* Theorem. Greedy algorithm is optimal.
* Proof:
* We compare the solution obtained from greedy algorithm with an optimal solution.
* Let *G=i1, i2, …, ik* denote the set of jobs selected by greedy.
* Let Opt=j1, j2, …, jn denote the set of jobs in the optimal solution.
* The set of jobs are mutually compatible and the number of jobs is the largest.
* Without loss of generality, we assume that

i1=j1, i2=j2, …, ir=jr and ir+1≠jr+1, where *r* could be 0, 1, 2, ….

* Job ir+1 finishes before (or at the same time of ) jr+1 due to our greedy algorithm.

We consider the following solution:

Opt2=i1=j1,i2=j2,…,ir=jr, ir+1, jr+2, …

Opt2 and Opt have the same number of jobs.

Thus, Opt2 is also an optimum solution.

Now, greedy solution G and Opt2 have r+1 choices in common.

Repeat the process, we can conclude that G and an optimum solution have all the choices in common.