

1B Unbalanced Problems and Degenerate Solutions

Unbalanced transportation problem:

If total supply > total demand:

If total supply < total demand:

The demand (or supply) and the costs for a dummy:

What units sent to a dummy demand point, or from a dummy supply point, represent:

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

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.

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

c) Use the north-west corner method to obtain an initial solution.

	A	B	C		Supply
X					40
Y					60
Z					50
Demand	50	40	30		

2. The table shows the cost in pounds of transporting each unit to three retailers A, B and C from three suppliers W, X and Y. It also shows the number of units required by each retailer and the number available at each supplier.

	A	B	C	Supply
W	8	9	11	55
X	9	10	12	70
Y	11	10	8	65
Demand	74	72	68	

- a) Use the north-west corner method to obtain an initial solution.

	A	B	C	Supply
W	8	9	11	55
X	9	10	12	70
Y	11	10	8	65
Demand	74	72	68	

Units transported

	A	B	C	Supply
W				55
X				70
Y				65
Demand	74	72	68	

- b) State, with a reason, which retailer has not had their demand fully met.

Degenerate solution (m rows and n columns):

When this happens:

How to make the solution non-degenerate:

3. The table shows the unit cost in pounds of transporting goods from supply points W, X, Y and Z to demand points A, B and C. It also shows the number of units required at each demand point and the number of units available at each supply point.

	A	B	C	Supply
W	10	11	6	30
X	4	5	9	20
Y	3	8	7	35
Z	11	10	9	35
Demand	30	40	50	120

- a) Demonstrate that the north-west corner method gives a degenerate solution and explain why it is degenerate.

	A	B	C	Supply
W				30
X				20
Y				35
Z				35
Demand	30	40	50	120

- b) Adapt your solution to give a non-degenerate initial solution and state its cost.

	A	B	C	Supply
W				30
X				20
Y				35
Z				35
Demand	30	40	50	120