

Stable Matching, More Formally

Perfect matching:

- Each rider is paired with exactly one horse.
- Each horse is paired with exactly one rider.

Stability: no ability to exchange

an unmatched pair $r-h$ is **blocking** if they both prefer each other to current matches.

Stable matching: perfect matching with no blocking pairs.

Stable Matching Problem

Given: the preference lists of n riders and n horses.

Find: a stable matching.

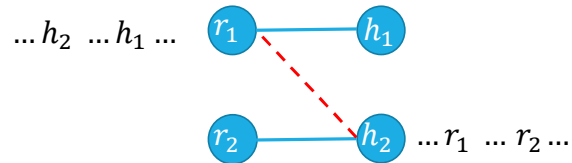
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Gale-Shapley Algorithm

```
Initially all  $r$  in  $R$  and  $h$  in  $H$  are free
while there is a free  $r$ 
  Let  $h$  be highest on  $r$ 's list that  $r$  has not proposed to
  if  $h$  is free
    match  $(r, h)$ 
  else //  $h$  is not free
    Let  $r'$  be the current match of  $h$ .
    if  $h$  prefers  $r$  to  $r'$ 
      unmatch  $(r', h)$ 
      match  $(r, h)$ 
```

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Claim 4: The matching has no blocking pairs.

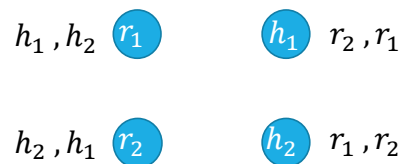


How did r_1 end up matched to h_1 ?

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Multiple Stable Matchings

Suppose we take our algorithm and let the horses do the "proposing" instead.



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