

QQQ – Decision 2 – Chapter 1 – Transportation Problems (Version 1)

Total Marks: 22

(22 = Platinum, 20 = Gold, 18 = Silver, 15 = Bronze)

1. The table below shows the cost, in pounds, of transporting one unit of stock from each of four supply points, A, B, C and D, to three demand points, P, Q and R. It also shows the stock held at each supply point and the number of units required at each demand point.

A minimum cost solution is required.

	P	Q	R	Supply
A	27	23	25	35
B	29	30	28	41
C	29	33	26	29
D	32	34	36	45
Demand	57	31	62	

- (a) Use the north-west corner method to obtain an initial solution to this transportation problem. (1)
- (b) Perform one iteration of the stepping-stone method to obtain an improved solution. You must make your method clear by showing the route and stating the
- shadow costs
 - improvement indices
 - entering cell and exiting cell
- (4)
- (c) Formulate the transportation problem as a linear programming problem. You must define your decision variables and make the objective function and constraints clear. (5)

(Total 10 marks)

2. The table below shows the cost, in pounds, of transporting one unit of stock from each of four supply points, E, F, G and H, to three sales points, A, B and C. It also shows the stock held at each supply point and the amount required at each sales point.
A minimum cost solution is required.

	A	B	C	Supply
E	23	28	22	21
F	26	19	29	32
G	29	24	20	29
H	24	26	19	23
Demand	45	19	23	

- (a) Explain why it is necessary to add a dummy demand point. (1)
- (b) On Table 1 in the answer book, insert appropriate values in the dummy demand column, D. (1)

	A	B	C	D	Supply
E	23	28	22		21
F	26	19	29		32
G	29	24	20		29
H	24	26	19		23
Demand	45	19	23		

Table 1

After finding an initial feasible solution and applying one iteration of the stepping-stone method, the table becomes

	A	B	C	D
E	21			
F	19	13		
G		6	23	
H	5			18

(c) Starting with GD as the next entering cell, perform two further iterations of the stepping-stone method to obtain an improved solution. You must make your method clear by showing your routes and stating the

- shadow costs
- improvement indices
- entering and exiting cells

(6)

(d) State the cost of the solution found in (c). **(1)**

(e) Determine whether the solution obtained in (c) is optimal, giving a reason for your answer. **(3)**

(Total 12 marks)