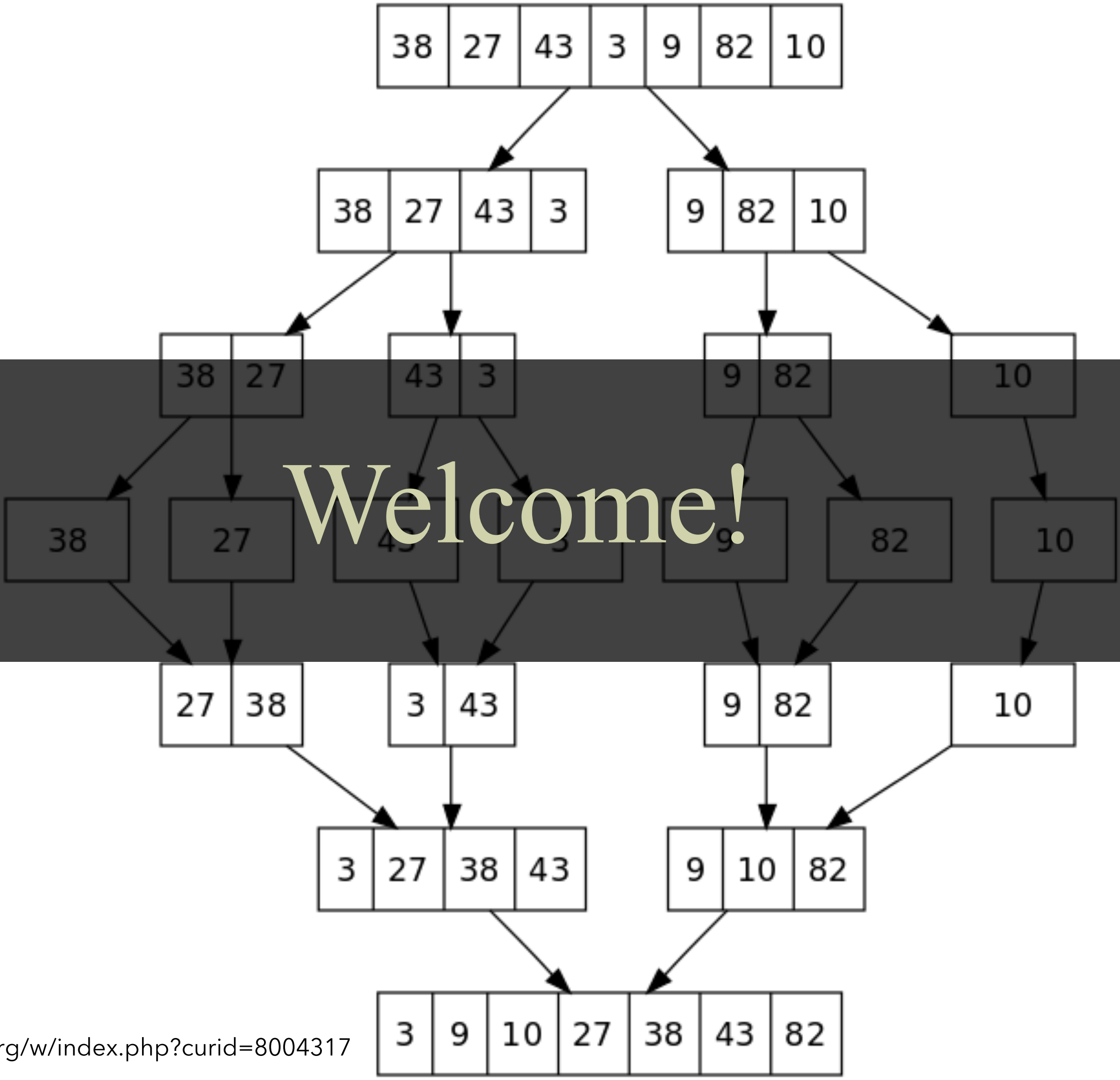
Lecture 1: Overview & Intro to Java

CS 62

Spring 2018

Alexandra Papoutsaki & William Devanny

http://www.cs.pomona.edu/classes/cs062



Welcome!

https://commons.wikimedia.org/w/index.php?curid=8004317

Who we are:

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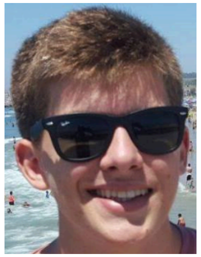

Sarp Misoglu

Index Cards

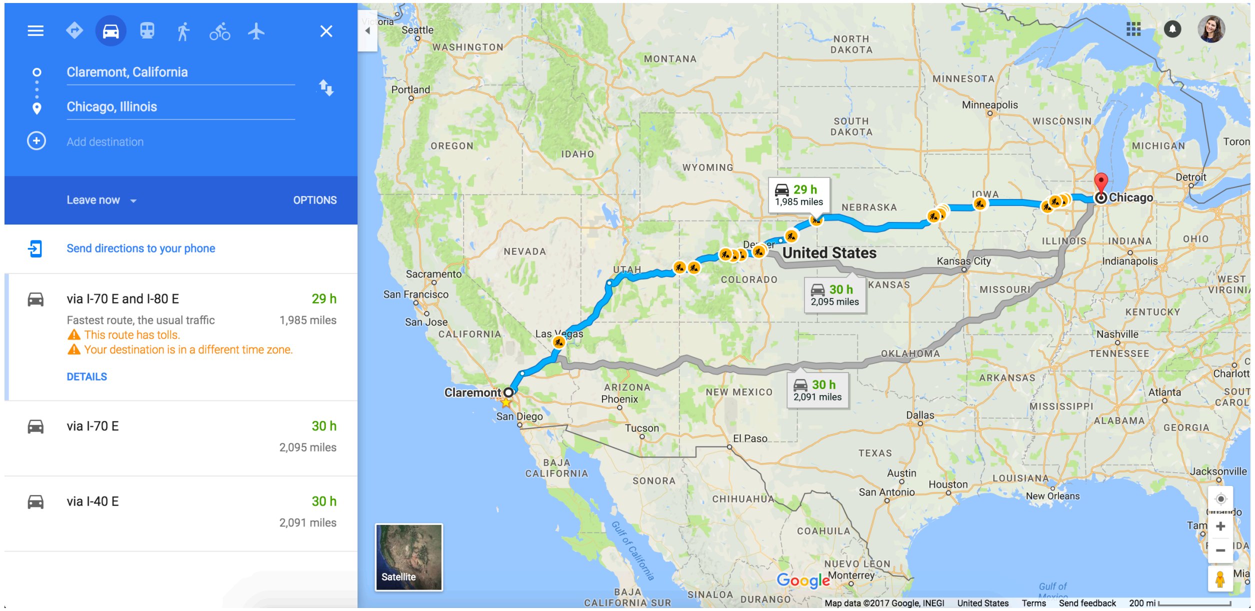
- Write down the questions you have as you go
- Question answered? ~~Strikethrough~~
- I will collect the feedback at the end of class

Why take CS62?

- How to implement algorithms and data structures in Java.
- How to design large programs (in object-oriented style) so that it is easy to modify them.
- How to analyze complexity of alternative implementations of problems.

Sample Problems

- Find the shortest path from Claremont to Chicago on interstate system (and do it efficiently).


Claremont, California
Chicago, Illinois
Add destination
Leave now
OPTIONS
Send directions to your phone

via I-70 E and I-80 E — 29 h, 1,985 miles
Fastest route, the usual traffic
⚠ This route has tolls.
⚠ Your destination is in a different time zone.
DETAILS

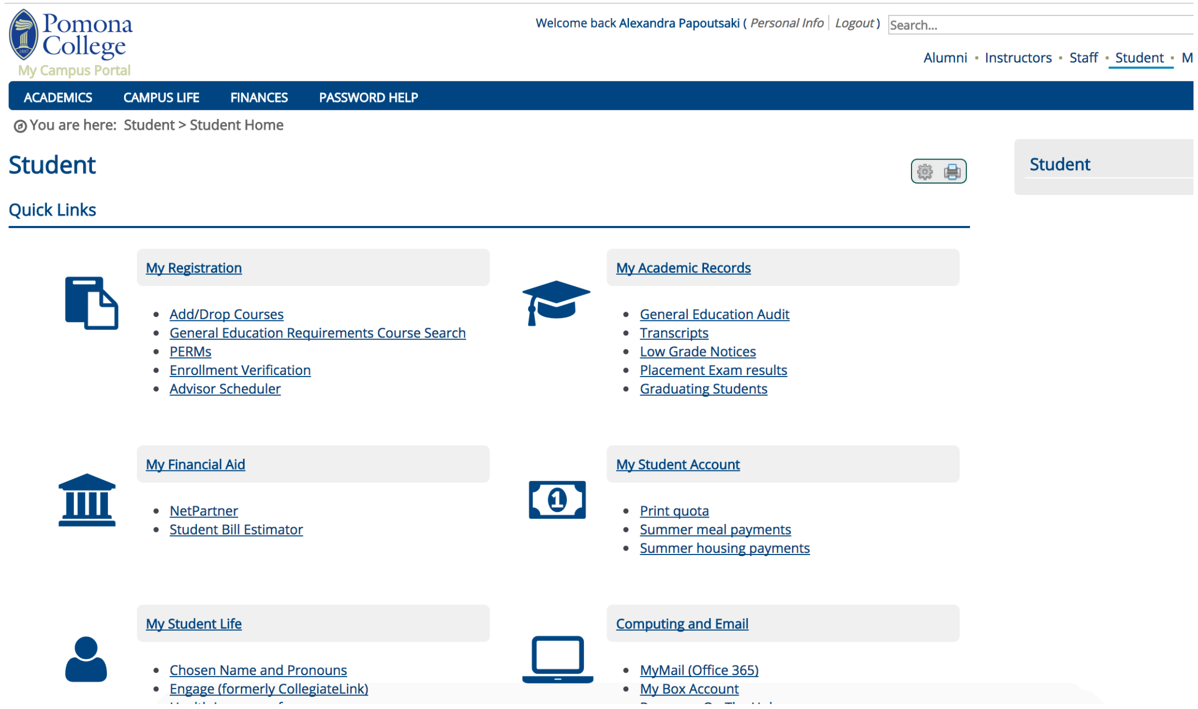
via I-70 E — 30 h, 2,095 miles

via I-40 E — 30 h, 2,091 miles

Google maps

Sample Problems

- Schedule final exams so there are no conflicts.



Pomona College
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Welcome back Alexandra Papoutsaki (*Personal Info* | *Logout*) Search...

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- Student Bill Estimator

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- Print quota
- Summer meal payments
- Summer housing payments

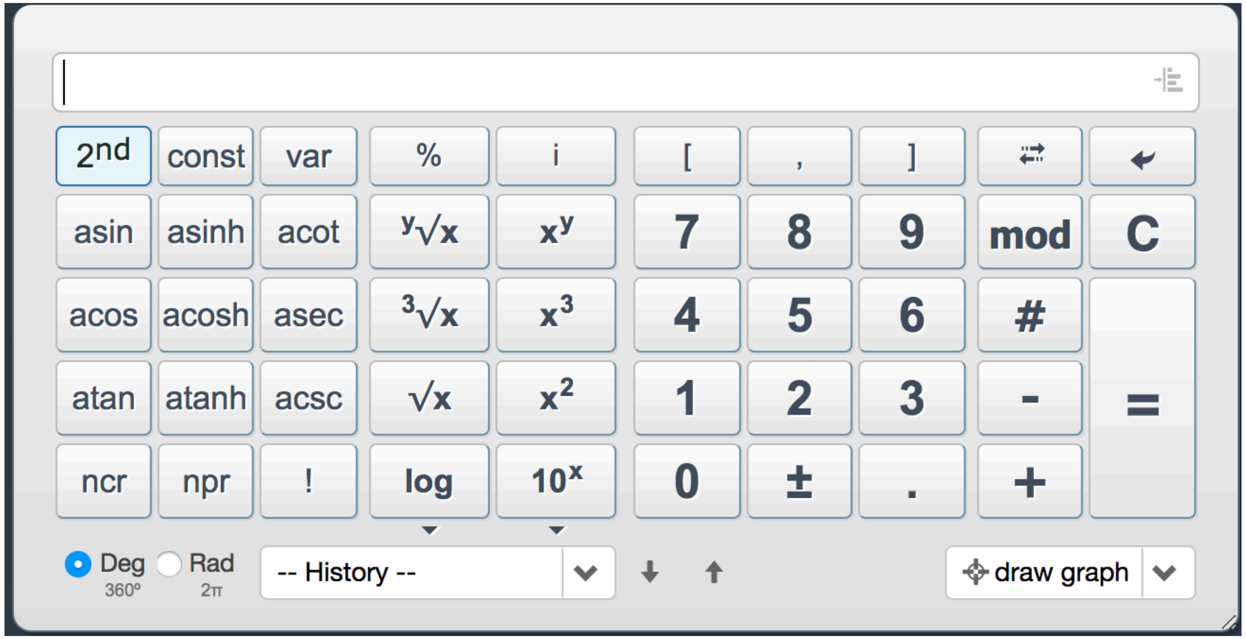
My Student Life
- Chosen Name and Pronouns
- Engage (formerly CollegiateLink)

Computing and Email
- MyMail (Office 365)
- My Box Account

my.pomona.edu

Sample Problems

- Design and implement a scientific calculator.



web2.0calc

Sample Problems

- Design and implement a simulator that lets you study traffic flow in a city or airport.

airtopsoft

Your responsibilities

- Skim reading in advance of lecture.
- After lectures, review notes and study examples carefully until you understand them.
- Come to labs prepared.
- Don’t remain confused. Faculty and TAs are here to help.
- Follow academic integrity guidelines

Assignments

- Lab work:
    - Learn tools and prepare work for weekly assignments.
    - Lab attendance is mandatory! *No lab today!!!*
- Weekly assignment is separate
    - Programs generally are due on Sunday nights.
    - See late policy on syllabus. 3^n% penalty per day late.
- Daily homework
    - Not collected, but often on **regular Friday quizzes**.
    - *No quiz this Friday!*

Text

- Java Structures, $\sqrt{7}$ edition, by Duane Bailey
  - available online for free
  - http://www.cs.williams.edu/~bailey/JavaStructures/Book.html
- Various online resources

Slides

- Will generally be available before class
  - with code, where applicable
- Designed for class presentation, not for complete notes.
- Will need to take notes (perhaps on slides).
- No laptops or other electronics open in class
  - If you have a disability affecting this, come see me.

Prerequisite

- Officially, CS 52 at Pomona
- Knowledge of Java equivalent to CS 51 at Pomona or CMC or the AP Test with 4 or 5.
  - *not CS 5 from HMC or* CS 30 from Pomona*!*
- Come see one of faculty if having any questions
- Assume comfortable with classes & objects, recursion, multi-dimensional arrays, etc. in Java

Heavy Workload

- students spend average of 8+ hours outside of class.
- … but not “weeder”
- Must both learn practical (programming) skills and more theoretical analysis skills
  - Learn about tools to become better programmer
  - Be ready to answer “interview questions”

Grading Policy

Weekly Programming Assignments		35%
Exams:	Total:	55%
	Midterms: 15% each	
	Final Exam: 25%	
In-lab exercises and quizzes		10%
Total:		**100%**

- We drop the two quizzes with the lowest grade
  - Keep this option for *real* emergencies and unpredictable events

See online syllabus for other important information!

Using Github does not mean you can make your assignments publicly available

http://www.cs.pomona.edu/classes/cs062

Object-Oriented Design

- Objects are building blocks.
- Programs are collections of interacting objects.
- Objects cooperate to compute solutions or complete tasks.
- Objects communicate via sending messages.

The ticketing system in a movie theatre

http://www.trover.com/d/MHOV-laemles-claremont-5-theatres-claremont-california

Objects

- Objects can model objects from world:
  - Physical things
    - e.g., car, student, card, deck of cards
  - Concepts
    - e.g., meeting, date
  - Processes
    - e.g., sorting, simulations

More objects

- Objects have:
  - Properties, e.g., color, model, manufacturer
  - Capabilities, e.g., drive, stop, admit passenger
- Objects are responsible for knowing how to perform actions.
  - Commands: change object's properties, (e.g., set speed)
  - Queries: respond based on object's properties (e.g., how fast?)

Even more objects

- Properties typically implemented as “fields” or “instance variables”
  - Affect how objects reacts to messages
  - Can be:
    - Attributes, e.g., color
    - Components, e.g., door
    - Associations, e.g., driver
- Capabilities as “methods”
  - Invoked by sending messages

Quick Java Review

Primitive Data Types

- **`char`** , **`int`**, **`byte`**, **`short`**, **`long`** , **`double`**, **`float`**, **`boolean`**
- Use a small amount of memory to represent a single item of data
- All data of same primitive data type use the same amount of memory
- Cannot be used to instantiate type variables, that is no **`new`**
- Have corresponding object "wrapper" types:
    - **`Integer`**, **`Double`**, **`Float`**, **`Boolean`**, etc.

Objects

- Any data type that is not a primitive
- You already know `String`
  - Thousands more coming with Java by default
- You can create your own with the **`new`** keyword
- Contain data and methods
- Respond to messages

Classes

- Classes are templates for objects
  - The data type of that kind of object
- Constructor
  - Have the same name with the class
  - generate new distinct objects
    - `new Car("Toyota")`
    - Specify all fields and methods – public and non-public
  - May be used as basis for more refined classes via inheritance
    - `class Car extends Vehicle`

Access modifiers

Modifier	Class	Package	Subclass	World
`public`	Y	Y	Y	Y
`protected`	Y	Y	Y	N
Default (nothing!)	Y	Y	N	N
`private`	Y	N	N	N

Instance Variables

- or member variables or fields
- Declared in a class, but outside any method, constructor or block
- Each object has its own copy of the variable!
- Invoked as: `myObject.variableName`

Static Variables

- or class variables
- static means constant, i.e. it will be constant for all instances of the class
- cannot be defined in method body
- Invoked as: `myClass.variableName`

Local Variables

- Declared in method, constructor or block
- Destroyed after the execution of the method
- No access modifier

- What about these variables?

```
public class Student {
    private String name;
    private int id;

    public static int numberOfStudents=0;
}
```