

# Lecture 3

CSE 331

Sep 2, 2022

# Participate on Piazza

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LIVE Q&A Drafts mid- final grading lectures office\_hours notation\_alert proof\_alert project recitation diversity piazza logistics algorithms support\_pages t/f\_poll

Unread Updated Unresolved Following [New Post](#) Search or add a post...

Show Actions

**PINNED**

- Instr VM setup office hours** 8/30/22  
Based on @9, it looks like there is some interest in having an OH where y'all can go and get some help to setup a VM
- Instr CSE 220 Unix session** 8/29/22  
As I mentioned in class today, CSE 220 will be hosting a how to use the Unix system session. I have confirmation on the
- Instr If you plan to use C++ for pr...** 8/27/22  
There will be on programming question per homework. You can submit your code in any of C++, Java and Python. If
- Instr Late night office hour** 8/27/22  
(For TA office hour slots, please vote in @8) This year, I plan to have night office hours in CSE 331. Note that these
- Instr TA office hours** 8/27/22  
Please select all the time slots below that you will be able to attend (even if for part of the time) for TA office hours.
- Search for Teammates!** 8/11/22  
• 3 Open Teammate Searches

**TODAY**

- Instr Recitation 1 notes** 8/30/22  
You can access the recitation notes for this

## Class at a Glance

Updated 0 seconds ago. [Reload](#) [Go to Live Q&A](#)

<input checked="" type="checkbox"/> <b>no unread posts</b>	<b>license status</b> pending instructor license (13 days left)
<input checked="" type="checkbox"/> <b>no unanswered questions</b>	<b>20</b> total posts
<input checked="" type="checkbox"/> <b>no unanswered followups</b>	<b>173</b> total contributions
	<b>6</b> instructors' responses
	<b>1</b> students' responses
	<b>n/a</b> avg. response time

Student Enrollment 145 enrolled out of 160 (estimated) [Edit](#)

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Opening this link in the same browser will log you out as atri@buffalo.edu

<https://piazza.com/buffalo/fall2022/cse331/>

# Read the syllabus CAREFULLY!

## Syllabus Quiz

### Options

[View handin history](#)

[View writeup](#)

[Download handout](#)

 Due: **December 13th 2022, 11:59 pm**

 Last day to handin: **December 13th 2022, 11:59 pm**

**No graded material will be handed back until you pass the syllabus quiz!**

### Academic Integrity

Question 1: Sharing my answers to this syllabus quiz with other 331 students

- Is OK if I do it to help out a friend
- It does not matter since there is no grade attached with it
- Is an academic integrity violation and should not be done
- Is an academic integrity violation but I can take the chance

Question 2: Penalty for academic violation in CSE 331 is an automatic

- warning and a chance to make-up
- A zero in the assignment AND a letter grade reduction (for first violation across all CSE courses) and an F in the course (for 2nd violation across all CSE courses)
- A zero in the corresponding assignment and nothing else

Please do keep on asking Qs!

The only bad question is the one that is not asked!

# VM setup OH today

note @34   

stop following

13 views

Actions ▾

## VM setup office hours TOMORROW

Following up on @20--

Nick will be holding two office hours for VM setup **tomorrow, Friday, Sep 2:**

- 3-4pm
- 5-6pm

The office hours will be **Salvador Lounge** (2nd floor space that faces Grace plaza though the glass wall).

The above covers everyone who responded to the poll in @20. Hope this helps!

office\_hours

Edit good note | 0

Updated 2 hours ago by Atri Rudra

# TA office hours

Finalized by today

Details will be posted on piazza



OH next week  
dedicated to help  
with proofs

# Two comments on Programming

Programming is worth about 16% of your final grade

Algorithm design/proofs are worth about 80% of your final grade

Invest your time wisely

# Questions/Comments?



# Make broadband more available

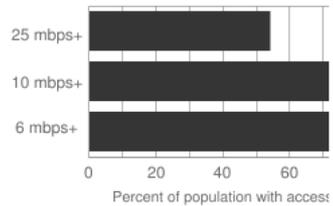
## Cattaraugus County

Population: 79518

Median Income: \$41,368.88

Access to any cable technology: 67.5%

Access to two or more wireline providers: 61.2%



Say you are tasked to come up with the infrastructure

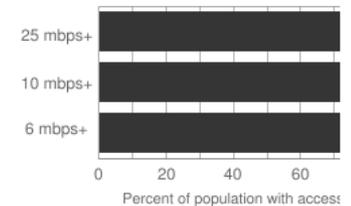
## Erie County

Population: 913295

Median Income: \$49,817.67

Access to any cable technology: 98.9%

Access to two or more wireline providers: 96.8%



# Make broadband more available

## Input requirements

Where are the customers located?  
What are the bandwidth requirements?  
How is the input represented?

What objective are we optimizing?  
How should the connections be configured?

## Output requirements

## Problem Definition

Where should we lay down the physical stuff?  
What algorithm should be use to do this?

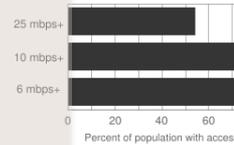
## Algorithm Design

Implement the scheme

How should we do testing and maintenance?

### Cattaraugus County

Population: 79518  
Median Income: \$41,368.88  
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Access to two or more wireline providers: 61.2%



Is Internet a right?

Environmental factors

Security/Privacy

Where is funding coming from?

Income inequality in population

Get regulatory approval

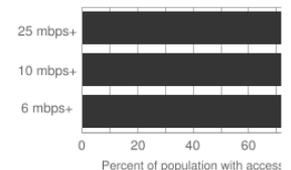
Hire people

Get access to physical space

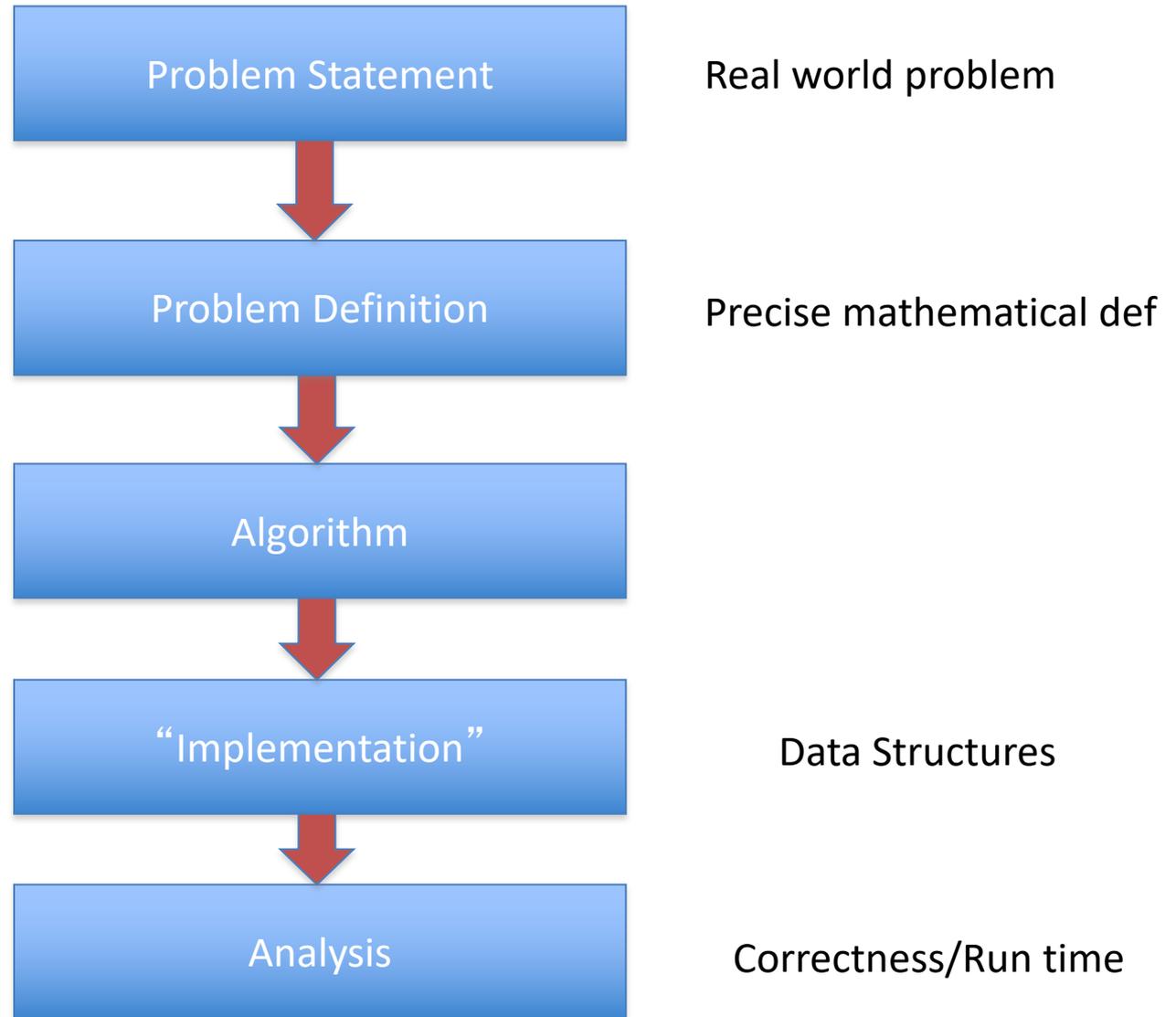
Outreach

### Erie County

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Median Income: \$49,817.67  
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# Main Steps in Algorithm Design



# National Resident Matching

## Preparing for #Match2018?

**Frequently  
Asked  
Question**

**An NRMP ID is  
NOT Required for  
Submitting Your  
Applications**

[>> Learn more](#)

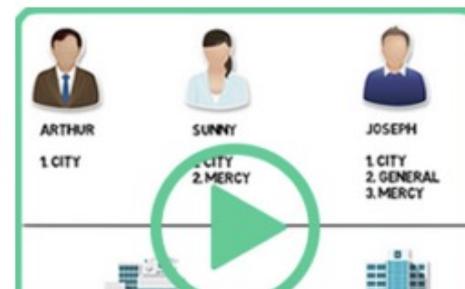
### WHAT'S HAPPENING

- Check the Eligibility of Applicants
- Registration Open for Adolescent Medicine, Medical Toxicology, and Headache Medicine
- Timely Residency Applicant Resources
- Registration Open for Colon & Rectal Surgery, Medical Genetics, Sleep Medicine, and Spinal Cord Injury

[READ MORE](#)



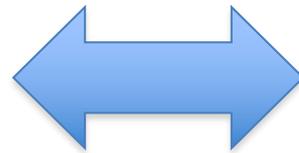
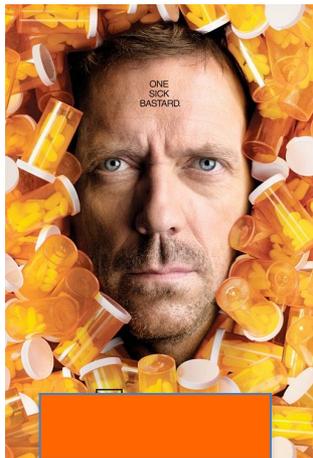
**VIDEO: The Match Process for Applicants**



# (Screen) Docs are coming to BUF



Bailey (Grey's Anatomy)



Buffalo General



Millard Filmore (Gates Circle)

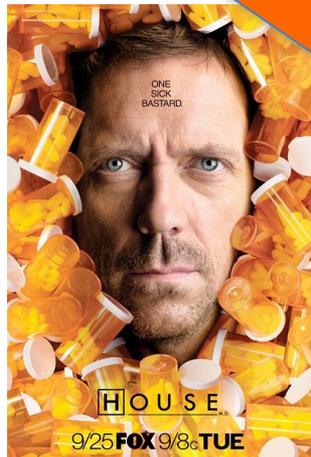


Millard Filmore (Suburban)

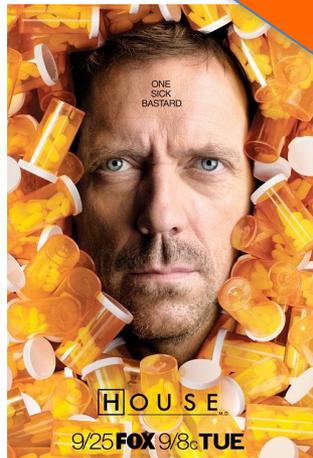


JD (Scrubs)

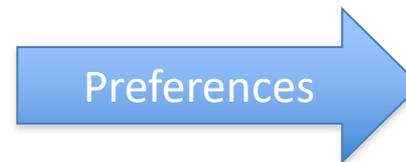
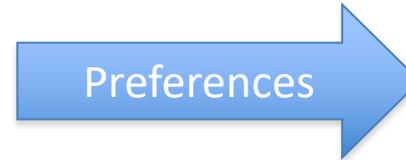
# What can go wrong?



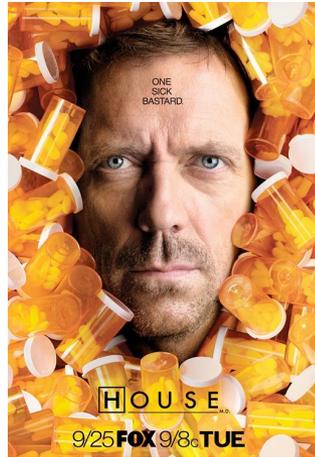
# The situation is unstable!



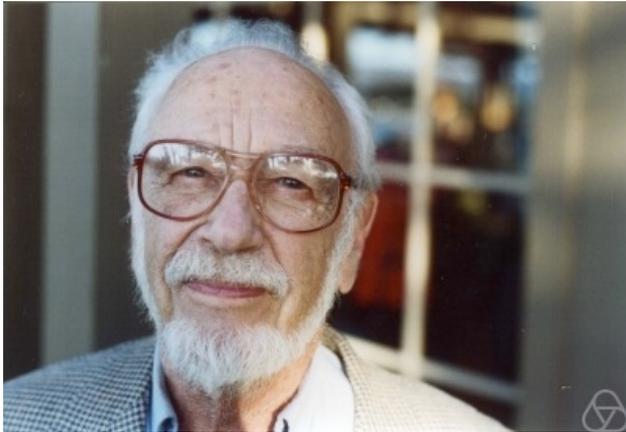
# What happens in real life



# NRMP plays matchmaker



# Stable Matching Problem



David Gale



Lloyd Shapley

# Questions/Comments?



# Matching Employers & Applicants

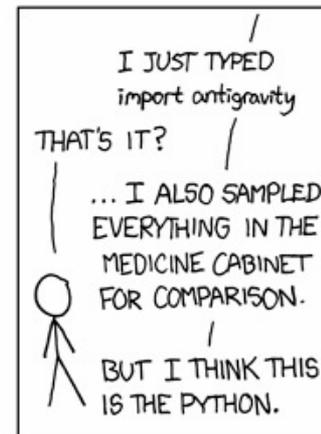
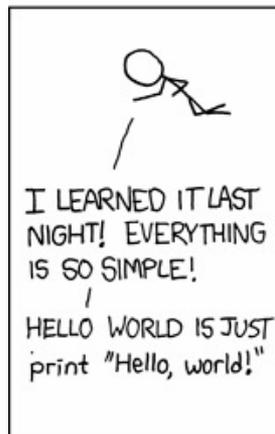
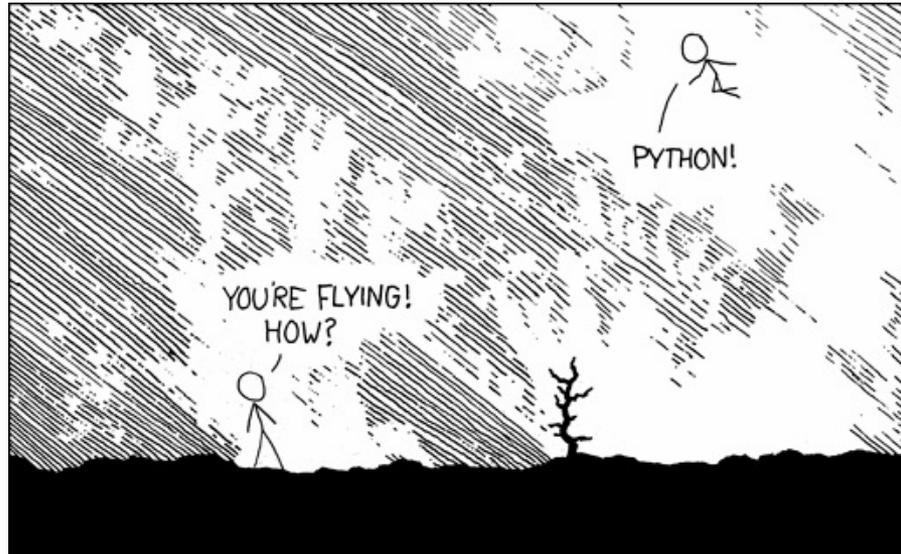
**Input:** Set of employers ( $E$ )  
Set of applicants ( $A$ )  
Preferences

**Output:** An assignment of applicants to employers that is “stable”

For every  $x$  in  $A$  and  $y$  in  $E$  such that  $x$  is **not** assigned to  $y$ , either

- (i)  $y$  prefers every accepted applicant to  $x$ ; or
- (ii)  $x$  prefers her employer to  $y$

# Simplicity is good



# Questions to think about

1) How do we specify preferences?

Preference lists

2) Ratio of applicant vs employers

1:1

3) Formally what is an assignment?

(perfect) matching

4) Can an employer get assigned  $> 1$  applicant?

NO

5) Can an applicant have  $> 1$  job?

NO

6) How many employer/applicants in an applicants/employers preferences?

All of them

7) Can an employer have 0 assigned applicants?

NO

8) Can an applicant have 0 jobs?

NO

# Lost in Notation....

## CSE 331 Fall 2022 Schedule

Previous schedules: [2022 \(Spring\)](#), [2021 \(Fall\)](#), [2021 \(Spring\)](#), [2020](#), [2019](#), [2018](#), [2017](#), [2016](#), [2014](#), [2013](#), [2012](#), [2011](#), [2010](#) and [2009](#).

### ▲ Future Lectures

The topics for lectures in the future are tentative and subject to change. Also the links for future lectures are from [Fall 2017](#), [Fall 2018](#), [Fall 2019](#) and [Fall 2021](#). Recordings of Fall 2022 lectures are also available from [UBLeans](#).

Date	Topic	Notes
Mon, Aug 29	Introduction    F22  F21  F19  F18  F17	
Tue, Aug 30		(HW 0 out)
Wed, Aug 31	Main Steps in Algorithm Design     F22  F21  F19  F18  F17	<a href="#">Week 1 recitation notes</a>
Fri, Sep 2	Stable Matching Problem  F21  F19  F18  F17  x <sup>2</sup>	[KT, Sec 1.1]
Mon, Sep 5	<b>No Class</b>	Labor Day

# Questions/Comments?



# Non-feminist reformulation

$n$  men

Each with a preference list

$n$  women

Match/marry them in a “stable” way

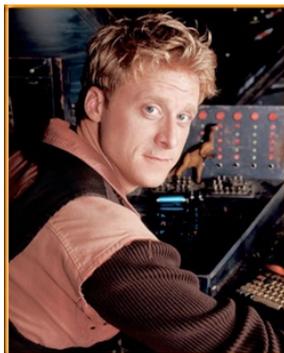
# On matchings

Mal



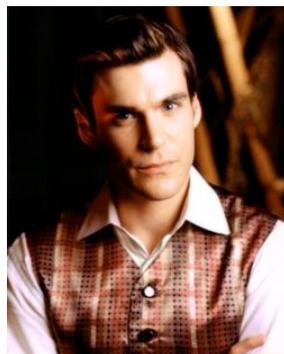
Inara

Wash

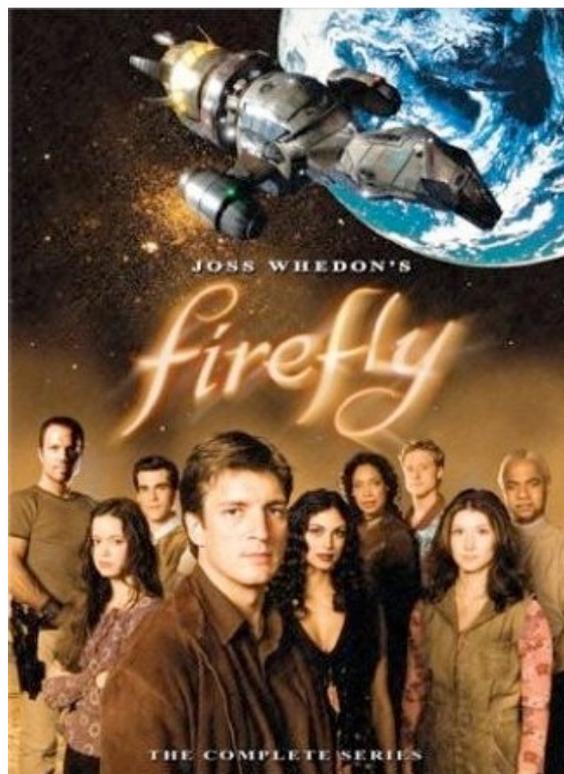


Zoe

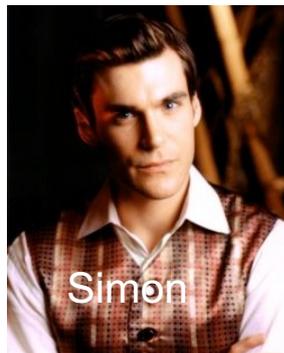
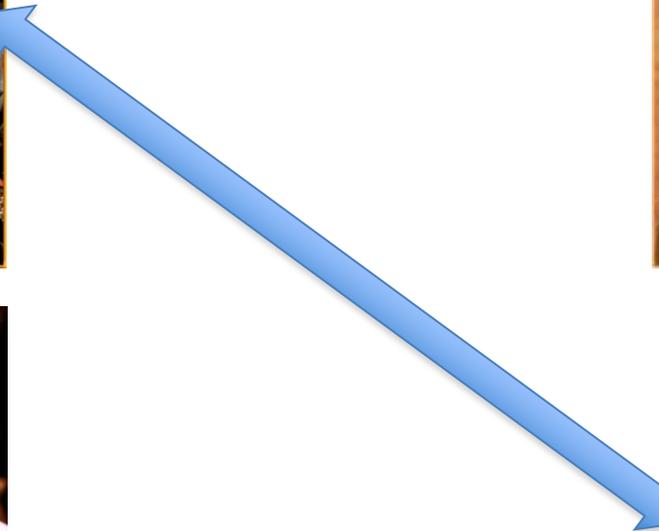
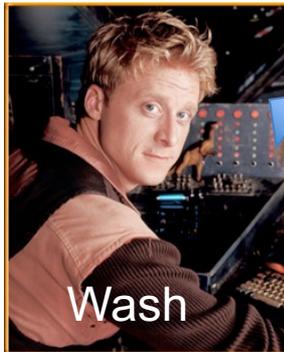
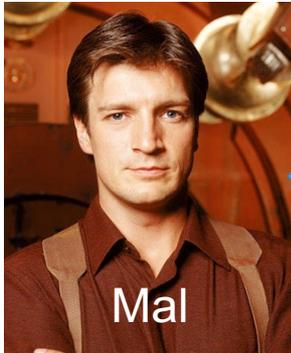
Simon



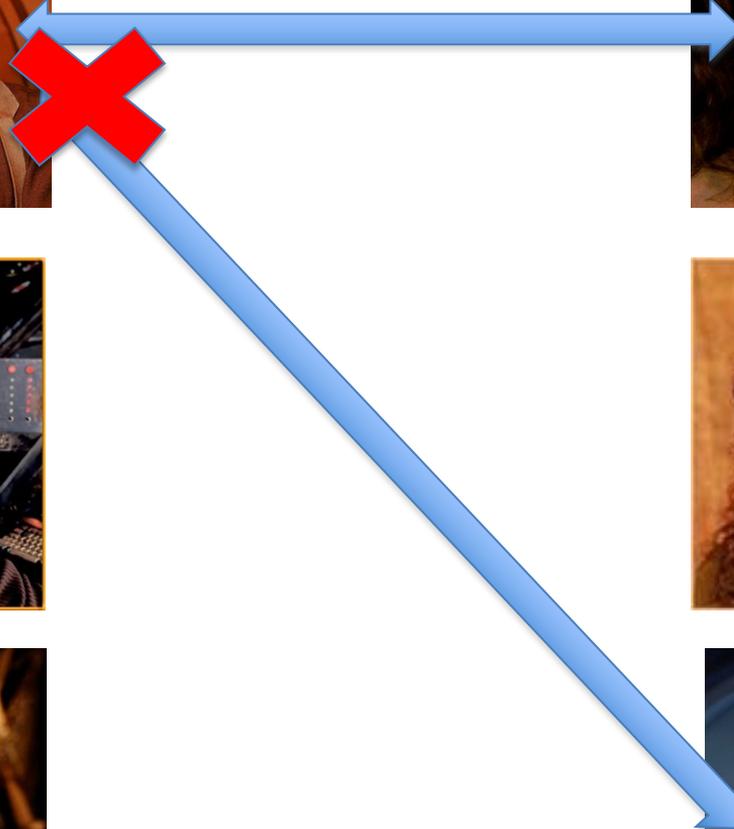
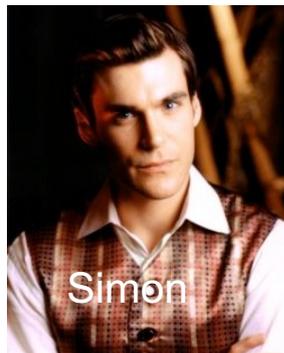
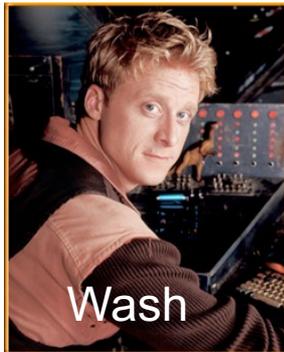
Kaylee



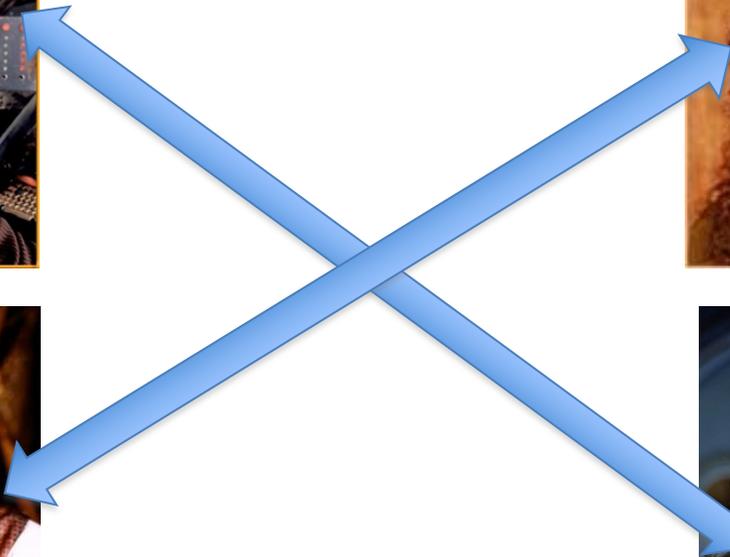
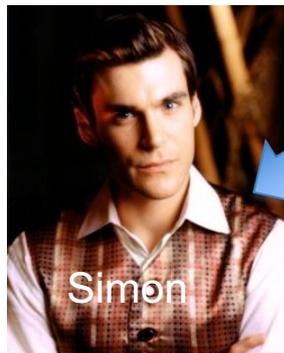
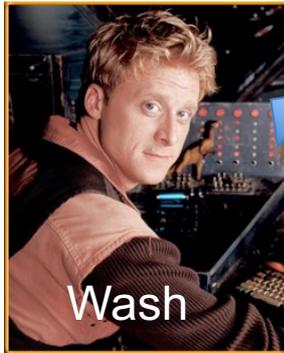
# Is this a valid matching?



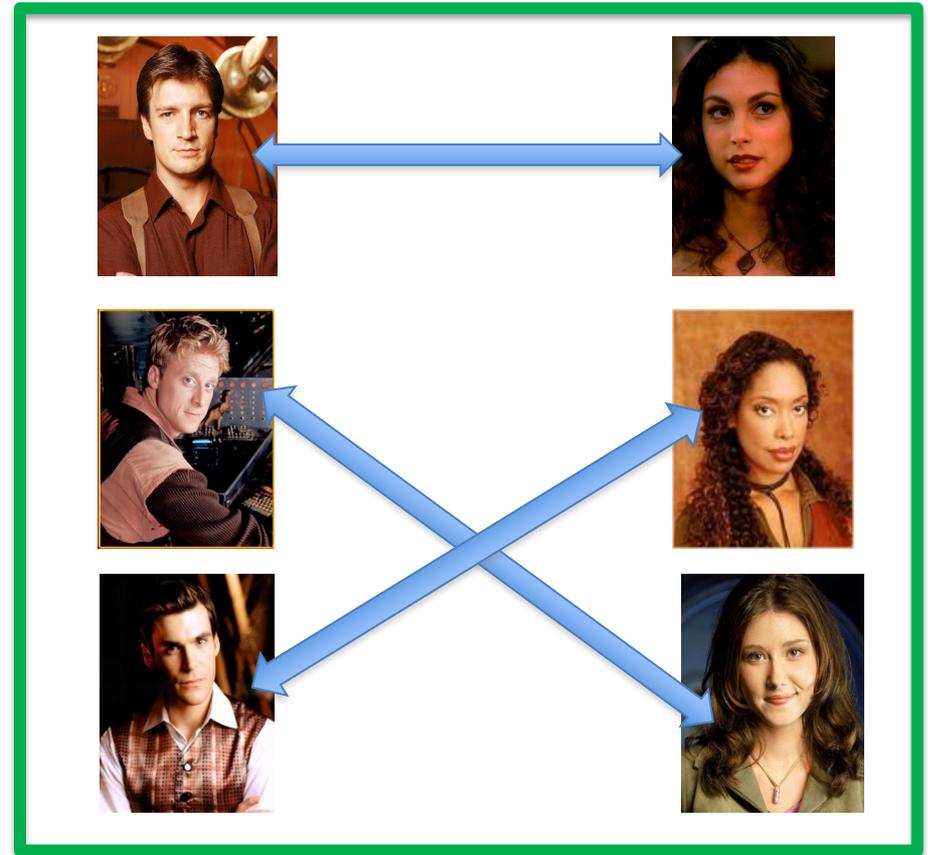
# Is this a valid matching?



# Is this a valid matching?



# Which one is a perfect matching?



# On to the board...

