IT1007
Extra Consult

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Programming Fundamental Overview

- Computers are STUPID. Tell them *exactly* what you want them to do
- What can you tell them to do?
  - Keep track of variables
  - Conditional checking / Execution (**Conditionals**)
  - Do something X times (**Iteration / Recursion**)
  - Data Structure Manipulation (**Lists, Dicts** etc)

Programming Fundamental Overview

- Programming is just a tool to translate ***a method of solving problems*** to the computer to solve them.

- This may seem super obvious, but you dont really get it until you can ***easily translate thoughts to code***

Programming Fundamental Overview

Functions

Functions are re-usable bits of code that takes in something, and gives you something. Functions help you ***not repeat code.***

Eg:

- Calculate e. Formula→ sum(1/n!)
- Now calculate binomial
  - Are you going to hardcode the calculation again?
  - No! call factorial function!

Programming Fundamental Overview

Lists

- Normally used when you're working with **ordered** data
  - CSV, blah.
- Collection of *anything* in a row / 2d matrix / etc.

Programming Fundamental Overview

Lists

- You're grading tests, and the score for 10 students are 67,45,45,64,86,22,57,76,33,20
- Can you:
  - Find what the 8th student scored?
  - Calculate the mean? what about median?
  - Find if any 2 students scored a combined mark of 112

Programming Fundamental Overview

Dictionaries

- Normally used when you're working with **unordered** data
- "I give you this, you give me this" principle
- Eg, x = {"apples":2,"oranges":4}
  - x["apples"] → 2

Programming Fundamental Overview

Dictionaries

- You're grading tests, and the score for 10 students are 67,45,45,64,86,22,57,76,33,20
- Can you:
  - Find the number of times each mark appears?

Practice Paper

PE Review

PE Review

Q1:

If you can do the:

- Compute e question (duh)
- Bisection question (last question of Mock PE)

You should be able to do this. It's a combination!

Skills Required

- Iteration
- Conditionals

PE Review

Q1:

Basic Idea

- You have a formula, that sums to infinity for the most accurate value of e.
- Obviously, you cant do infinity. BUT. You CAN do up to a given level of precision
- Core idea: Just keep adding new terms until your error criteria is fulfilled!

PE Review

Q2:

<u>If you can do the:</u>

- Filter wave lab (duh)

<u>Skills Required</u>

- Iteration
- List Manipulation
- Understanding of “Not modifying input list”

PE Review

Q2: Basic Idea

- You don’t want to modify the **inputs** because lists are **mutable,** modifying that will change the original value which may be used elsewhere. So create a clone list
  - *list(wave)*
- You have a list of values, that you want to modify according to some logic.
- Thats.. about it.

PE Review

Q3:

<u>If you can do the:</u>

- Integration lab (duh)

<u>Skills Required</u>

- Iteration
- Conditionals

PE Review

Q3: Basic Idea

- First, UNDERSTAND WHAT YOURE DOING
  - What is integration?
    - TLDR: Area under the curve. Obviously easiest way is then draw a huge rectangle, but thats inaccurate for curves. so draw **miniscule** rectangles

PE Review

Q3: Basic Idea

- You have delta_x, which is the width of the rectangle.
- Hence, you just need to:
  - start from beginning (point a), add delta_x (point b)
  - find the height at point_a. multiply and get the area
  - Add the area to a storage variable.
  - your point_a is now point_b. add delta_x to the old point_b to get your new point_b.
  - Repeat!

PE Review

Q4:

If you can do the:

- Image processing lab (duh)

Skills Required

- Iteration
- Conditionals
- Understanding documentation (subplots / layouts)
- Understanding numpy arrays & indexing

PE Review

Q4: Basic Idea

- Understand what is happening
  - 1st pic: original avengers
  - 2nd pic: school
  - 3rd pic: together
    - How to merge?
- How to get the layout? what function to use?

PE Review

Q4: Basic Idea

- For the first 2 pics - just set the layout and display
- Last pic:
  - Set layout
  - Loop and apply conditional logic
    - if G > R and G > B and G > 110
      - replace
  - show

PE Review

Q5: “Bonus” Question thats actually free marks

Skills Required

- Iteration
- Conditionals
- A bit of math

PE Review

Q5: Basic Idea (Simplest Way - Brute Force)

- a^2 + b^2 = C
- Loop a from 1 to C
  - Loop b from 1 to C
    - Check a**2 + b**2 = C. If so, done
- Thats it!! 10 / 20 done

PE Review

Q5: Basic Idea (Smarter Way)

- The previous way wont work for larger integers. we need to find a way to cut down the amount of computation
- Solution? Rearrange the formula!
- a**2 = (C - b^2)
  - If a can be square rooted, then its valid!
  - now you only need one loop to (n/2)!