The Way of the Program

Chapter 1 (and sundries)

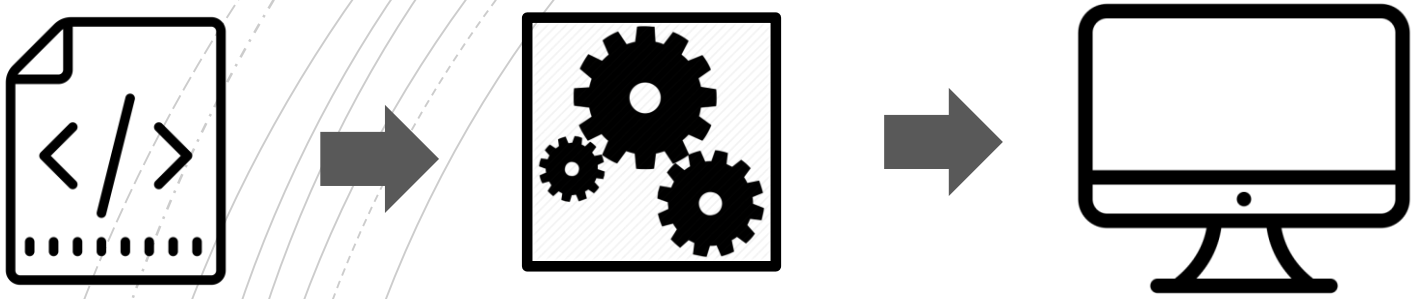
Today's Outline

- Talk about what Python is
  - Important because people often don't use technical language correctly.
- Write your first script.
- Introduce the software development cycle and why it's important.
- Discuss "open source" technology in development.

Computer Languages

- Explain ”natural” versus “formal” language.
  - e.g. English versus Scientific notation.
- Explain “low-level” vs. “high-level.”
  - “Low” is machine oriented (e.g. “C”) while “high” is people oriented and used for writing software and applications (e.g. Java, Python).
- Explain “interpreted vs. compiled.”
  - Compiled languages are parsed into machine code first while interpreted are parsed at run time.

Interpreted (e.g. Python)

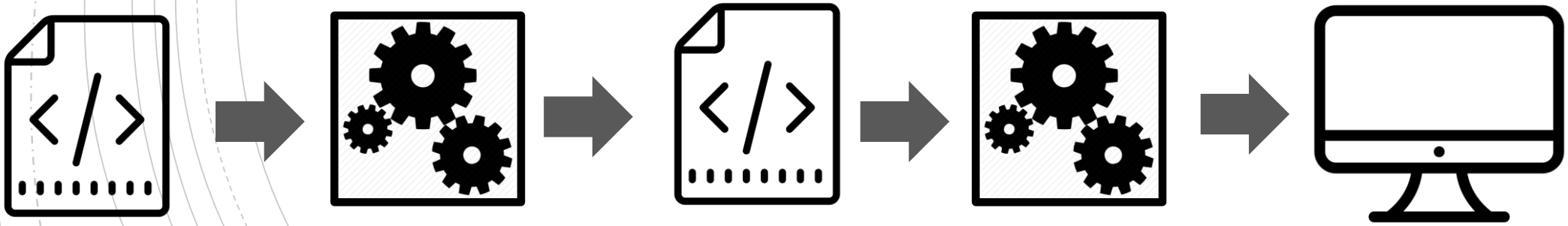


Your code.

Interpreter
(e.g. Terminal)

Output!

Compiled (e.g. C++)



Your code.

Compiler

Object or
target code.

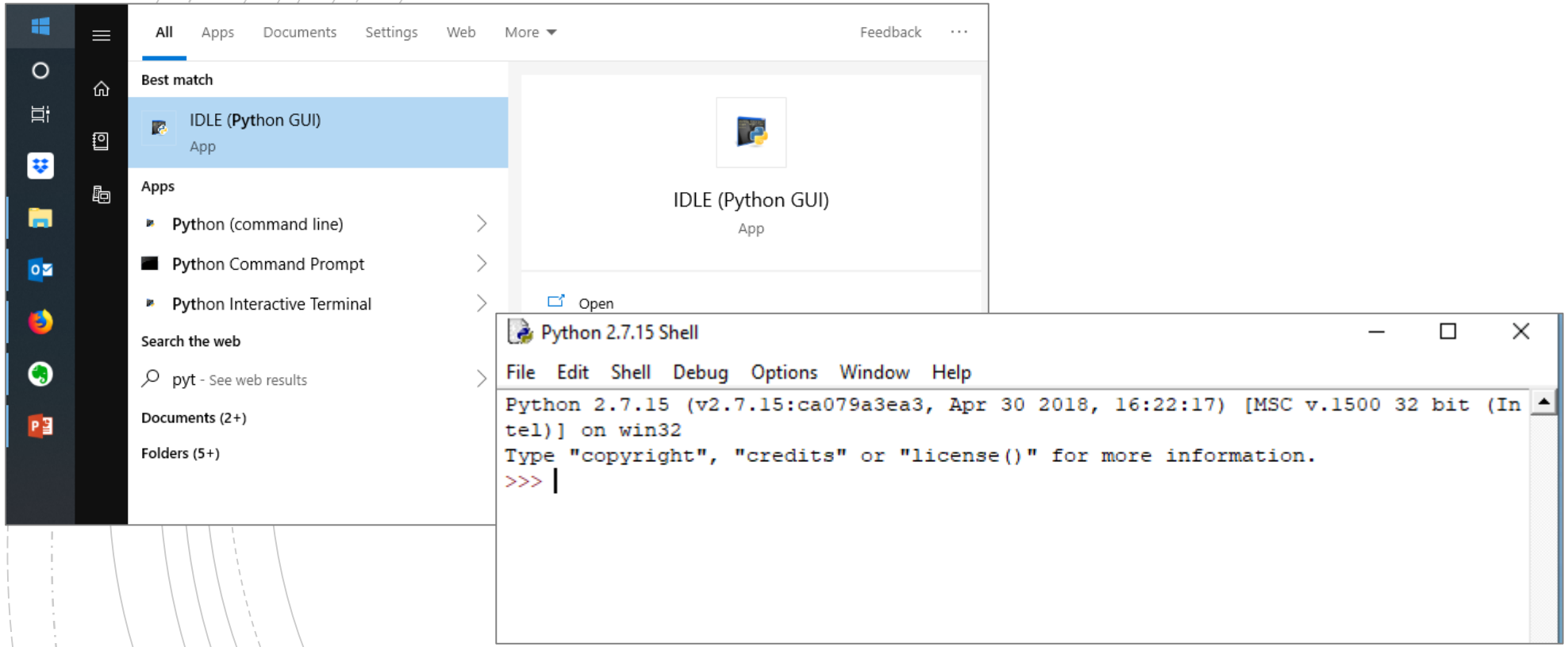
Executor

Output!

Python Interpreters

- Python is “an interpreted, high-level, programming language.”
- Some interpreters are: Command Line, Terminal (MacOS), others?
  - Python interpreter is what runs your Python programs.
  - Not terribly important at this stage.
- IDLE (Integrated Development Environment):
  - Software that provides *comprehensive facilities* to computer programmers for software development.

Python IDLE



- Python shell is an interactive interface. Every line you type into it will be executed.

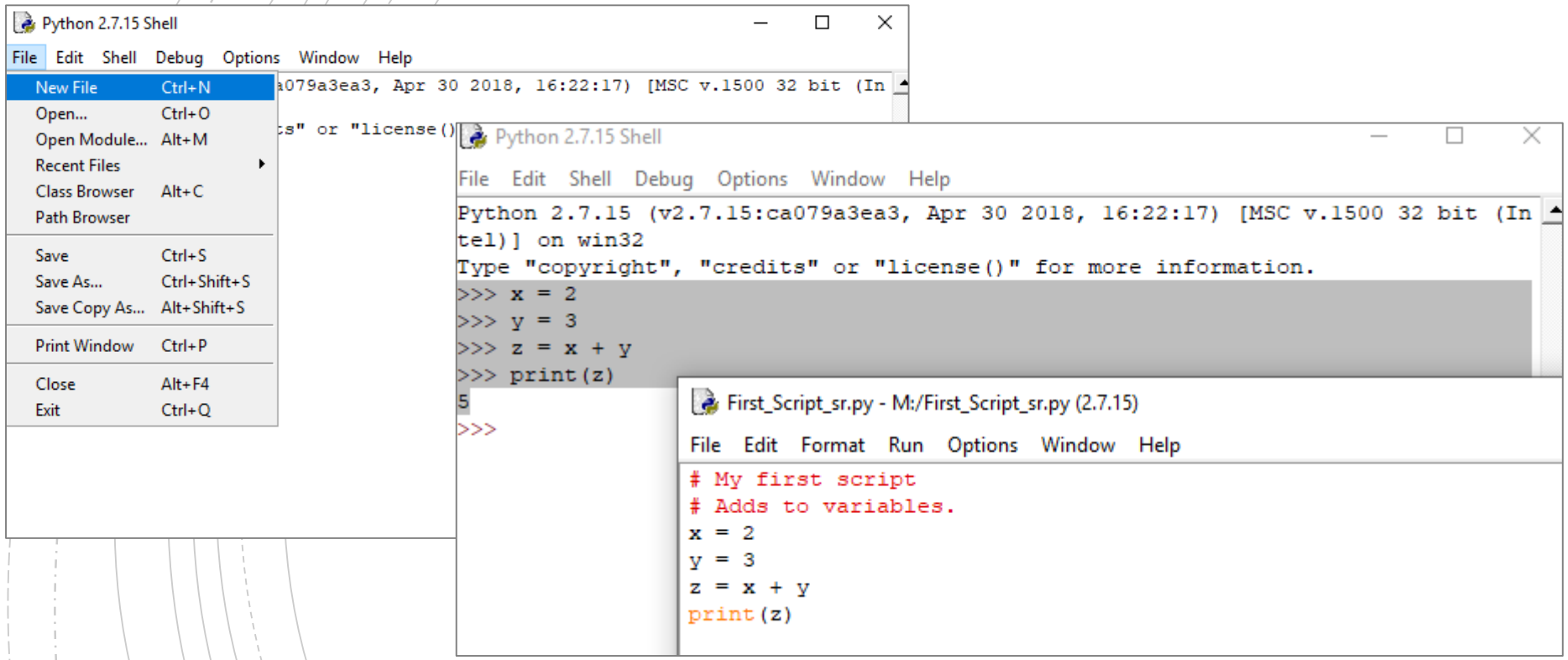
Exercise - IDLE

- When prompted with “>>>” type:

```
>>> x = 2
>>> y = 3
>>> z = x + y
>>> print (z)
```

- Press “return” to run your script.
- From IDLE, open a new script window using the dropdown window: > File > New File (or Ctrl + N)

Python File Editor



- Save to > This PC > choose network drive "First_script_xx.py"

Exercise - IDLE

- Type `# Here is where documentation goes.`
- Then copy what you just typed in Shell window and paste it into the new script window. **Save.**
- Do NOT include the ">>>"
- From drop down menu choose > Run Module (or F5). The result is shown in the Shell window.
- Congrats: you just created your first script.
  - **But what did we do? Did we just do addition?**

What is a program?

- Sequence of instructions to perform a computation. Does this always mean a mathematical computation?
  - Nope. It can be a symbolic computation. What's an example of this?
  - Symbolic computation is handling non-numerical values, this means symbols like in algebra.
- What are the basic elements of a programming language?
  - Input, output, math, sequence of statements, conditional execution, repetition.

What's it look like?

```
def printFileNames():
    filenames = ["land1990.shp", "land2000.shp",
                 "land2010.shp"]
    i=0
    while i<3:
        print (filenames[i])
        i = i+1
printFileNames()
```

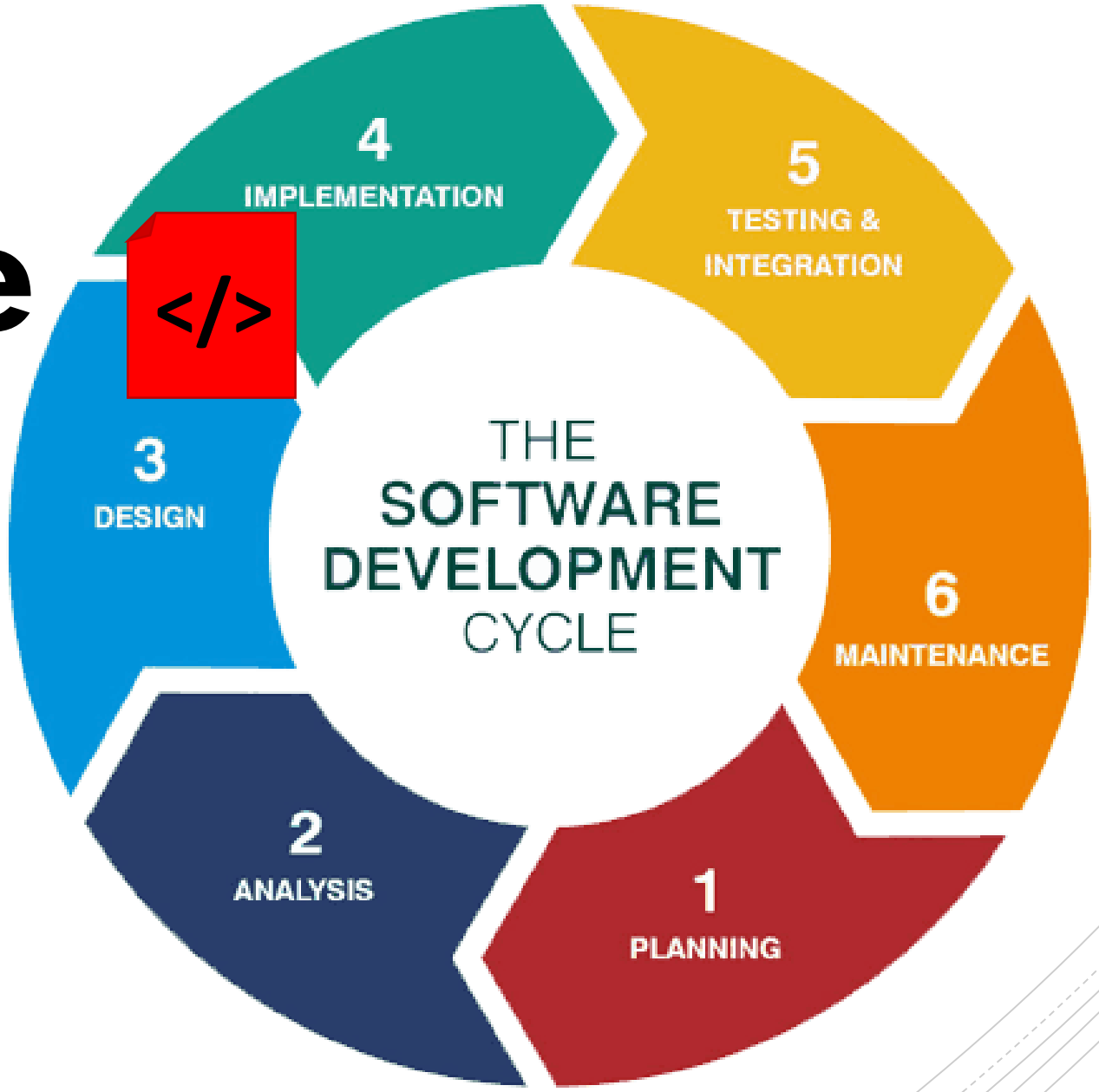
Software Development

Understanding programming in the big picture.

Software Dev. Cycle

This captures the main points.

Where is programming in this cycle?

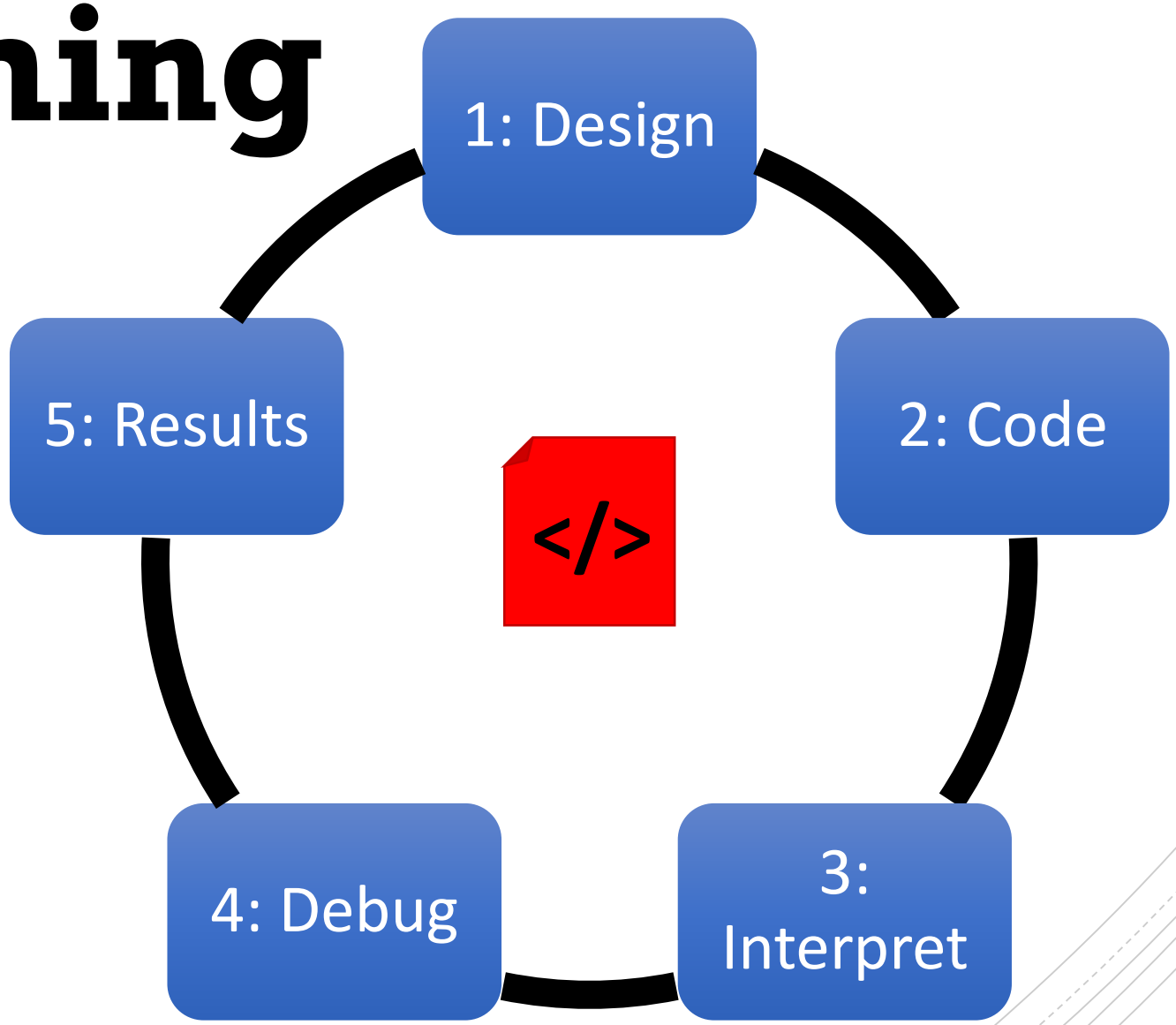


Programming Cycle

What is "debugging?"

Is the cycle always in this order?

No. You will encounter LOTS of errors and debug, re-write code, re-interpret often.



3 Types of Errors

- Syntax erors: example?
  - Program does not run because of the syntax errors (e.g. grammar error)
- Runtime errors: define.
  - Program runs, but yield errors in the middle or at the end of the process (e.g. 100/0)
- Semantic errors: example?
  - Program runs fine, but the result is not what you expected
  - Python doesn't use commas for numbers! So, 1,000,000 = (1,0,0).

Maintenance?

Tech in International Aid

- What is “open source (OS)?”
- Open source software is software with source code that anyone can inspect, modify, and enhance.
- So it has to be publicly *accessible* and freely available to use and change.

Tech in International Aid

- Arguments for OS in International Aid?
- Principles for Digital Development: https://digitalprinciples.org
- Who is actively promoting this? UNICEF, esp. with regards to local talent.
- Are having “open standards” and good documentation important?


Open standards...


Sustainability...
GIRLS IN ICT DAY 2013

Tech in International Aid

- How should U.S. tax dollars be used?
- 2013: 48% of USAID spending for Haiti went to for-profit development firms
- 2014: $2.5 million Performance bonus paid to Chemonics CEO.

Tech in International Aid

- What about the flip side? What are arguments for proprietary software?
- "Abandonware"… the value of ownership.
- "nothing more sustainable in the long term than a profitable company"

What's next?

Resources

Where to get help when you're cold freakin'

Resources

- Stack overflow: https://stackoverflow.com
  - Developer forum, publicly open, great place to browse.
  - Structure help requests: Detailed, clear, concise, provide code snippet that you need to test (but not the entire script)
- Github: https://github.com
  - Code repository for version control, sharing, etc.
  - Great example: https://github.com/Akuli/python-tutorial
- Your fantastic CA!
  - Shashank is there to help!

More on Github

- Code sharing repository, but also a place to see *what* people are coding.
  - Yours truly - https://github.com/Shadrock
  - Dr. Estes in Geo: https://github.com/ldemaz
  - UNHCR - https://github.com/unhcr
  - Or not … https://github.com/chemonics-intl
- Each "repository" (or repo) in your account can hold code, documentation, data.
  - Great way to create an online 'portfolio' piece.
  - The "Readme" is editable and can act like a basic web page, intro.
  - Example: https://github.com/Shadrock/RNI-Activity-Map

Sign up for Github!

- Go to https://education.github.com/pack and sign up for a student account!
- We'll check your account tomorrow.
- We'll be using a private account for our work that you can move to your public account if you wish.

Summary

- Understand what Python is and how it fits into the larger software development process.
- Wrote our first script.
- Learned about Github
- Began thinking about programming in the broader context of technology and development.
  - Big emphasis on things you would want to consider, or have others consider, when working on #ICT4D projects!

Deleted

Python Shell & Program Editor

- Need to figure this out.
- Basicc