LEC 01

CSE 122

Java Review & Functional Decomposition

Questions during Class?

Raise hand or send here

sli.do #cse122

BEFORE WE START

Talk to your neighbors:

What's your favorite YouTube or Twitch channel to watch?

Music: [122 24au Lecture Tunes]

Instructors: Miya Natsuhara and Elba Garza

TAs:

Ayush	Heon	Harshitha	Aishah
Andrew	Izak	Marcus	Ben
Logan	Colin	Carson	Ivory
Kyle	Jessica	Jack	Cady
Maggie	Shivani	Connor	Diya
Nicole H	Ken	Cora	Katharine
Caleb	Mia	Hannah	
Nicole W	Ashley	Leo	
Jacob	Chaafen	Anya	

Lecture Outline

- Announcements/Reminders
- Review Java
- Functional Decomposition
- Code Quality
- First Assignment
  - Grading

Announcements

- Hope you had fun in your first quiz section yesterday!
- Creative Project 0 (C0) released later today, due next Thursday, Oct 3
  - Focused on Java Review + Functional Decomposition
- Java Review Session – planning on Monday, Sept 30
  - Tentatively 12:30pm-1:20pm and 3:30pm-4:20pm (location TBD)
- IPL will also open on Monday!
- Instructor Office Hours posted
  - Viewable on the Staff page of the course website

Reminders

- Fill out the Introductory Survey
- Make an intro video to introduce yourself to your classmates!
  - Optional, but fun ☺
- ★ Complete the pre-class material (PCM) for Wednesday (see calendar)
  - Will be posted after class today
- Attend quiz section on Tuesday!

Section Credit

- Students receive "section credit" for a quiz section by:
  - Completing and submitting section homework at the beginning of the quiz section
    - Section homework must be submitted **on paper**, **in person**, and **at the beginning of quiz section**.
    - No need to print out the problems – you just need to turn in a piece of paper with your name, the section, and your work/answers.
  - Attending and engaging in the quiz section's class and activities
- Section homework is comprised of a small collection of warm-up problems focused on that section's topics
  - These problems should take up to **20 minutes** for each section. If you find yourself taking significantly longer than this, you may stop your work and write that you worked for 20 minutes.
  - Section homework is graded on demonstrated effort, not on completeness or correctness.

Section Credit + Late Days

- Students can earn a free "late day" (a late day is 24-hours) by earning section credit for **6** quiz sections.
  - Late days can only be applied to Programming Assignment and Creative Project initial deadlines (not resubmissions)
  - Some math:
    - There are 17 quiz sections you can earn credit for
    - Students can maximally earn 2 late days throughout the quarter
    - You can miss 5 sections and still earn the maximum number of late days
- Missing a quiz section will not count against you, but attending section can help you earn late days to use throughout the quarter at your discretion.

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Reminders: Review Java Syntax

Java Tutorial reviews all the relevant programming features you should familiar with (even if you don't know them in Java).

- Printing and comments
- Variables, types, expressions
- Conditionals (if/else if/ else)
- Loops (for and while)
- Strings
- Methods
- Arrays
- 2D arrays

Practice : Think

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In-Class Activities

- **Goal**: Get you actively participating in your learning
- Typical Activity
  - Question is posed
  - **Think** (1 min): Think about the question on your own
  - **Pair** (2 min): Talk with your neighbor to discuss question
    - If you arrive at different conclusions, discuss your logic and figure out why you differ!
    - If you arrived at the same conclusion, discuss why the other answers might be wrong!
  - **Share** (1 min): We discuss the conclusions as a class
- During each of the **Think** and **Pair** stages, you will respond to the question via a sli.do poll
  - Not worth any points, just here to help you learn! 😉

Practice : Think

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What is the output of this Java program?

```
public class Demo {
   public static void main(String[] args) {
      int[] nums = {1, 4, 4, 8, 13};

      int totalDiff = 0;
      for (int i = 1; i <= nums.length; i++) {
         totalDiff += (nums[i] - nums[i - 1]);
      }
      System.out.println("Total Diff = " + totalDiff);
   }
}
```

A) Total Diff = 12
B) Total Diff = 10
C) Total Diff = 9
D) Exception!

Practice : Pair

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What is the output of this Java program?

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D) Exception!

Case Study: Minesweeper Description

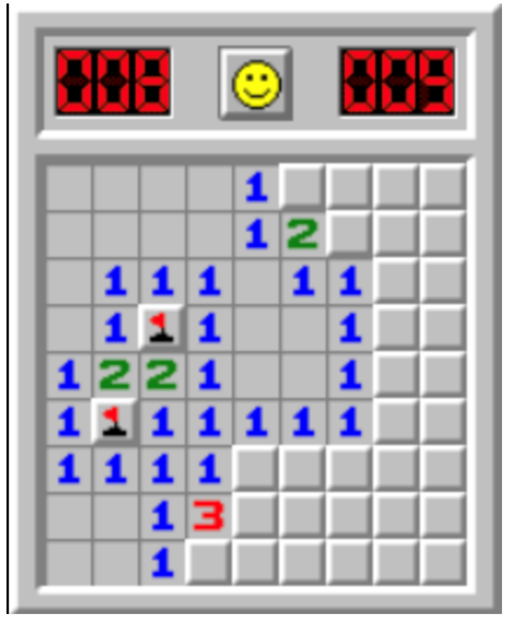
Minesweeper is a classic puzzle game that involves a grid of squares, some of which contain hidden mines. The objective of the game is to uncover all the squares that do not contain mines, without detonating any of the mines.

In the board that the player is working from, each square contains either:

- A mine
- A number indicating how many mines are adjacent to the square
- Is blank (indicating there are 0 mines adjacent to the square)

The player clicks on a square to reveal what is hidden underneath. If the square contains a mine, the game is over and the player loses. If not, the player uses the information in that square to determine how to proceed.

Using logic and deduction, the player must determine the locations of the mines and mark them with flags. Once all the mines have been flagged, the game is won. The game comes with different levels of difficulty which may determine things in the game such as the size of the grid or the number of mines hidden within it.



Case Study: Minesweeper Output

```
Welcome to MineSweeper!
Please choose game difficulty (NOTE: Difficulty: 1 to 10): 3
|  - - - - - - - - - - - - -  |
|  0 0 1 X 1 1 X 1 0 0 0 0 0  |
|  0 0 1 1 1 1 1 1 0 0 0 0 0  |
|  1 1 1 0 0 0 0 0 0 0 0 0 0  |
|  1 X 2 1 1 0 0 0 0 0 0 0 0  |
|  1 1 2 X 1 0 0 1 1 1 0 0 0  |
|  0 0 1 1 1 0 0 1 X 1 0 0 0  |
|  0 0 0 0 0 0 0 1 1 1 0 0 0  |
|  0 0 0 0 0 0 0 0 0 0 0 0 0  |
|  1 1 1 0 0 0 0 0 0 0 0 0 0  |
|  1 X 1 1 1 1 0 0 0 0 0 0 0  |
|  1 1 1 1 X 2 1 1 0 0 0 0 0  |
|  1 1 0 1 1 2 X 1 0 0 0 0 0  |
|  X 1 0 0 0 1 1 1 0 0 0 0 0  |
|  - - - - - - - - - - - - -  |
```

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Functional Decomposition

Functional decomposition is the process of breaking down a complex problem or system into parts that are easier to *conceive, understand, program,* and *maintain.*

"Bake the cookies" ⟶

Wet
- Mix butter and sugar
- Beat in eggs & vanilla

Dry
- Mix in flour, baking soda, and chocolate chips

Place
- Make cookie-sized balls of dough
- Place evenly on baking sheet

Bake
- Bake at 350 degrees Fahrenheit for 10 minutes
- Let cool after

Functional Decomposition

In our code, functional decomposition often means breaking a task into smaller methods (also called functions).

Example: Minesweeper

- Introduce the game
- Set up blank game board
- Randomly decide where to place mines
- Place counts in each non-mine square

Avoid Trivial Methods

Introduce methods to decompose a complex problem, not just for the sake of adding a method.

Bad example:

```java
public static void printMessage(String message) {
    System.out.println(message);
}
```

Good Example:

```java
public static double round(double num) {
    return ((int) Math.round(num * 10)) / 10.0;
}
```

Rule of thumb: A method should do at least two steps

- Ask yourself: Does adding this method make my code easier to understand?

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Code Quality

“Programs are meant to be read by humans and only incidentally for computers to execute.” – Abelson & Sussman, SICP

Code is about *communication.* Writing code with good **code quality** is important to communicate effectively.

Different organizations have different *standards* for code quality.

- Doesn’t mean any one standard is wrong! (e.g., APA, MLA, Chicago, IEEE, ...)
- Consistency is very helpful within a group project
- See our Code Quality Guide for the standards we will all use in CSE 122

CSE 122 Code Quality

Examples relevant for this week

- Naming conventions
- Descriptive variable names
- Indentation
- Long lines
- Spacing
- Good method decomposition
- Writing documentation

Practice : Pair

What does this code do? How could you improve the quality of this code? (No Slido poll)

```
public static int l(String a,char b){
       int j=-1;for(int a1=0;a1<a.length();a1   ++) {
  if (a.charAt(a1) == b) {
        j = a1;
            } } if(j==-1){return -1;} else {
 return j;} }
```

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Creative Project 0

- Released today, due next Thursday (Jan 11) at 11:59 pm on Ed
  - Can hit the "Submit" button multiple times – we will grade the last submission made before the initial deadline.
  - Build good habits: Don't "shotgun debug"
  - While you can resubmit this assignment, it's important to meet due date to get as much feedback as possible.
- Focused on reviewing Java concepts and Functional Decomposition
- See Grading Rubric to know what to expect
- IPL opens Monday!