

Unbalanced Assignment Problem
 — An assignment problem is called an unbalanced assignment problem whenever the no. of jobs is not equal to the no. of persons. Thus the cost matrix of an unbalanced assignment problem is not a square matrix.
 For the soln of such problem we add dummy rows or columns to the given matrix to make it a square matrix.
 The cost in these dummy rows or column are taken to be zero.
 Now, the problem reduces to balanced assignment problem and can be solved by assignment algorithm.

Q. Use the Hungarian method to find which of the two jobs should be left undone when each of the four persons will do only one job in the following cost minimizing assignment problem

		Jobs					
		J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
Persons	P ₁	10	9	11	12	8	5
	P ₂	12	10	9	11	9	4
	P ₃	8	11	10	7	12	6
	P ₄	10	7	8	10	10	5

The assignment problem is unbalanced. So let us convert it into balanced one by supplying two fictitious persons with cost cell 0.

	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
P ₁	10	9	11	12	8	5
P ₂	12	10	9	11	9	4
P ₃	8	11	10	7	12	6
P ₄	10	7	8	10	10	5
P ₅	0	0	0	0	0	0
P ₆	0	0	0	0	0	0

	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆	
P ₁	5	4	6	7	3	0	✓ ⑤
P ₂	8	6	5	7	5	×	✓ ①
P ₃	2	5	4	1	6	×	✓ ②
P ₄	5	2	3	5	5	×	✓ ③
P ₅	0	×	×	×	×	×	— L ₂
P ₆	×	0	×	×	×	×	— L ₃

	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆	
P ₁	4	3	5	6	2	0	✓ ④
P ₂	7	5	4	6	4	×	✓ ①
P ₃	1	4	3	0	5	×	— L ₁
P ₄	4	1	2	4	4	×	✓ ②
P ₅	0	×	×	×	×	1	— L ₂
P ₆	×	0	×	×	×	1	— L ₃

	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
P ₁	3	2	4	5	1	0
P ₂	6	4	3	5	3	∅
P ₃	1	4	3	0	5	1
P ₄	3	0	1	3	3	∅
P ₅	0	∅	∅	∅	∅	2
P ₆	∅	∅	0	∅	∅	2

✓ ③
 ✓ ①
 12
 13
 14

	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
P ₁	2	1	3	4	0	∅
P ₂	5	3	2	4	2	0
P ₃	1	4	3	0	5	2
P ₄	3	0	1	3	3	1
P ₅	0	∅	∅	∅	∅	3
P ₆	∅	∅	0	∅	∅	3

∴ J₁ & J₂ should be left undone

P₁ → J₅

P₂ → J₆

P₃ → J₄

P₄ → J₂