

STABLE MARRIAGE ALGORITHM BY GALE-SHAPLEY

Men's Preference List:

```
M1: W5 W2 W3 W4 W1
M2: W2 W5 W1 W3 W4
M3: W4 W3 W2 W1 W5
M4: W1 W2 W3 W4 W5
M5: W5 W2 W3 W4 W1
```

Women's Preference List:

```
W1: M5 M3 M4 M1 M2
W2: M1 M2 M3 M5 M4
W3: M4 M5 M3 M2 M1
W4: M5 M2 M1 M4 M3
W5: M2 M1 M4 M3 M5
```

The Final Couples are:

```
M4 <==> W1
M2 <==> W2
M5 <==> W3
M3 <==> W4
M1 <==> W5
```

Explanation:

Implemented in C++. The program runs as follows:

-> Initialization of our 2d vector of strings (both men and women separately) by reading input from file.

-> Print preferences of both men and women to give general idea of our inputs.

-> loop through bool vector that stores the status of man to find unengaged men and if engaged men is found then break.

-> loop through again with condition that less than total capacity and men is unengaged.

-> calculate index value of women by looping through men's preference array.

-> check if the women is not currently engaged and engage with the current man if free.

-> check for extra preference of women as they get priority by checking the current man and new man but if the precedence is lower than the current male then return true else false;

-> update the womenPartner vector with name of new man, set the value property engaged of new man to true. While simultaneously breaking off the previous engagement and setting the previous man to false.