

Step-1

Let us consider the following compatibility matrix.

$$A = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

To cover all the 1s in compatibility matrix A , 5 lines are required.

Step-2

Let us consider the case where k marriages have to happen, but all the 1s are covered in less than k lines.

Now, in this case, there are few individuals which zero compatibility information.

Thus, in this case complete matching of k pairs is not possible.

Thus, the weak duality is true: **if k marriages are possible, then it takes at least k lines to cover all the 1s.**