Whse 2	400				400
N1		100	350	50	500
Demand	400	600	350	50	

Total Cost
\$6,750.00

- b. Complete the table below showing the optimal transportation plan for location N2. Identify the minimum cost for this location.

	Receiver Demand				
Supplier	Store A	Store B	Store C	Dummy	Supply
Whse 1		500			500
Whse 2	400				400
N2		100	350	50	500
Demand	400	600	350	50	

Total Cost
\$5,500.00

- c. Which location should the manufacturer select for the new transportation system?

Location N2

#3: A large company is which has 3 manufacturing locations, is contemplating construction of a new manufacturing facility which will supply three warehouses. The two leading locations are Toledo and Cincinnati. The new factory would have a supply capacity of 160 units per week. Transportation costs for Toledo to warehouses A, B, and C are \$18, \$8, and \$13 per unit, respectively. Transportation costs for Cincinnati to warehouses A, B, and C are \$7, \$17, and \$13 per unit, respectively. Transportation costs for the existing system are shown in the following table.

	Whse A	Whse B	Whse C	Capacity
Mfg 1	10	14	10	210
Mfg 2	12	17	20	140
Mfg 3	11	11	12	150
Demand	220	220	220	

Answer the following questions.

- a. Complete the table below showing the optimal transportation plan for location Toledo. Identify the minimum cost for this location.

	Receiver Demand			
Supplier	Whse A	Whse B	Whse C	Supply
Mfg 1			210	210
Mfg 2	140			140
Mfg 3	80	60	10	150
Toledo		160		160
Demand	220	220	220	

Total Cost
\$6,720.00

- b. Complete the table below showing the optimal transportation plan for location Cincinnati. Identify the minimum cost for this location.

	Receiver Demand			
Supplier	Whse A	Whse B	Whse C	Supply
Mfg 1			210	210
Mfg 2	60	80		140
Mfg 3		140	10	150
Cincinnati	160			160
Demand	220	220	220	

Total Cost
\$6,960.00

- c. Which location should the manufacturer select for the new transportation system?

Toledo

#4: A retailer which currently has two stores: A and B. They also have 3 warehouses and are considering opening a new store. Three locations in California are currently under consideration: South Coast Plaza (SCP), Fashion Island (FI) and Laguna Hills (LH). Each of the projected locations has a demand potential of 300 units. The shipping costs per unit from the current warehouses to each of these locations are shown in the following table.

	SCP	FI	LH
Whse 1	4	7	5
Whse 2	11	6	5
Whse 3	5	5	6

Transportation costs for the existing system are shown in the following table.

	Store A	Store B	Capacity
Whse 1	15	9	660
Whse 2	10	7	340
Whse 3	14	18	200
Demand	400	500	

Answer the following questions.

- d. Complete the table below showing the optimal transportation plan for South Coast Plaza (SCP). Identify the minimum cost for this location.

	Receiver Demand			
Supplier	Store A	Store B	SCP	Supply
Whse 1		500	160	660
Whse 2	340			340
Whse 3	60		140	200
Demand	400	500	300	

Total Cost
\$10,080.00

- e. Complete the table below showing the optimal transportation plan for location Fashion Island (FI). Identify the minimum cost for this location.

	Receiver Demand			
Supplier	Store A	Store B	FI	Supply
Whse 1	60	500	100	660
Whse 2	340			340
Whse 3			200	200
Demand	400	500	300	

Total Cost
\$10,500.00

- f. Complete the table below showing the optimal transportation plan for location Laguna Hills. Identify the minimum cost for this location.

	Receiver Demand			
Supplier	Store A	Store B	LH	Supply
Whse 1		500	160	660
Whse 2	340			340
Whse 3	60		140	200
Demand	400	500	300	

Total Cost
\$10,380.00

- g. Which location should the manufacturer select for the new transportation system?

South Coast Plaza