

## Objective

- More for loop
- Designing for Change
- Using Functions

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## Review

- Which lab did you submit today?
  - How many have you completed?
- What statement do we use to repeat something?
- What are the possible ways to use the `range` function?
  - What do they mean?

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## Practicing **for** Loops

What is getting repeated?  
How many times?

➤ A) 1

2

3

4

Tell me that you  
love me more

➤ C) 10

9

8

7

...

1

Blast off!

➤ B) I had the time of my life  
And I never felt this way before  
And I swear this is true  
And I owe it all to you

} 3 times,  
followed by Dirty bit

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## Programming Practice

- Add 5 numbers, inputted by the user
  - After implementing, simulate running on computer
- How would have implemented this last week?
  - How can we improve that based on our new knowledge?

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**sum5.py**

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## Generalizing Solution: Accumulator Design Pattern

1. Initialize accumulator variable
2. Loop until done
  - Update the value of the accumulator
3. Display result

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## Programming Practice at Home

- Average 5 numbers inputted by the user
- Good example of how to build up to a solution
  - Break down into smaller pieces

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[average5.py](#)

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# DESIGNING FOR CHANGE

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## Designing for Change

- What are we likely to change in the program?
- How can we make the program easier to change?

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## Constants

- Special variables whose values are defined once and never changed
  - By convention, not enforced by interpreter
- By convention
  - A constant's name is all caps
  - Typically defined at top of program → easy to find, change
- Examples:

```
NUM_INPUTS = 5  
MIN_VALUE = 0
```

Never assigned values in  
remainder of program

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## Programming Practice

- Sum **x** numbers inputted by the user

`sum_with_constant.py`

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## Parts of an Algorithm

- Input, Output
- Primitive operations
  - What data you have, what you can do to the data
- Naming
  - Identify things we're using
- Sequence of operations
- Conditionals
  - Handle special cases
- Repetition/Loops
- Subroutines
  - **Call**, reuse similar techniques



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## Motivating Functions

- PB&J: spreading PB, spreading jelly
  - Similar processes
  - Want to do many times
  - Simplify by saying “spread” rather than saying “move the knife back and forth, condiment side down, against the bread until you get X inches of ...”
- Benefits
  - Reuse, reduce code
  - Easier to read, write

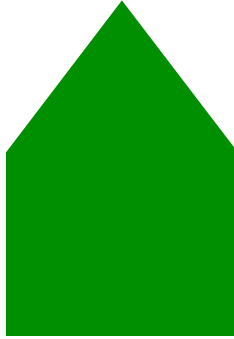
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## Example

- How would you find the area of this shape?



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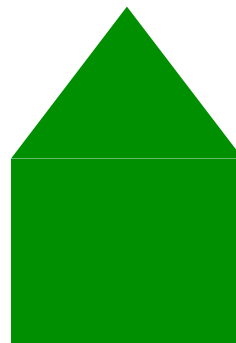
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## Example

- How would you find the area of this shape?
- Algorithm Possibilities:
  - Total Area =  $\frac{1}{2} b_t h_t + w_r * h_r$
  - Total Area = Area of triangle + Area of rectangle

Which algorithm is easier to understand?

For (most) humans,  
words and abstraction of ideas  
are easier to understand



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## Functions

- Functions perform some task
  - May take **arguments/parameters**
  - May **return** a value that can be used in assignment



We don't know **how** it does it,  
but it's okay because it doesn't matter  
→as long as it **works!**

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## Broader Issue

Davis  
Jordan  
Joseph  
Margaret  
Mary-Frances

Alison  
Chas  
Harris  
Lizzie  
Parker

Findley  
Lindsey  
Robert  
Ryan

Andrew  
Anna  
Ian  
Olivia

Ben  
Chase  
Kalady  
Rachel

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## Google Search

- Why is Google search a “broader issue”?
- How does Google search work?
  - Which are the most important pieces?
- What are some ways you think searches could be improved?
  - How do you measure “improved search”?
- What kind of power do search engines have?
- Will you use Google differently, now that you know how it works (kind of)?
- Google has teams that work on specialized searches
  - What kinds of specialized work could they do?

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## Looking Ahead

- Pre Lab 3, Lab 3 next week

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