CompSci 101
Fall 2021

Lecture 4

Reminders

- **THE CLASS IS ALREADY REMOTE!**
  - Lectures: Live→Videos (Calendar)
  - Labs: Async Request Form
- **NO READING QUIZZES!**
- **ALL CLASS-RELATED QUESTIONS SHOULD BE SUBMITTED IN ED!**

- **Assignments**
  - APT-0 due, APT-1 live
  - Complete Prelab-1 ASAP
- **Lab 1-Friday**
  - Complete Prelab-1
  - Attend your assigned section!
- **Assessments**
  - 3C Assessment-Learning Innovation
  - "Who Are You?"-Ms. Velasco (Welcome email)
  - 80% response rate→Extra credit

Key instructions

- **Input**
- **Output**
- **Assignments***
- **Math/Logic**
- **Conditionals**
- **Repetition**

not listed in book

PFTD

- **Functions**
  - Programmer-defined
- **Conditionals**
- **7-Steps**
- **PAY ATTENTION TO ERROR MESSAGES**

"The mere imparting of information is not education."

- Dr. Carter G. Woodson

People to Know: Dr. Timnit Gebru

- Stanford (BS/MS/PhD, EE)
- Stanford (PhD, EE)
- Ethical AI
- Co-founder: Black in AI
- Gender Shades Project

Two types of functions

- **Pre-defined**
  - Built into Python language
  - print(), len(), random()
- **Programmer-defined**
  - YOU must create them from scratch!!

- **Python Standard Library**
  - https://docs.python.org/3/library/
- **Additional Python reference**
  - https://www.w3schools.com/python/default.asp

How to use pre-defined functions

1. Where it's defined
2. How to use (i.e., call) it (name)
3. Any input required (parameters/arguments)
4. Expected result (if any) of its execution (i.e., value)
   - Variable to store that value

import *module_name*

if _ _name_ _ = = '_ _main_ _':
    print(*module_name*.*function_name*(*arguments*))

```
import math

if __name__ == '__main__':
    print(math.floor(6.3333345))
```

How do these functions work??

Programmer-defined functions

- **YOU must make ALL the magic happen**
  - Behind the scenes (define) AND when you use (call) function
- **Difference is step 1:**
  - Where function defined (and how)
- **You won't be "importing" any modules (for now)**

Why create your own functions?

All the single ladies (all the single ladies)
All the single ladies (all the single ladies)
All the single ladies (all the single ladies)
All the single ladies
Now put your hands up

Up in the club, we just broke up
I'm doing my own little thing
You decided to dip but now you wanna trip
'Cause another brother noticed me
I'm up on him, he up on me
Don't pay him any attention
'Cause I cried my tears
For three good years
Ya can't be mad at me

'Cause if you like it then you should have put a ring on it
If you like it then you should've put a ring on it
Don't be mad once you see that he want it
If you like it then you should've put a ring on it

Whoa uh oh uh uh oh oh uh oh uh uh oh
Whoa uh oh uh uh oh oh uh oh uh uh oh

If you like it then you should have put a ring on it
If you like it then you should've put a ring on it
Don't be mad once you see that he want it
If you like it then you should've put a ring on it

I got gloss on my lips, a man on my hips
Hold me tighter than my Dereon jeans
Acting up, drink in my cup
I can't care less what you think
I need no permission, did I mention
Don't pay him any attention
'Cause you had your turn
And now you gonna learn
What it really feels like to miss me

'Cause if you like it then you should have put a ring on it
If you like it then you should've put a ring on it
Don't be mad once you see that he want it
If you like it then you should've put a ring on it

Whoa uh oh uh uh oh oh uh oh uh uh oh
Whoa uh oh uh uh oh oh uh oh uh uh oh

If you like it then you should have put a ring on it
If you like it then you should've put a ring on it
Don't be mad once you see that he want it
If you like it then you should've put a ring on it

Whoa uh oh uh uh oh oh uh oh uh uh oh
Whoa uh oh uh uh oh oh uh oh uh uh oh

What's the difference?

All the single ladies (all the single ladies)
All the single ladies (all the single ladies)
All the single ladies (all the single ladies)
All the single ladies
Now put your hands up

Up in the club, we just broke up
I'm doing my own little thing
You decided to dip but now you wanna trip
'Cause another brother noticed me
I'm up on him, he up on me
Don't pay him any attention
'Cause I cried my tears
For three good years
Ya can't be mad at me

'Cause (Chorus)if you like it then you should have put a ring on it
If you like it then you should've put a ring on it
Don't be mad once you see that he want it
If you like it then you should've put a ring on it

(Refrain)
Whoa uh oh uh uh oh oh uh oh uh uh oh
Whoa uh oh uh uh oh oh uh oh uh uh oh

Chorus

I got gloss on my lips, a man on my hips
Hold me tighter than my Dereon jeans
Acting up, drink in my cup
I can't care less what you think
I need no permission, did I mention
Don't pay him any attention
'Cause you had your turn
And now you gonna learn
What it really feels like to miss me

'Cause (Chorus)
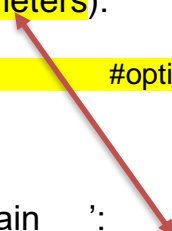
Refrain

Chorus

Refrain

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Benefits of Functions

- **Easier to**
  - Read/understand
  - Modify
  - Test
  - Debug
- **Pro tip: Look for any repetition in your programs**

Creating/Using functions

1. Define the function (How it works)
2. "Call" the function (Using it)

```
def functionName(parameters):
    Code block
    return statement                #optional


if _ _name_ _ = = '_ _main_ _':
    variable=functionName(arguments)
```

```python
def output(name):
    print(name)


if __name__ == '__main__':
    student1="Keila"
    output(student1)
```

Demo
• No return vs return
• Variable scope

Activity 1: Creating Functions
http://bit.ly/101f21-09-02-1

Activity 1: Creating Functions http://bit.ly/101f21-09-02-1

- **Demo- PythonTutor: http://pythontutor.com**
  - How are functions defined?
  - Where does execution begin?
  - What is the global frame?
  - What is a local/function frame?

- **Variables**

Programming Process: High-level (Seven Steps)

- **After devising the algorithm, translate to code**
  - Plan first, then code
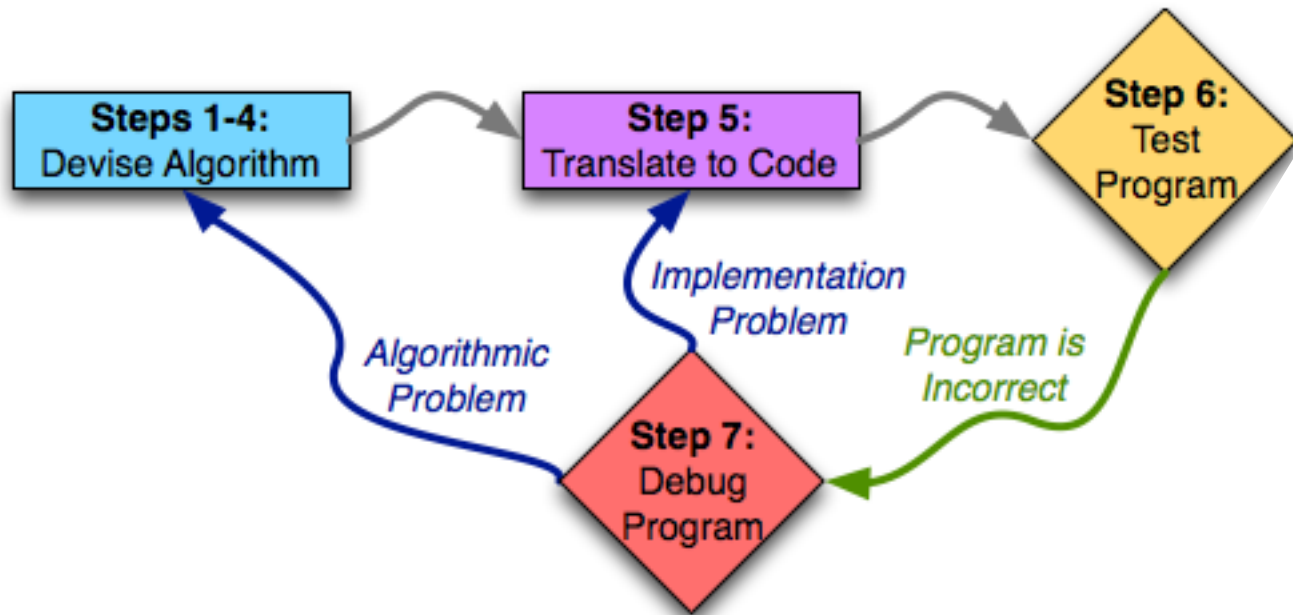 - Bridge analogy: blueprints→construction
  - Essay analogy: outline→prose

Programming Process: High-level

Steps 1-4: Devise Algorithm	→	Step 5: Translate to Code	→	Step 6: Test Program

- **Next test our program**
  - Testing important, often under-taught skill
  - Testing should also be part of steps 1-4
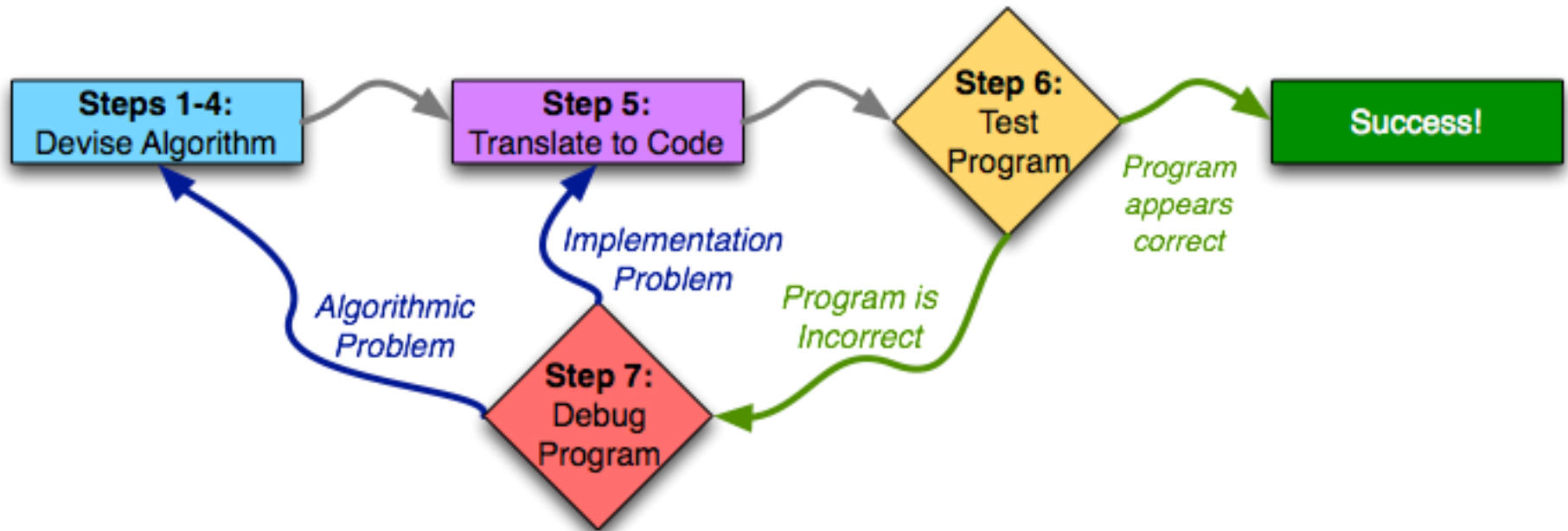
Programming Process: High-level

- **Ideally would be correct first time; may need to debug**

  - Identify problem (with science!)

  - Return to appropriate prior step to fix the problem

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Programming Process: High-level

- **Work through cycle until program works**

Solving Laundry APT

- **Navigate to APTs in class website and …**

Problem Statement

Consider the problem of trying to do a number of loads of laundry, given only one washer and one dryer. Washing a load takes 25 minutes, drying a load takes 25 minutes, and folding the clothes in a load takes 10 minutes, for a total of 1 hour per load (assuming that the time to transfer a load is built into the timings given). 10 loads of laundry can be done in 10 hours, 600 minutes, using the method of completing one load before starting the next one. Though it can be done faster, see examples.

Specification

```
filename: Laundry.py

def minutesNeeded(m):
    """
    Return integer number of minutes to launder m (integer) loads
    """

    # you write code here
```

Write the method, `minutesNeeded,` that returns the shortest time needed to do `m` loads of laundry. In other words, given an integer value representing the number of loads to complete, `m`, determine the smallest number of minutes needed to complete all loads of laundry.

Solving Laundry APT

- **m = 2**

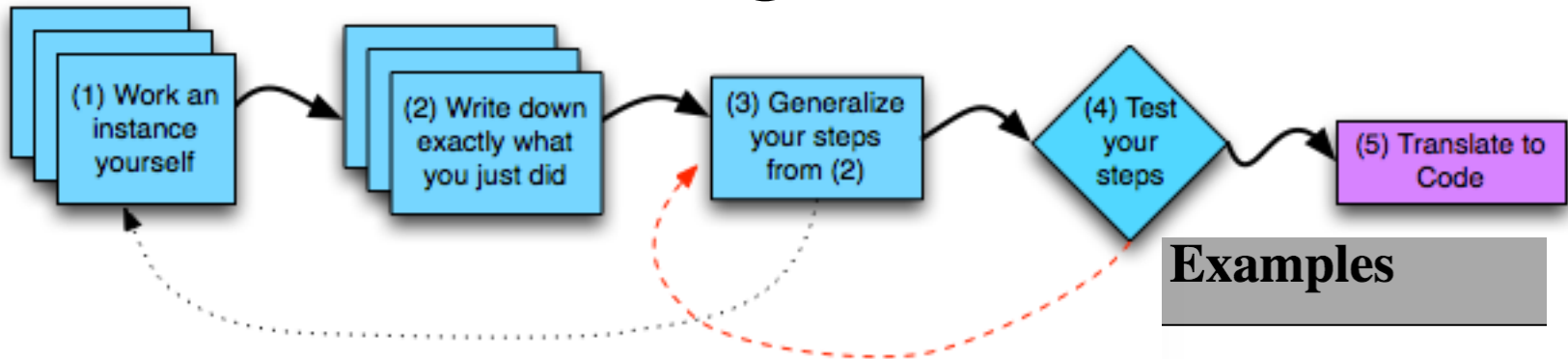| Wash	Dry	Fold

Wash	Dry	Fold

- **Return: 25 + 25 + 25 + 10 = 85 minutes**

Reading an APT

- Step 1: Work an example

- Step 2: Write down exactly what you did

  What should be a variable?

- Step 3: Generalize your steps

- Step 4: Test your steps (with new input)

  TPS: For Laundry APT

Examples

1. `m = 1`

   `returns: 60`

   You must wasl minutes.

2. `m = 2`

   `returns: 85`

Solving an APT

- **Create new project**
  - File > New Project
  - Existing interpreter (first project you made from installation)

- **Create new Python File**
  - Right click on project > New > Python File

- **Create function within module**
  - Name it properly!

Names and Return 0 Submission

- **Take small steps to get all green!**

Test Results Follow (scroll to see all)

# of correct: 0 out of 19

1	fail
2	fail
3	fail
4	fail
5	fail
6	fail
7	fail
8	fail
9	fail
10	fail
11	fail
12	fail
13	fail
14	fail
15	fail
16	fail
17	fail
18	fail
19	fail

Test Results Follow (scroll to see all)

# of correct: 12 out of 19

1	pass
2	pass
3	pass
4	pass
5	pass
6	pass
7	pass
8	pass
9	pass
10	pass
11	pass
12	pass
13	fail
14	fail
15	fail
16	fail
17	fail
18	fail
19	fail

Test Results Follow (scroll to see all)

# of correct: 19 out of 19

1	pass
2	pass
3	pass
4	pass
5	pass
6	pass
7	pass
8	pass
9	pass
10	pass
11	pass
12	pass
13	pass
14	pass
15	pass
16	pass
17	pass
18	pass
19	pass

Testing Laundry.minutesNeeded

- **The function minutesNeeded is in module Laundry**
  - Wrote the function, how to call it?
    - Submissions DO NOT need a main code
  - You can test by creating main in your PyCharm!
    - **Remember to comment out or delete before uploading APT**

Where to put/use what in Python file

- **Top: docstring with date and username**
- **Function definitions right after docstring**
- **Test code inside `if __name__ == '__main__':`**

- **Variables inside vs outside a function**
  - *Only* use the variables inside that function
  - Therefore, *do not* use the variables outside the function (like in the main)
    - Your code will not work on the server

Conditionals (Preview for Lab 1)

Conditionals: You can't have it both ways!

- If condition is true→action1
- Or else→action2

if *condition1*:

    block1

else:

    block2

```python
if __name__ == '__main__':
    num1 = 7

    if num1 == 5:
        print("The number is 5!")
    else:
        print("The number is NOT 5!")
```

Reminders

- **Some functions "return" values after they complete.**

  - Your program must "catch" (i.e., store) that value in a variable.

  - Otherwise→no way of using results of the function

Reminders

- **Work smarter, not harder**
- **Design first**
- **Try to identify where you are stuck**
  - Identify resources to help solve problem
- **Leverage your design and PythonTutor to understand program flow of control**
  - http://pythontutor.com