Stable marriage problem

The stable marriage problem is the problem of finding a stable matching between two **equally** sized sets of elements given an ordering of preferences for each element.

The SMP has been stated as follows:

```
Given n men and n women, where each person has ranked all men in the order of
preferences, marry the men and women together such that there are no two
people of opposite sex who both rather have each other then their current
partners. When there are no such pairs of people, the set of marriages is
deemed stable.
```

Applications include:

1.assign graduating medical students to first hospital appointments.

The Gale-Shapley algorithm (2012 Nobel Prize in Economics)

Initialize all m $\epsilon Mandw\epsilon Wtofree$

```
While \exists free man m who still has a women w to propose to {

    w = first women on m's list to whom m has not yet proposed

    if w is free:
        (m,w) become engaged

        else some pair (m^' , w) already exitsts

            if w prefers m to m^'

            (m,w) become engaged
                else
                (m^', w) remain egaged

}
```