

Sept 13

Pigeon-hole principle: If  $\leq n-1$  pigeons are put in  $n$  holes  $\Rightarrow \exists$  at least one empty hole.

Lemma 4: At the end of any iteration (of GS algo) if woman  $w$  is free  $\Rightarrow w$  has NOT proposed to all men.

Pf. idea: Pf. by contradiction (Pigeon hole principle + Obs 1 + Algo def.)

Pf details: Assume free woman  $w$  who has proposed to all men.

$\Rightarrow$  all  $n$  men are engaged  $\text{---} (*)$

Obs 1 + Algo def.

Since  $w$  is free  $\Rightarrow \leq n-1$  women are engaged

$\Rightarrow$

$\leq n-1$  men are engaged  $\Rightarrow$  contradicts  $(*)$  ■

PHP  
(hole :: men  
pigeon :: women  
assign :: engaged)