Transshipment problem [Bronson, 1982, Pr. 9.3, p 89] **ROUTINE**

Sources (they only **send**): 1, 2 — Give as **positive** quantities (supply)

Destinations (they only **receive**): 5, 6 — Give as **negative** quantities (demand)

		Destin.^{s} 5	6	Capacity
Sources	1	8	*M*	95
	2	*M*	*M*	70
Capacity		30	45	75 \ 165

A) Insert junctions — ***Transshipment points*** or ***depots*** or ***junctions*** (remaining): 3, 4. Each becomes *source* **and** *destination*. Transform to *transportation problem*. Insert junctions appropriately with their capacities ***M*** is infinity, to mean "no path".

		Destin.^{s} **3**	**4**	5	6	
Sources	1	**3**	***M***	8	*M*	95
	2	**2**	**7**	*M*	*M*	70
	3	**0**	**3**	**4**	**4**	**15**
	4	***M***	**0**	***M***	**2**	**0**
		0	**30**	30	45	105 \ 180

B) Balance — If the transportation problem is not balanced, insert one **fictitious** *source* or *destination* with the capacity difference (and 0 transportation costs).

		Destin.^{s} 3	4	5	6	**7**	
Sources	1	3	*M*	8	*M*	**0**	95
	2	2	7	*M*	*M*	**0**	70
	3	0	3	4	4	**0**	15
	4	*M*	0	*M*	2	**0**	0
		0	30	30	45	**75**	180 \ 180

C) Convert — Let *T* be the total capacities. (Here, *T* = 180.) To convert to aTP *equivalent* to the ***transshipment problem***, add *T* to every junction's capacity.

		Destin.^{s} 3	4	5	6	7	
Sources	1	3	*M*	8	*M*	0	95
	2	2	7	*M*	*M*	0	70
	3	0	3	4	4	0	195
	4	*M*	0	*M*	2	0	180
		180	**210**	30	45	75	540 \ 540

Solve as an **ordinary** TP. Solution:

		Destin.^{s} 3	4	5	6	7	
Sources	1	20				75	95
	2	70					70
	3	90	30	30	45		195
	4		180				180
		180	210	30	45	75	

(This solution is non-degenerate: **4** + **5** – 1 = **8** full cells, as expected) At junctions —points (*i*, *i*)—, interpret the quantity as **complement to *T*.** (So, here: 90 units pass by 3; and 4 is not used.)

❖