Shipping cost ($) per carton

		Country 1	2	3	Supply (box)
	1	20	24	24	60
Factory	2	18	23	20	70
	3	20	25	26	50
Demand (box)		40	65	75	

(a) x_{ij} means Factory i to Country j

$$Z = 20x_{11} + 24x_{12} + 24x_{13} + 18x_{21} + 23x_{22} + 20x_{23} + 20x_{31} + 25x_{32} + 26x_{33}$$

Subject to

$$x_{11} + x_{12} + x_{13} = 60$$
$$x_{21} + x_{22} + x_{23} = 70$$
$$x_{31} + x_{32} + x_{33} = 50$$
$$x_{11} + x_{21} + x_{31} = 40$$
$$x_{12} + x_{22} + x_{32} = 65$$
$$x_{13} + x_{23} + x_{33} = 75$$

$$x_{ij} \geq 0$$

(b)

Shipping cost ($) per carton

Country

		1	2	3	Supply (box)
Factory	1	20	24	24	60
	2	18	23	20	70
	3	20	25	26	50
Demand (box)		40	65	75	

$3+3-1=5$

			$u=$
20	24 (55)	24 (5)	0
18	23	20 (70)	-4
20 (40)	25 (10)	26	1
$V=$ 19	24	24	

$C_{ij} - u - V$ 的 ≥ 0 optimal

$Z = 24\times55 + 24\times5 + 20\times70 + 20\times40 + 25\times10 = 3890$

(C)

Shipping cost ($) per carton

		Country 1	2	3	Supply (box)
Factory	1	20	24	24	60
	2	18	23	20	70
	3	20	25	$26+\Delta$	50
Demand (box)		40	65	75	

$26+\Delta-24-1 \geq 0 \Rightarrow \Delta \geq -1$