

TRANSPORTATION PROBLEM CASES

1. A company manufactures a type of product in three different production plants: P1, P2 and P3. Each of these production plants can produce up to 1500 units per month. The company supplies four customers who require each 1000, 1200, 1500 and 1000 units per month. The company makes a benefit of 110 units for the manufacture of each unit of product. The unit transportation costs from each production plant to each customer are displayed below:

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	1	2	3	4
P1	30	10	25	10
P2	15	25	30	10
P3	20	30	15	20

Formulate the matrix format of the transportation problem for the given production problem, so as to maximize the company's revenue:

2. Three suppliers A, B and C, each produce road grit which has to be delivered to council depots W, X, Y and Z. The stock held at each supplier and the demand from each depot is known. The cost, in pounds, of transporting one lorry load of grit from each supplier to each depot is also known. This information is given in the table

	Depot W	Depot X	Depot Y	Depot Z	Supply
Supplier A	180	110	130	290	14
Supplier B	190	250	150	280	16
Supplier C	240	270	190	120	20
Demand	11	15	14	10	50

3. Three outlets A, B and C are supplied by three suppliers X, Y and Z. The table shows the cost, in pounds, of transporting each unit, the number of units required at each outlet and the number of units available at each supplier.
 - a) Explain why it is necessary to add a dummy demand point in order to solve this problem.
 - b) Add a dummy demand point and appropriate costs to the table.
 - c) Use the north-west corner method to obtain an initial solution and also find the optimal solution by using MODI

	X	Y	Z	Supply
A	9	11	10	40
B	10	8	12	60
C	12	7	8	50
Demand	50	40	30	

4. A mining company extracts gravel, the basic product it sells, from three mines, L1, L2

and L3. The weekly production of each mine is 75, 150 and 75 tons of gravel respectively. The gravel has to be transported to five main consumers, K1, K2, K3, K4 and K5 requiring for their needs 100, 60, 40, 75 and 25 tons of gravel per week respectively.

The problem that concerns the company's management is the minimization of the required cost for the transportation of the product to the consumers. For this purpose a cost analysis was carried out which gave the results of the following table (the numbers denote the transportation cost in € per ton of gravel).

	K1	K2	K3	K4	K5
L1	3	2	3	4	1
L2	4	1	2	4	2
L3	1	0	5	3	2

Find the Optimum solution by using VAM

5. Wheat is harvested in the Midwest and stored in grain elevators in three different cities—Kansas City, Omaha, and Des Moines. These grain elevators supply three flour mills, located in Chicago, St. Louis, and Cincinnati. Grain is shipped to the mills in railroad cars, each car capable of holding one ton of wheat. Each grain elevator is able to supply the following number of tons (i.e., railroad cars) of wheat to the mills on a monthly basis.

<i>Grain Elevator</i>	<i>Supply</i>
Kansas City	150
Omaha	175
Des Moines	<u>275</u>
Total	600 tons

Each mill demands the following number of tons of wheat per month.

<i>Mill</i>	<i>Demand</i>
Chicago	200
St. Louis	100
Cincinnati	<u>300</u>
Total	600 tons

The cost of transporting one ton of wheat from each grain elevator (source) to each mill (destination) differs according to the distance and rail system. These costs are shown in the following table. For example, the cost of shipping one ton of wheat from the grain elevator at Omaha to the mill at Chicago is \$7.

Grain Elevator	Mill		
	A. Chicago	B. St. Louis	C. Cincinnati
1. Kansas City	\$6	\$ 8	\$10
2. Omaha	7	11	11
3. Des Moines	4	5	12

The problem is to determine how many tons of wheat to transport from each grain elevator to each mill on a monthly basis in order to minimize the total cost of transportation.

6. A Company has 3 production facilities S1, S2 and S3 with production capacity of 7, 9 and 18 units (in 100's) per week of a product, respectively. These units are to be shipped to 4 warehouses D1, D2, D3 and D4 with requirement of 5,6,7 and 14 units (in 100's) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below.

	D ₁	D ₂	D ₃	D ₄	Capacity
S ₁	19	30	50	10	7
S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Demand	5	8	7	14	34

Find initial basic feasible solution for given problem by using

- North-West corner method
- Least cost method
- Vogel's approximation method
- obtain an optimal solution by MODI method if the object is to minimize the total transportation cost.

7. Millennium Herbal Company ships truckloads of grain from three silos to four mills. The supply (in truckloads) and the demand (also in truckloads) together with the unit transportation costs per truckload on the different routes are summarized in the transportation model

	D	E	F	G	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

8. A Departmental store wishes to purchase the following quantities of ladies dresses.

Dress type	A	B	C	D
Quantity	150	100	75	250

Tenders are submitted by three different manufacturers who undertake to supply not more than the quantities below (all types of dress combined):

Manufacturer	W	X	Y
Total quantity	350	250	150

The store estimates that its profit per dress will vary with the manufacturer as shown in the matrix below. How should orders be placed?

	A	B	C	D
W	2.75	3.50	4.25	2.25
X	3.00	3.25	4.50	1.75
Y	2.50	3.50	4.75	2.00

