Compsci 101
Lists, Mutation, Objects
Live Lecture

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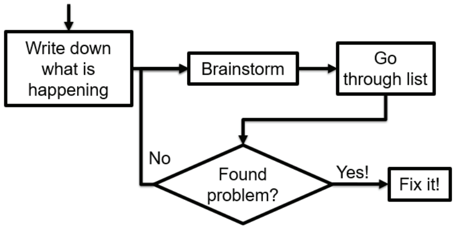
February 9, 2021

Debugging Steps



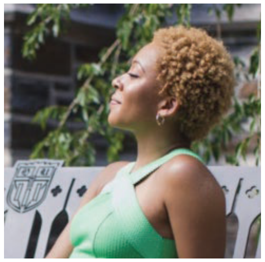
Announcements

- Assign 1 Totem, due Thursday, Feb 11
- Lab 3 Friday, Do Prelab 3 before lab
  - Note do prework for Feb 11, before Prelab 3
- Sakai QZ due by lecture time each day

- Exam 1 – Tuesday, Feb 16
- Need SDAO letters for exams!
  - Email them to Ms. Velasco
    yvelasco@cs.duke.edu

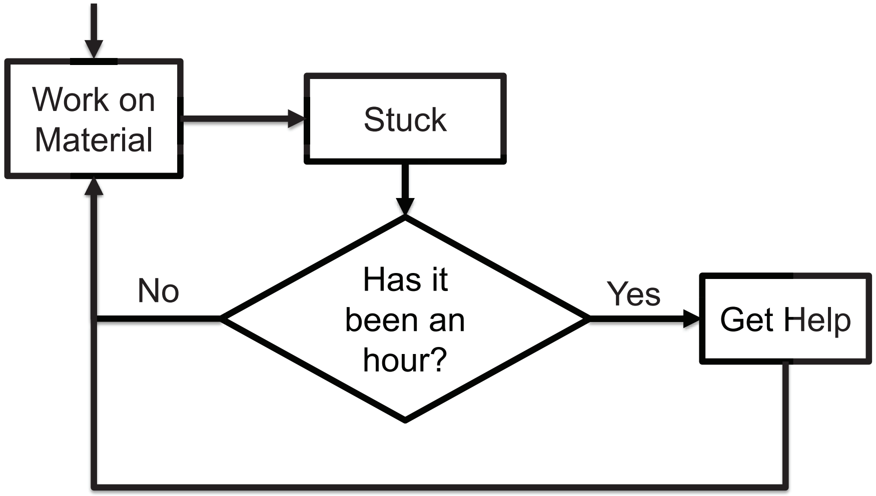
Genesis Bond '16

- Struggled at Duke
  - 5 years
  - Dismissed 1 semester due to grades
- Revature
  - Trainer Full Stack Development
  - She worked smarter
- Facebook Engineer, big success!
- Her story: http://bit.ly/dukebond



"Poor preparation promotes poor performance. In anything you do, your preparation will show."

One Hour Rule for Getting Help



PFTD

- Slicing
- Totem
- Debugging
- List concatenation and nesting
- Mutability
- Objects and what that means
- Exam 1

Exam 1 – Feb 16, 2021

- All topics through Thur. Feb 11 except loops
  - Understand/Study
    - Reading, lectures
    - Assignment 1, APT-1,
    - Labs 0-3 (except for loops in Lab 3)
  - Old tests and solutions on resources tab
    - See recommended ones posted today
- Logistics:
  - Online, More details next time
  - Pick a time to take it on Feb 16

Exam 1 – Feb 16, 2021 (cont)

- What you should be able to do
  - Read/trace code
  - Determine output of code segment
  - Write syntax
- Similar format to Test 1 Fall 2020
  - But note that test covers more topics
  - See posted list of problems posted on calendar page on today's date

Slicing Python Sequences

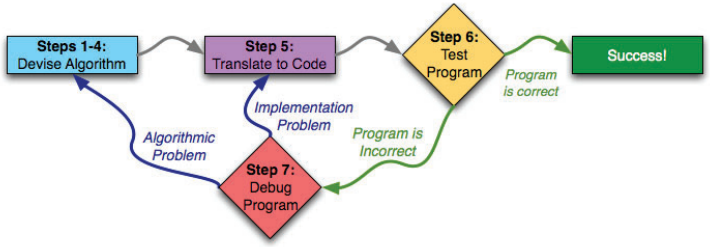
- `s="hello world"`
- `l=["my", "big", "beautiful", "world"]`
- Slicing provides sub-sequence (string or list)
  - `seq[n:m]` – all elements `i`, s.t. `n <= i < m`
  - Compare `s[0:3]` and `l[0:3]`
  - What is length of subsequence? `seq[2:4]`
  - Compare `s[4:-1]` and `l[2:-1]`
  - Is last index part of subsequence?

- We can omit value, e.g., `s[2:]` or `s[:3]`, good shortcut!

WOTO-1 Slicing
http://bit.ly/101s21-0209-1

Debugging

- Finding what is wrong + fixing it
  - Finding is its own skill set, and many find difficult
  - Fixing: revisit Step 1—5



How Not To Debug

- Bad (but tempting) way to debug
  - Change a thing. Does it work now?
  - No … another change … how about this?
- Trust doctor if they say?
  - “Ok try this medicine and see what happens?”
- Trust mechanic if they say?
  - “Let’s replace this thing and see what happens”

It may be easy, but that doesn’t make it a good idea!

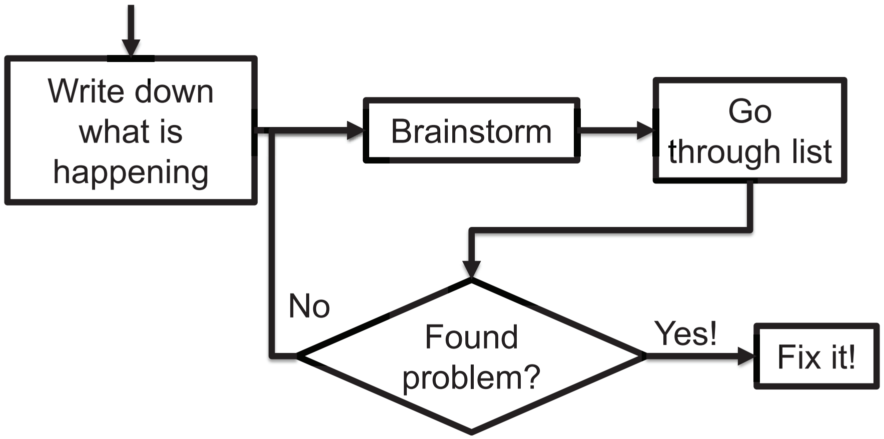
Debugging Steps

1. Write down exactly what is happening
   1. input, output, what should be output
   2. ____ happened, but ____ should happen
2. Brainstorm possible reasons this is happening
   1. Write down list of ideas
3. Go through list
4. Found it?
   1. Yes, fix it using the 7-steps
   2. No, go back to step 2

This is what experts do!

Remember: One-hour rule

Debugging Steps



WOTO-2 – Relate W’s to Debugging http://bit.ly/101s21-0209-2

- Who was involved?
- What happened?
- Where did it take place?
- When did it take place?
- Why/How did it happen?

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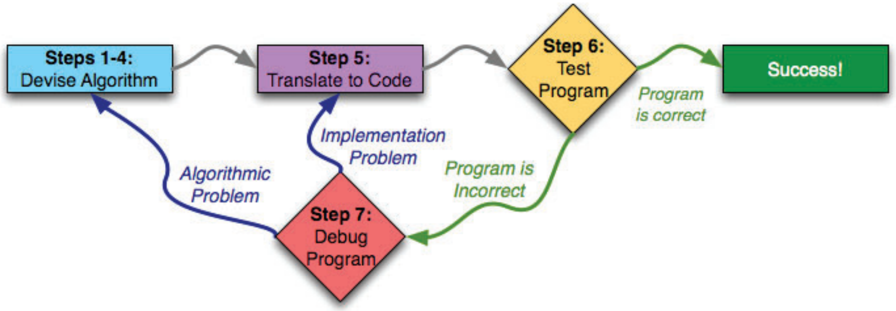
Translate these questions to debugging

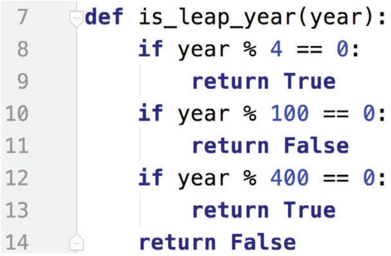
Step 7 -> Steps 1-4 or 5



Which year is a leap year?

- A Leap Year must be divisible by four.
- But Leap Years don't happen every four years … there is an exception.
  - If the **year** is also divisible by 100, it is not a **Leap Year** unless it is also divisible by 400.

WOTO: Buggy Leap Year http://bit.ly/101s21-0209-3



```
def is_leap_year(year):
    if year % 4 == 0:
        return True
    if year % 100 == 0:
        return False
    if year % 400 == 0:
        return True
    return False
```

Input: 1900
Output: True
Should be: False

Another Example: Function withCutOff

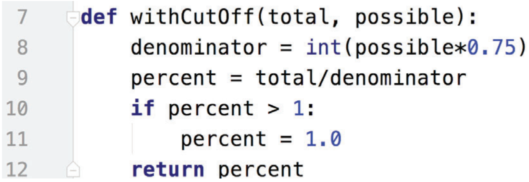
- This function should calculate an overall quiz score, using the total points of all your quizzes.
- If you earn 75% or more of the total points you get a 100% or 1.0
- If you earn less than 75% then your score is the total number of points you have, divided by the number of points that would represent 75% of the score.

withCutOff Function Examples

- Example 1, total points is 100, you have 90 points
  - 75% of points is 75 points, you have many more
  - Your score is 100% or 1.0.
- Example 2, total points is 100, you have 60 points
  - 75% of points is 75
  - your score is 60/75 is 80% or 0.8.
- Example3, total points is 134, you have 50 points
  - 75% of points is 100, (134*0.75 is 100)
  - Your score is 50/100 is 50% or 0.5.

WOTO: Buggy withCutOff function http://bit.ly/101s21-0209-4

WOTO: Buggy withCutOff function http://bit.ly/101s21-0209-4



```python
def withCutOff(total, possible):
    denominator = int(possible*0.75)
    percent = total/denominator
    if percent > 1:
        percent = 1.0
    return percent
```

Input: (1,1)
Output: Error
Should be: 1.0

Mutating Lists

- **`lt = [‘Hello’, ‘world’]`**
  - Change to: `[‘Hello’, ‘Ashley’]`
- Concatenation: **`lt = [lt[0]] + [‘Ashley’]`**
- Index: **`lt[1] = ‘Ashley’`**

- How change **`‘b’`** in **`lt = [1, ‘a’, [2, ‘b’]]`**?
  - `lt[2][1] = ‘c’`

WOTO-5 List Mutation http://bit.ly/101s21-0209-5