Transportation problems 1A

1 a Setting up the table:

	P	*Q*	*R*	Supply
A				32
B				44
C				34
Demand	28	45	37	110

Starting in the north-west corner, depot P requires 28 units, this does not exhaust the stock of supplier A.

	P	*Q*	*R*	Supply
A	28			32
B				44
C				34
Demand	28	45	37	110

Moving one square to the right allocate $32 - 28 = 4$ units. The stock of supplier A is exhausted but demand at Q has not been met.

	P	*Q*	*R*	Supply
A	28	4		32
B				44
C				34
Demand	28	45	37	110

Moving one square down allocate $45 - 4 = 41$ units. This satisfies the demand at Q bit does not exhaust the stock at supplier B.

	P	*Q*	*R*	Supply
A	28	4		32
B		41		44
C				34
Demand	28	45	37	110

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1 a (continued)

Moving one square to the right allocate $44 - 41 = 3$ units. The stock of supplier B is exhausted but demand at R has not been met.

	P	*Q*	*R*	Supply
A	28	4		32
B		41	3	44
C				34
Demand	28	45	37	110

Moving one square down allocate $37 - 3 = 34$ units. This satisfies the demand at R and exhausts the stock at supplier C. This is the final table.

	P	*Q*	*R*	Supply
A	28	4		32
B		41	3	44
C			34	34
Demand	28	45	37	110

b Supply points = 3, demand points = 3, occupied cells = 5.
$3+3-1=5=$ number of occupied cells. So the formula holds.

c Highlighting the unit cost in the occupied cells:

	P	*Q*	*R*	Supply
A	150	213	222	32
B	175	204	218	44
C	188	198	246	34
Demand	28	45	37	110

$\text{Cost} = 28\times150+4\times213+41\times204+3\times218+34\times246=22434$

2 a Following the same method as question **1a**, the final table is:

	P	*Q*	*R*	*S*	Supply
A	21	32	1		54
B			50	17	67
C				29	29
Demand	21	32	51	46	150

b Supply points = 3, demand points = 4, occupied cells = 6.
$3+4-1=6=$ number of occupied cells. So the formula holds.

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2 c Highlighting the unit cost in the occupied cells:

	P	*Q*	*R*	*S*	Supply
A	27	33	34	41	54
B	31	29	37	30	67
C	40	32	28	35	29
Demand	21	32	51	46	150

Cost $= 21\times 27 + 32\times 33 + 1\times 34 + 50\times 37 + 17\times 30 + 29\times 35 = 5032$

3 a Following the same method as question **1a**, the final table is:

	P	*Q*	*R*	Supply
A	123			123
B	77	66		143
C		34	50	84
D			150	150
Demand	200	100	200	500

b Supply points = 4, demand points = 3. Occupied cells = 6.
$4+3-1=6=$ number of occupied cells. So the formula holds.

c Highlighting the unit cost in the occupied cells:

	P	*Q*	*R*	Supply
A	17	24	19	123
B	15	21	25	143
C	19	22	18	84
D	20	27	16	150
Demand	200	100	200	500

Cost $= 123\times 17 + 77\times 15 + 66\times 21 + 34\times 22 + 50\times 18 + 150\times 16 = 8680$

4 a Following the same method as question **1a**, the final table is:

	P	*Q*	*R*	*S*	Supply
A	134				134
B	41	162			203
C		13	163		176
D			12	175	187
Demand	175	175	175	175	700

b Supply points = 4, demand points = 4, occupied cells = 7.
$4+4-1=7=$ number of occupied cells. So the formula holds.

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4 c Highlighting the unit cost in the occupied cells:

	P	***Q***	***R***	***S***	**Supply**
A	56	86	80	61	134
B	59	76	78	65	203
C	62	70	57	67	176
D	60	68	75	71	187
Demand	175	175	175	175	700

$\text{Cost} = 134 \times 56 + 41 \times 59 + 162 \times 76 + 13 \times 70 + 163 \times 57 + 12 \times 75 + 175 \times 71 = 45761$

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