Lecture 4

CSE 331

Sep 7, 2022

Please do keep on asking Qs!

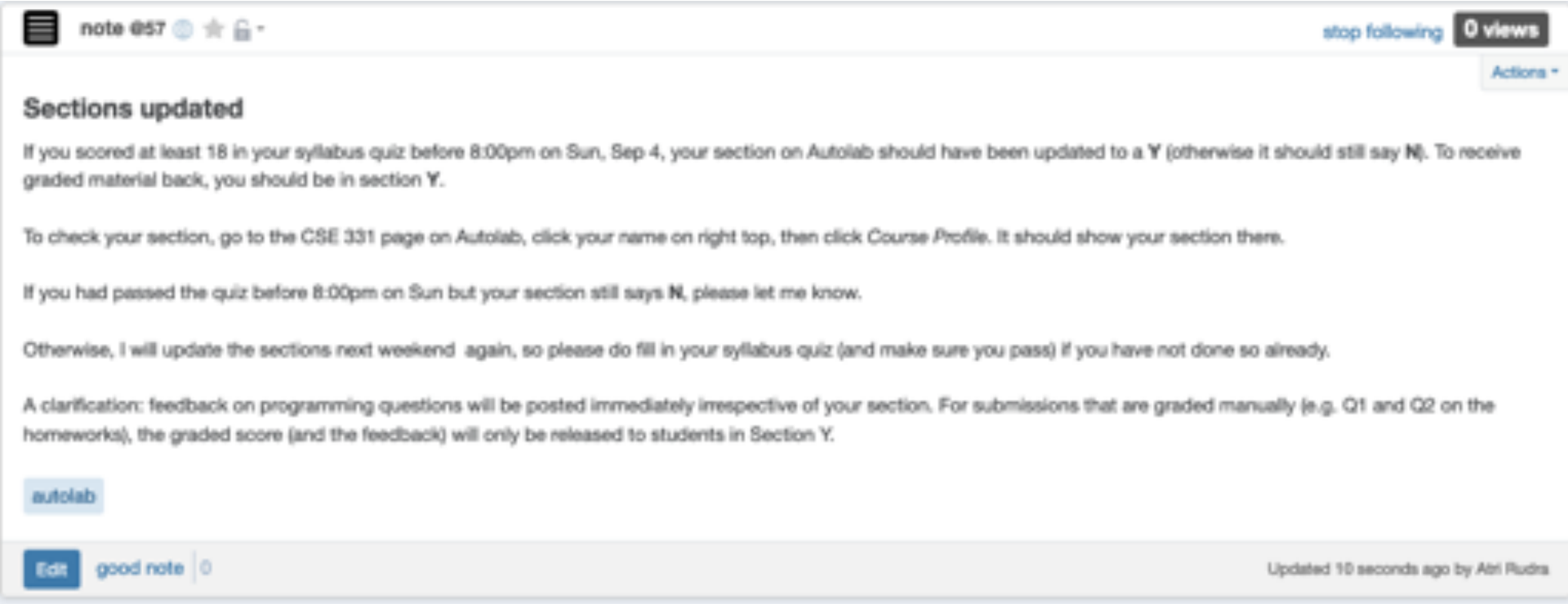
The only bad question is the one that is not asked!

Not just technical Qs but also on how the class is run

We’re not mind readers

If you need it, ask for help

Syllabus Quiz (and sections)



note @57

stop following 0 views

Actions

Sections updated

If you scored at least 18 in your syllabus quiz before 8:00pm on Sun, Sep 4, your section on Autolab should have been updated to a **Y** (otherwise it should still say **N**). To receive graded material back, you should be in section **Y**.

To check your section, go to the CSE 331 page on Autolab, click your name on right top, then click *Course Profile*. It should show your section there.

If you had passed the quiz before 8:00pm on Sun but your section still says **N**, please let me know.

Otherwise, I will update the sections next weekend again, so please do fill in your syllabus quiz (and make sure you pass) if you have not done so already.

A clarification: feedback on programming questions will be posted immediately irrespective of your section. For submissions that are graded manually (e.g. Q1 and Q2 on the homeworks), the graded score (and the feedback) will only be released to students in Section Y.

autolab

Edit good note 0

Updated 10 seconds ago by Atri Rudra

Separate Proof idea/proof details

</> Note

Notice how the solution below is divided into proof idea and proof details part. **THIS IS IMPORTANT: IF YOU DO NOT PRESENT A PROOF IDEA, YOU WILL NOT GET ANY CREDIT EVEN IF YOUR PROOF DETAILS ARE CORRECT.**

Proof Idea

As the hint suggests there are two ways of solving this problem. (I'm presenting both the solutions but of course you only need to present one.)

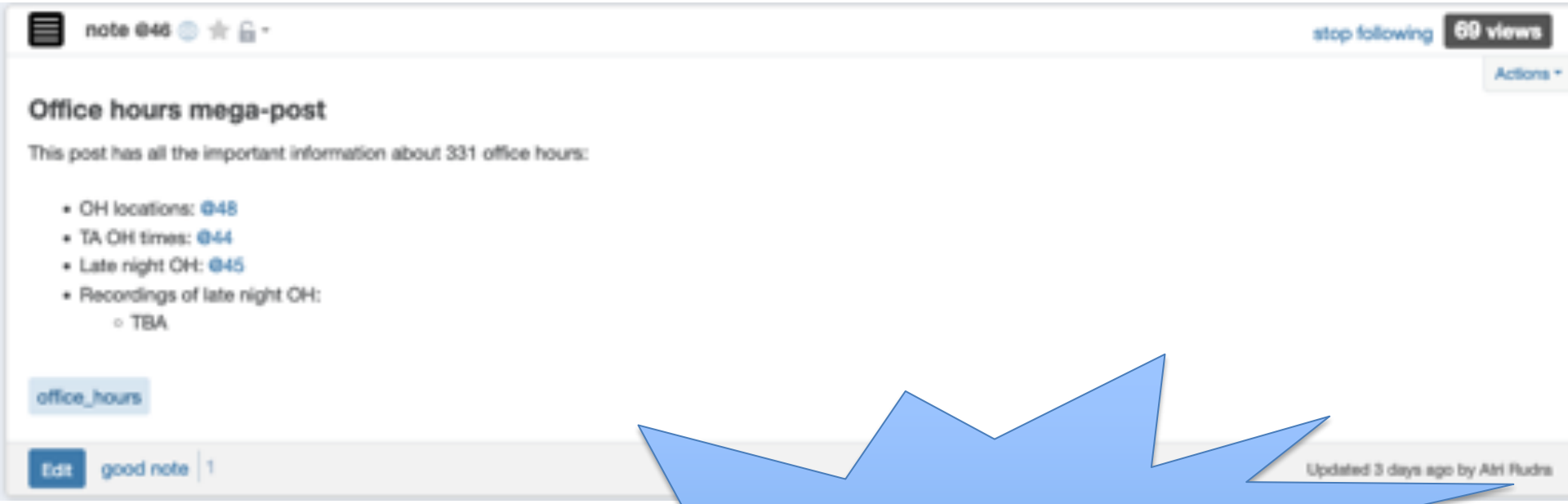
We begin with the approach of reducing the given problem to a problem you have seen earlier. Build the following complete binary tree: every internal node in the tree represents a "parent" RapidGrower while its two children are the two RapidGrowers it divides itself into. After s seconds this tree will have height s and the number of RapidGrowers in the container after s seconds is the number of leaf nodes these complete binary tree has, which we know is 2^s. Hence, the claim is correct.

The proof by induction might be somewhat simpler for this problem if you are not comfortable with reduction. In this case let $R(s)$ be the number of RapidGrowers after s seconds. Then we use induction to prove that $R(s) = 2^s$ while using the fact that $2 \cdot 2^s = 2^{s+1}$.

Proof Details

We first present the reduction based proof. Consider the complete binary tree with height s and call it $T(s)$. Further, note that one can construct $T(s+1)$ from $T(s)$ by attaching two children nodes to all the leaves in $T(s)$. Notice that the newly added children are the leaves of $T(s+1)$. Now assign the root of $T(0)$ as the original RapidGrower in the container. Further, for any internal node in $T(s)$ ($s \geq 0$), assign its two children to the two RapidGrowers it divides itself into. Then note that there is a one to one correspondence between the RapidGrowers after s seconds and the leaves of $T(s)$. Then we use the well-known fact (cite your 191/250 book here with the exact place where one can find this fact): $T(s)$ has 2^s leaves, which means that the number of RapidGrowers in the container after s seconds is 2^s, which means that the claim is correct.

Office hours finalized



Come ask your proof related Questions!

Late night office hour starts tonight!

1st True/False poll

poll @52 ☆

stop following | 82 views

Actions

The first true/false question

The plan is to do a weekly True/false question on piazza. The way it is going to work is that every Monday (or so) I will post a statement in a poll and ask you guys to vote True or False. (Please just vote and do not post your justification: yet.) Then after two days, I will give the correct answer (and we will see how well crowd-sourcing works in this context) and then ask for you guys to construct the correct justification. Note that this is to give you guys more practice for the true/false questions on the exams (there will be pretty much no true/false questions on the homeworks). So try and work on these on your own so that you gain some practice.

Anyhow, here is the **question for this week.** Is the following statement **True** or **False**?

Given n numbers $a_1, \ldots, a_n$ such that for every $i \in [n]$ (we will use $[n]$ to denote the set of integers $\{1, \ldots, n\}$) we have $a_i \in \{0, 1\}$. That is, we are given n numbers each of which is a bit. Then we can sort these n numbers in $O(n)$ time.

- ○ True
- ○ False

Submit

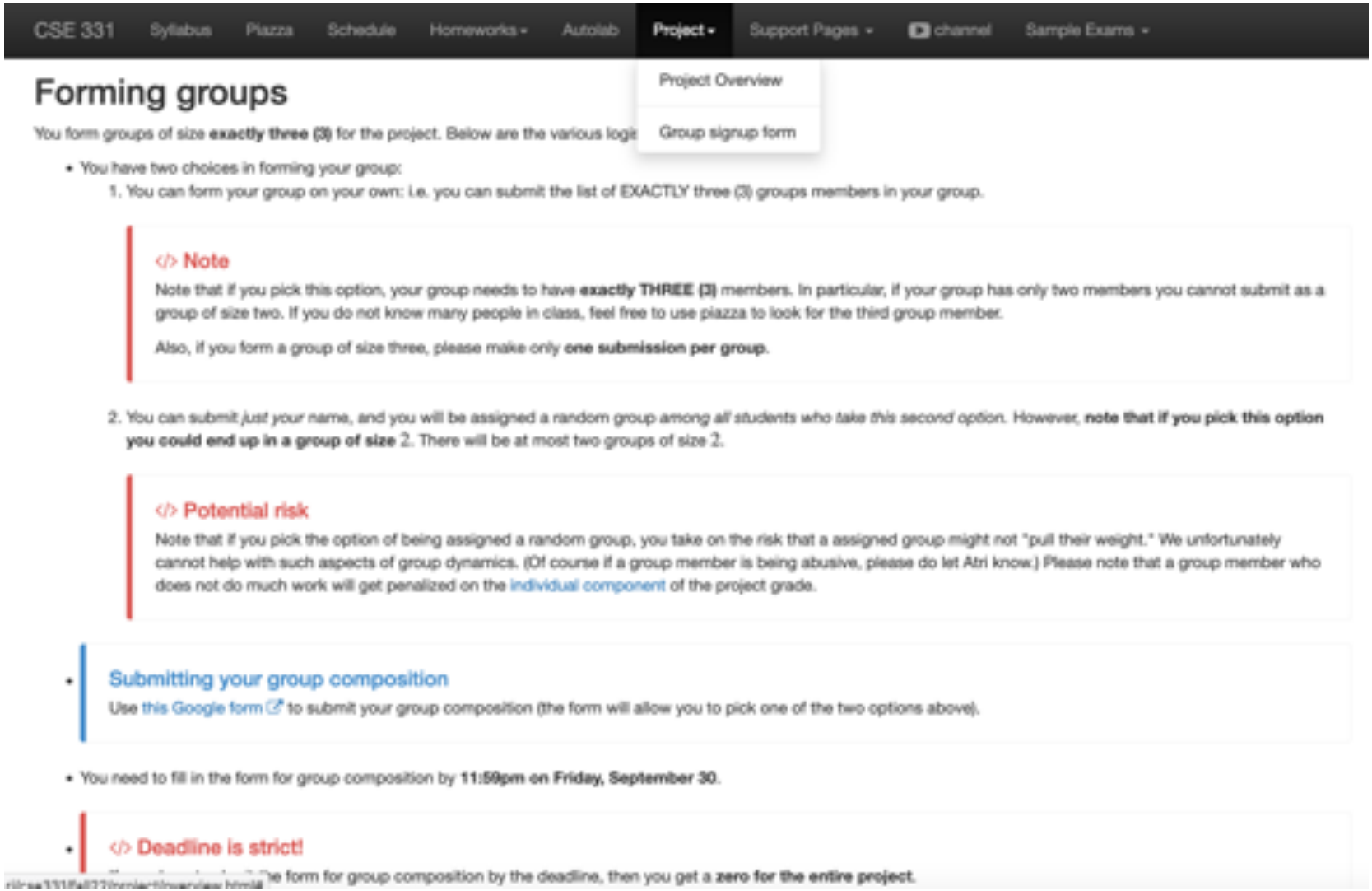
You have **not yet** voted.

Revoting is **not allowed.** Select your vote and click submit to register your vote.

Your name will **not be visible to anyone.**

Register your project groups

Deadline: Friday, Sep 30, 11:59pm



Update on VM

Using VM image on Windows

If plan to run the VM on Windows then Fall 2022 onwards, we recommend that you rub it using Virtual Box (and **not** VMWare). Here is a walkthrough video by Nick Minor on installing the VM on Windows using VirtualBox:

Using VM image on MacOS

Unfortunately, it looks like VirtualBox does not work that well on MacOS. We're looking into fixes.

In the meantime, using VMWare on MacOS might be the only option. If you already have a VMWare license that lasts until the semester lasts, then you should be all set. If you need a license **please email Abi ASAP**.

Piazza Response policy

Piazza Response policy

Please note the following rules regarding response time to student questions on piazza:

1. Any question posted between Friday at 5pm and Monday 9am might not get an answer from CSE 331 staff before Monday 9am.
2. On weekdays, we will aim to respond to student question within four hours unless the question is posted between 7pm and 9am, in which case we might only be able to respond after 9am.

Please note that the above does *not* means that we will never answer questions posted in the evening/night times as mentioned above-- it's just that we might not always be able to respond within four hours. Based on previous years, I do expect there to be reasonable response time in the evening times as well-- it's just that OUR response times might be more variable.

Solutions to HW 0 out

Questions/Comments?

Incorrect Proof Details: Q1(b) on HW0

Argument does not use ANYTHING about the problem statement!

Follows from part (a)

…f perfect matchings with n men and n wo…

This assumes number of perfect matchings only depends on n

Base case: P(1) = 1! = 1

Inductive hypothesis: Assume that P(n-1) = (n-1)!

Inductive step: Note that P(n) = n*P(n-1) = n*(n-1)! = n!

What are the issues with the above "proof"?

Incorrect Proof Details: Q1(b) on HW0

Needs justification

Claim 1: Number of perfect matchings is = number of permutations of 1…n

Claim 2: Number of permutations of 1…n is n!

Needs justification

Follow from 191 (?)

Claims 1 + 2 prove the result

What are the issues with the above proof?

Proof by contradiction for Q1(a)

Assume for contradiction there is an example where number of perfect matchings depends on the identities of the men and women.

Let n =1 and consider two cases
(1) M = {BP} and W = {JA}
(2) M = {BBT} and W = {AJ}

You can only assume things about the example directly implied by it being a counter-example

In both cases the number of perfect matchings is 1 = 1!

Hence contradiction.

There is NO contradiction

What are the issues with the above proof?

Questions/Comments?

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

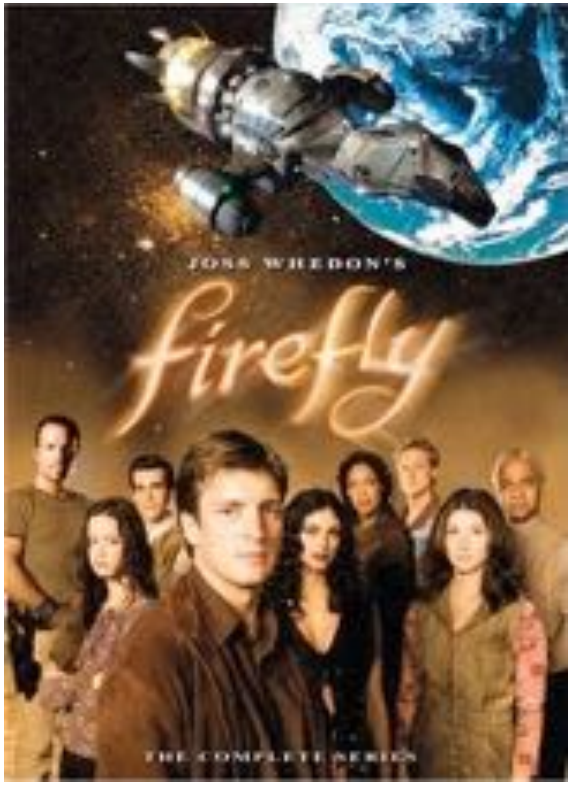
6) How many employer/applicants in an applicants/employers preferences? All of them

7) Can an employer have 0 assigned applicants? NO

8) Can an applicant have 0 jobs? NO

On matchings

Mal

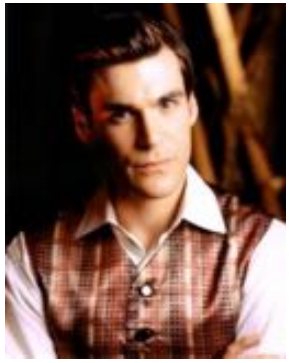


Inara

Wash

Zoe

Simon

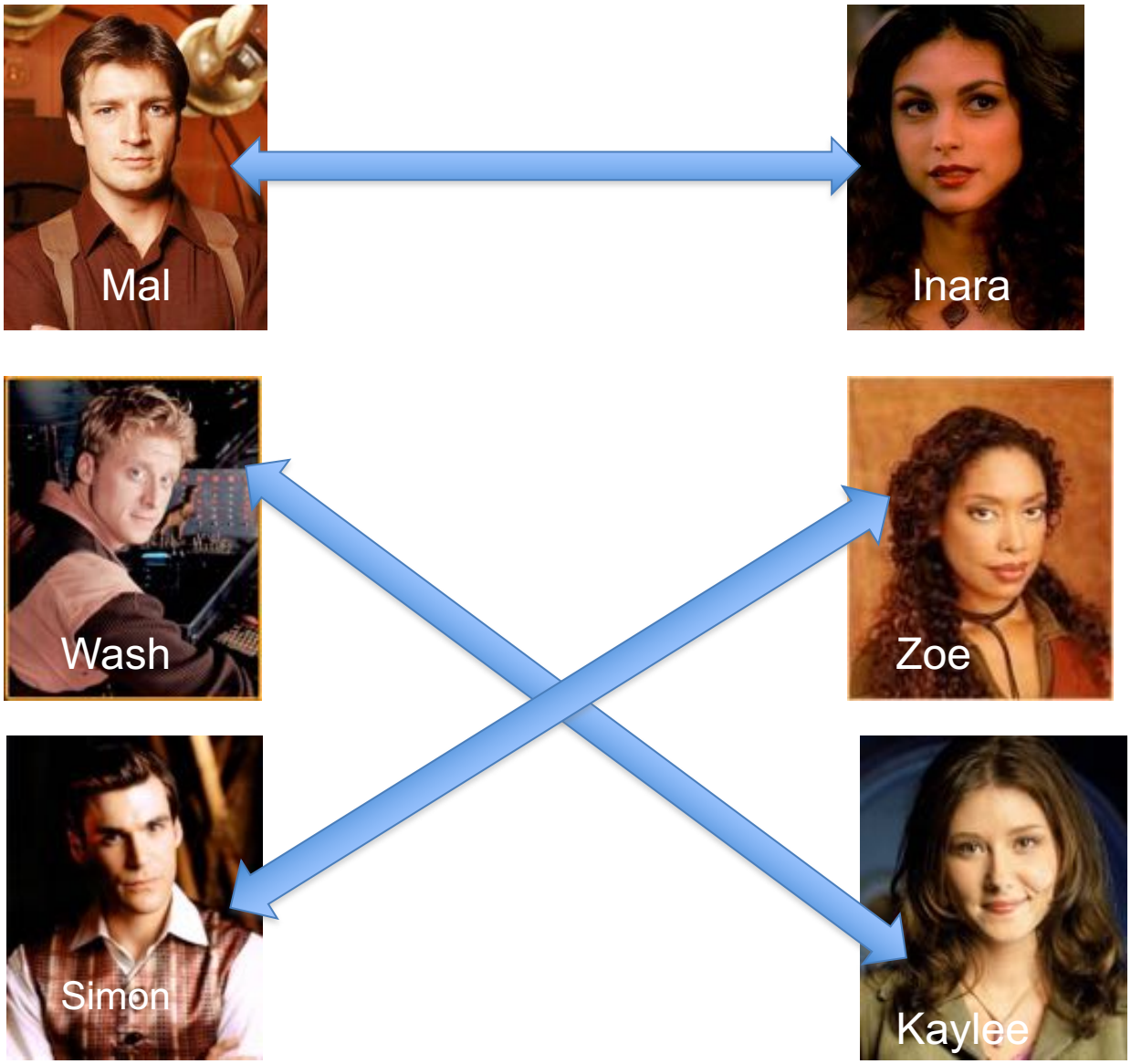


Kaylee

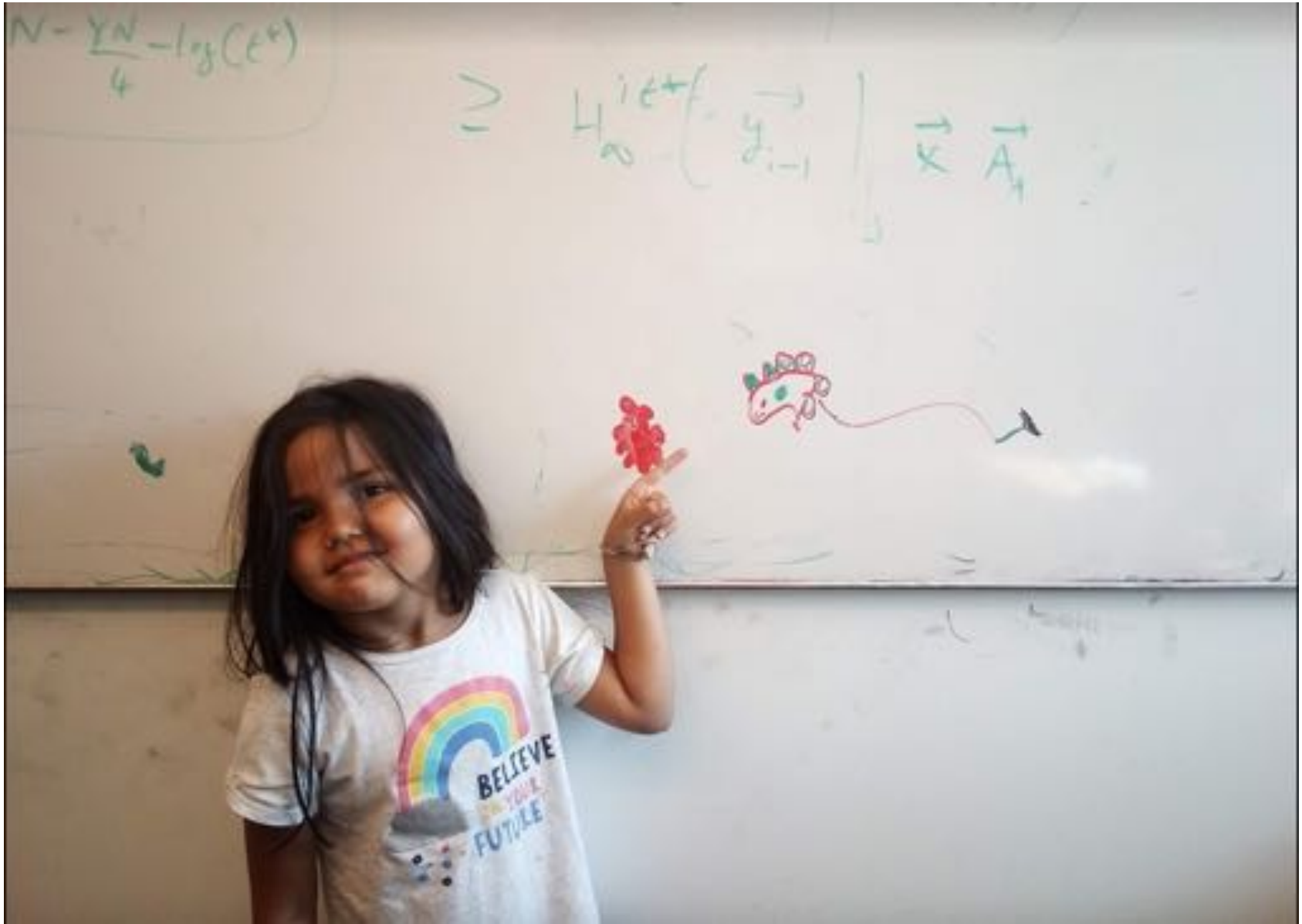
A valid matching

Not a matching

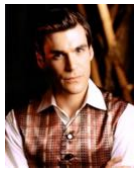
Perfect Matching

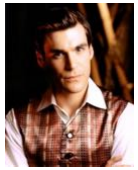


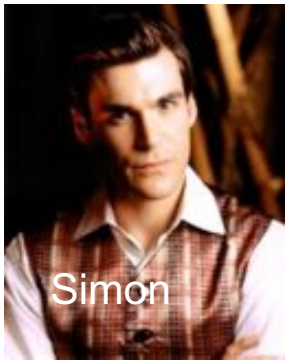
Questions/Comments?

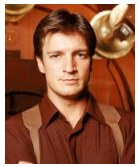


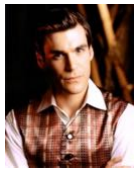
Preferences



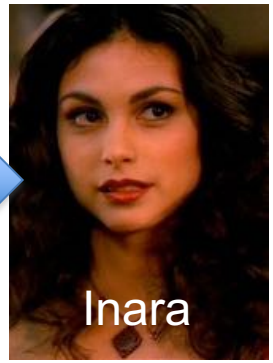


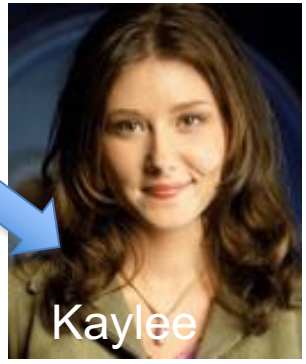






Instability





Back to the board…