On your way in…

Pick-up:
1. Graded HW0
2. POGIL Activity #5 (and 7, combined)
3. POGIL Activity #6

Hand-in:
1. Homework 1. Expressions and Functions
   - 2 folders: SU boxes *greater than* 1700, and *less than*

Housekeeping

Labs Available on Fridays

- PDF on [course website](#) > Labs & Homeworks
- Log-in to https://evolene.cs.williams.edu for starter code

CSCI 134 - Spring 2020
Introduction to Computer Science

Home | Shikha's Lectures | Iris's Lectures | Labs & Homeworks | Resources | CS@Williams

Labs

Monday (Tuesday) lab sections have labs due on Wednesday (Thursday) 11 pm respectively.

| Date	Topic
February 10/11	Lab 1. Python/Git workflow.
February 17/18	Lab 2. Implementing an Algorithm (Moon Age).

Homeworks

Lab Late Days

- You have **THREE** late days to use on labs this semester
  - **Not** on homeworks!

- Can use two at one time, not all three!
  - 2, then 1 OR 1, then 2 OR 1 then 1 then 1

- Must request late days in advance using this form:
  - http://bit.ly/s20late

Welcome to CS 134!

Introduction to Computer Science

Iris Howley

-Booleans & Conditionals-

```
        (_____)
       (0   0)_____/
        @@       `  \
                     \
          _____,    /
          / /       / /
         ^ ^       ^ ^
```
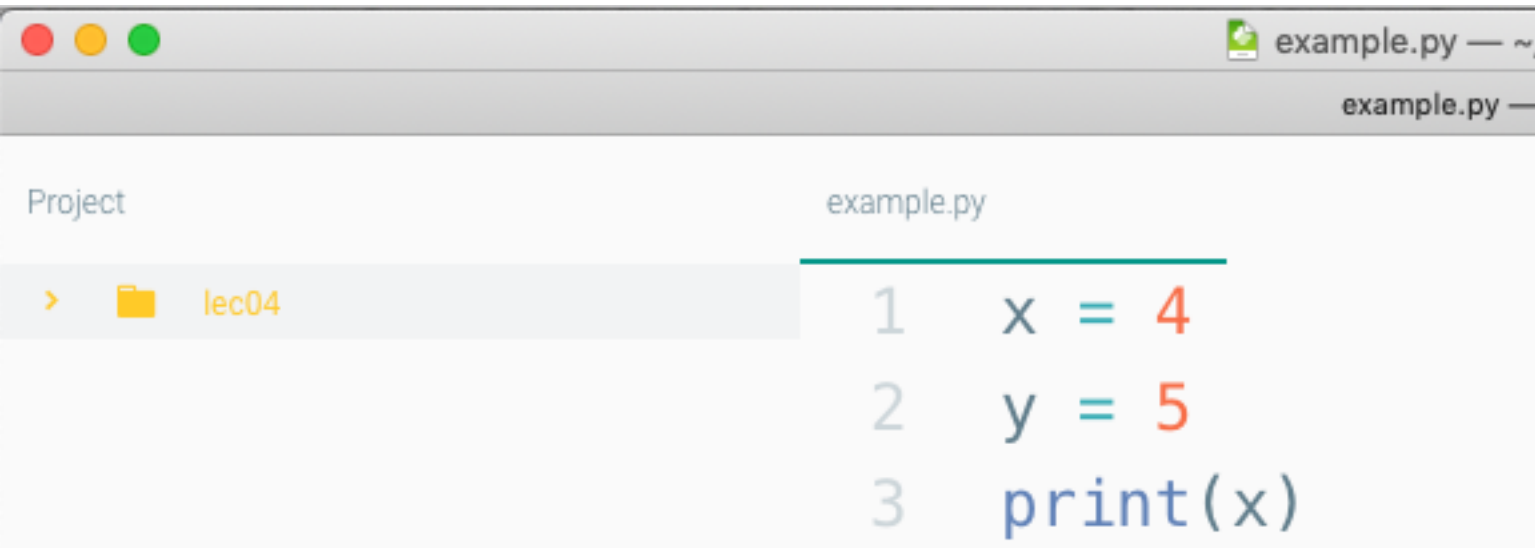
Spring 2020
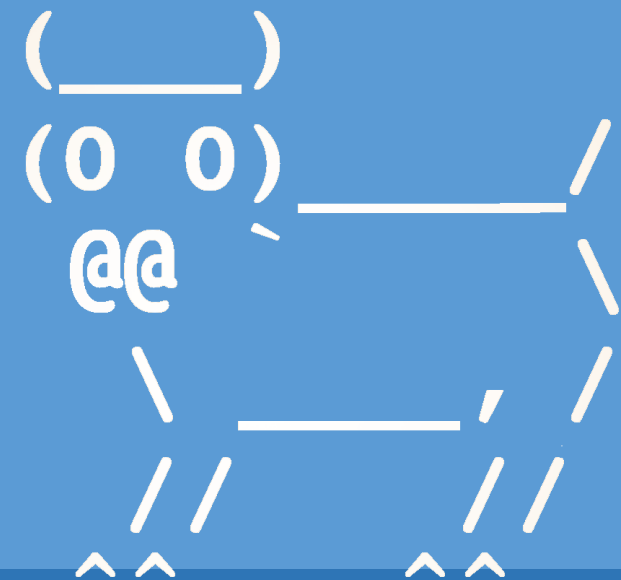
Interactive Python

- Called from terminal with: `python3`
- Can tell you're in interactive mode when you see: `>>>`
- Every line entered implicitly calls: `print(..)` on what's returned

```
>>> y = 5
>>> print(y)
5
>>> y
5
```
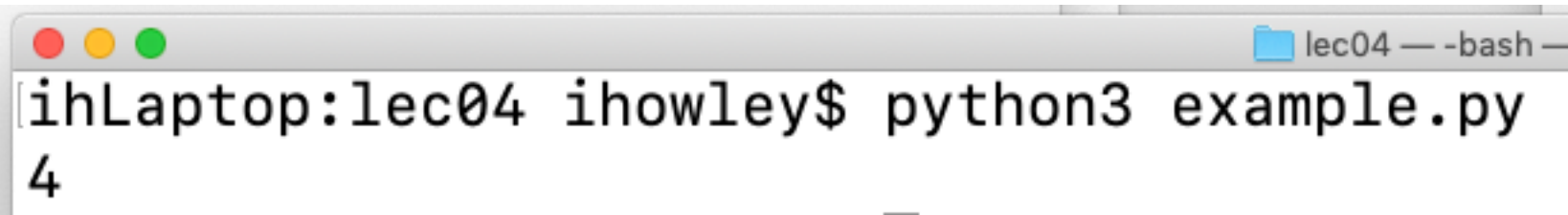
Interactive Python

```
ihLaptop:lec04 ihowley$ python3
Python 3.6.4 |Anaconda, Inc.| (default, Jan 16 2018, 12:04:33)
[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> x = 4
>>> y = 5
>>> print(x)
4
>>> x
4
>>> exit()
ihLaptop:lec04 ihowley$ python3
Python 3.6.4 |Anaconda, Inc.| (default, Jan 16 2018, 12:04:33)
[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> print(x)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'x' is not defined
```

Running python as a Script


```
1    x = 4
2    y = 5
3    print(x)
```

```
ihLaptop:lec04 ihowley$ python3 example.py
4
```

Running a Script Inside Interactive Python

```
[ihLaptop:lec04 ihowley$ python3
Python 3.6.4 |Anaconda, Inc.| (default
[GCC 4.2.1 Compatible Clang 4.0.1 (tag
Type "help", "copyright", "credits" or
[>>> import example
4
[>>> y
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'y' is not defined
[>>> from example import y
[>>> y
5
```

TODAY'S LESSON
if this, not that

Behavior that happens only when specific conditions are met.
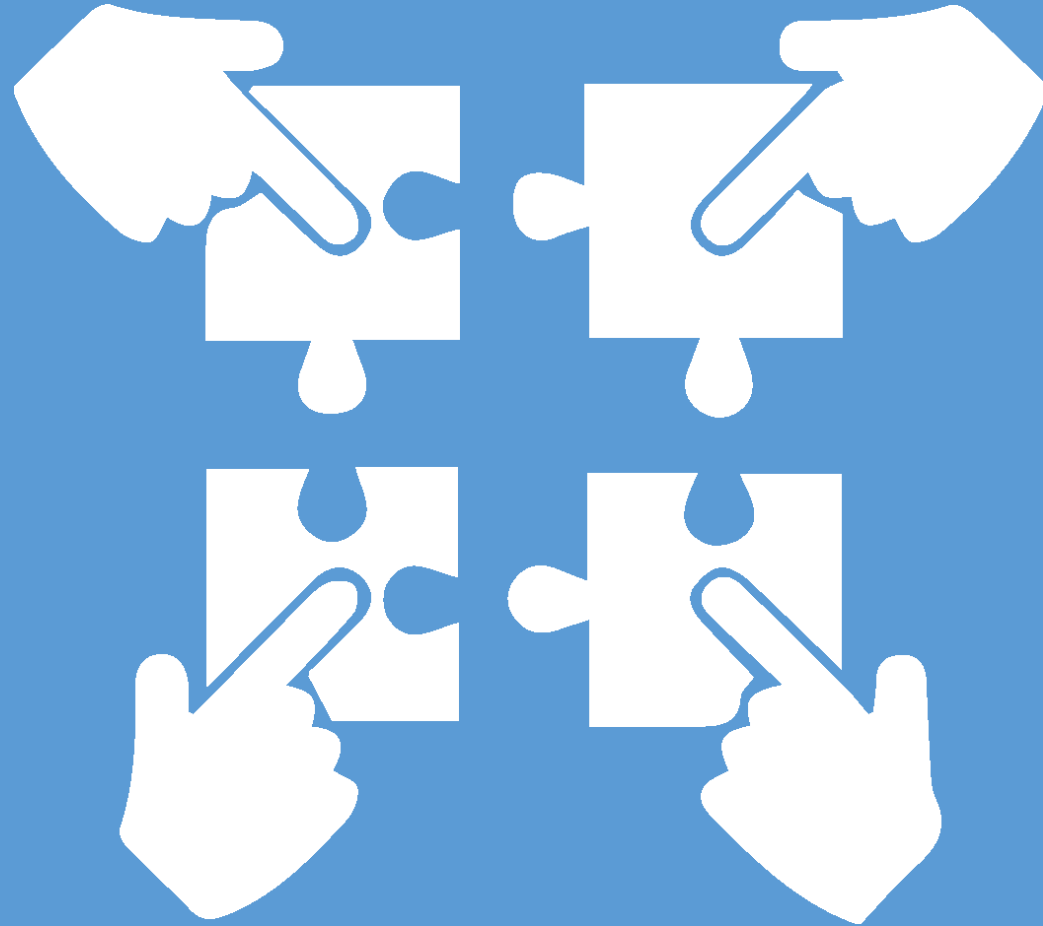
Booleans: True, False, not

```
>>> myvar = True
>>> type(myvar)
<class 'bool'>
>>> myvar2 = not True
>>> myvar2
False
>>> 4 == 4
True
>>> 4 == 3
False
>>> myvar3 = 4 == 3
>>> myvar3
False

>>> bool(3)
True
>>> bool(0)
False
>>> bool("0")
True
>>> bool("hello")
True
>>> bool(" ")
True
>>> bool("")
False
```

WE STILL HAVEN'T FIGURED OUT HOW TO MAKE SOMETHING HAPPEN ONLY SOME OF THE TIME.
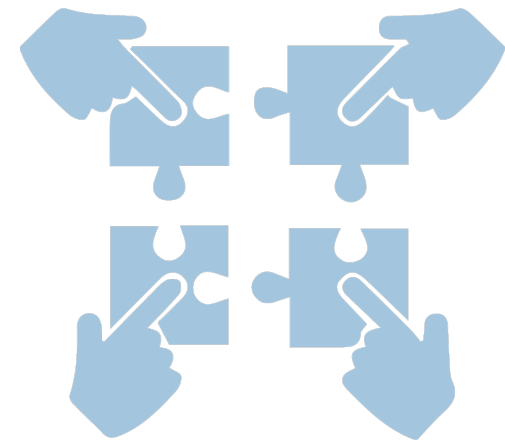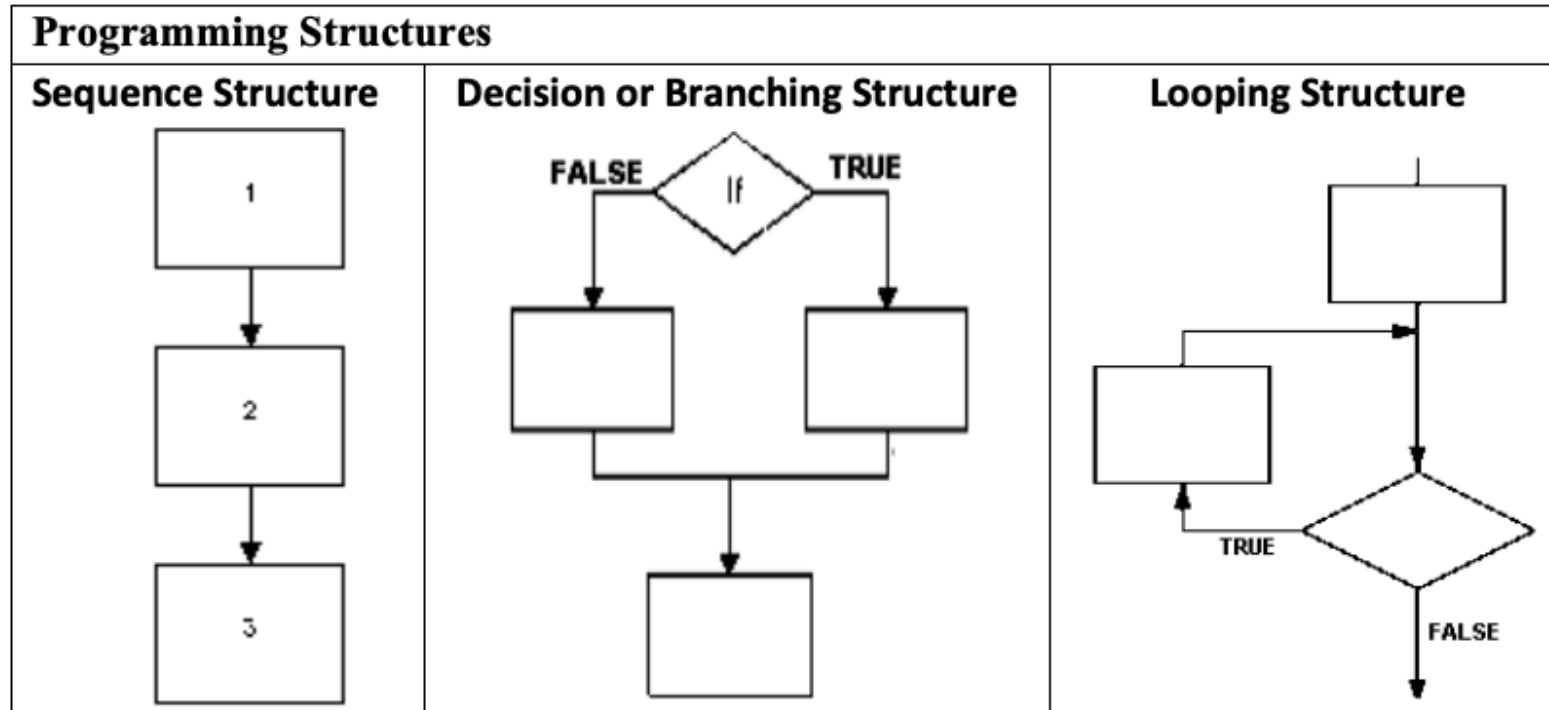
IF…ELSE IF…ELSE

(REQUIRES USING BOOLEANS)

Process-Oriented Guided-Inquiry Learning
(POGIL)

POGIL – Activity 5

- Look at Python Activity 5, Questions 1, 2, 4, 9
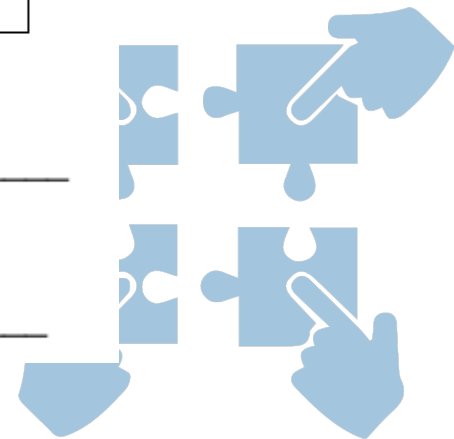- Find a partner and talk through the questions together

POGIL – Activity 5, Questions 1 & 2

Programming Structures

Sequence Structure	Decision or Branching Structure	Looping Structure

1. Which structure best describes the types of Python programs you have written so far?

_____

2. Which structure allows the programmer to create code that decides what code is executed?
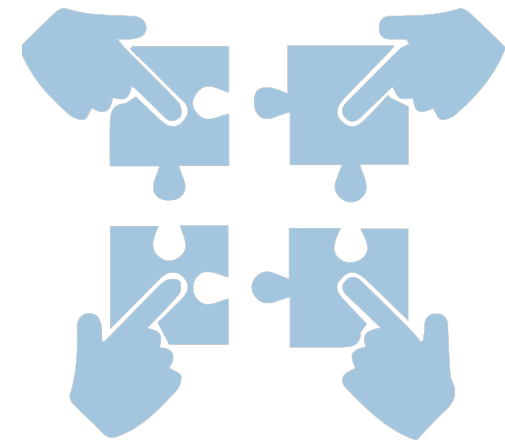
_____

POGIL – Activity 5, Question 4

4. What is the result of each of the following expressions?
   Assume: x = 4, y = 5, and z = 4

   a.   x > y   >>> 4 > 5   False
   b.   x < y   >>> 4 < 5   True
   c.   x == y   >>> 4 == 5   False
   d.   x != y   >>> 4 != 5   True
   e.   x >= z   >>> 4 >= 4   True
   f.   x <= z   >>> 4 <= 4   True
   g.   x + y > 2 * x   >>> 4+5 > 2*4 True
   h.   y * x – z != 4 % 4 + 16   >>> 5*4-4 != 16   False
   i.   pow(x,2) == abs(-16)   >>> 16 == abs(-16)   True

```
ihLaptop:lec04 ihowley$ python3
Python 3.6.4 |Anaconda, Inc.| (
[GCC 4.2.1 Compatible Clang 4.0.
Type "help", "copyright", "cred
>>> word1 = "hello"
>>> word2 = "good-bye"
>>> word1 == word2
False
>>> word1 != word2
True
>>> word1 < word2
False
>>> word1 >= word2
True
```

5. What is the result of the following expressions?

   Assume: `word1 = "hello"` and `word2 = "good-bye"`

   a.   word1 == word2   False
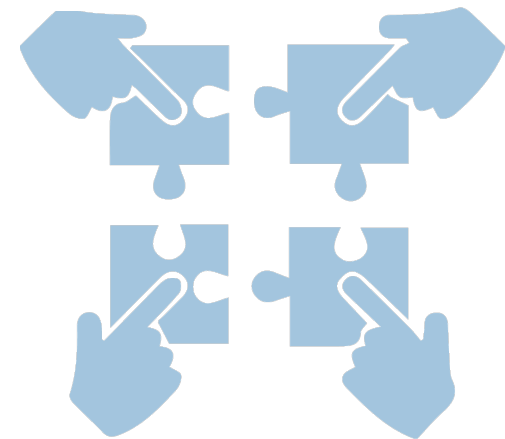
   b.   word1 != word2   True

   c.   word1 < word2   False

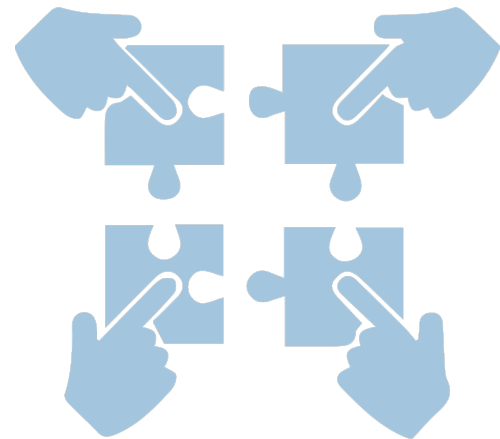   d.   word1 >= word2   True

6. How do the conditional operators work when the operands are strings? _____

POGIL – Activity 5, Question 7

7. What are the two possible answers for each expression in questions 4 and 5? _____
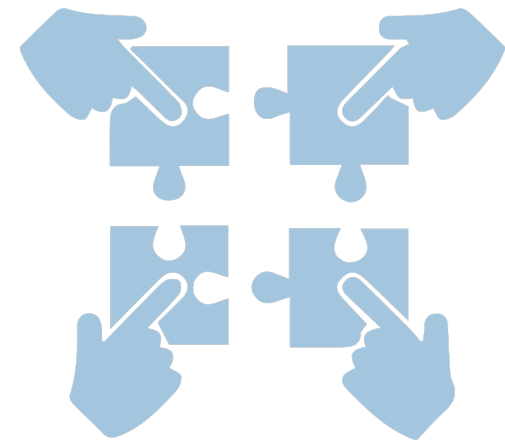
- True or False

POGIL – Activity 5, Question 9

9. Assume the value of the variable **numBooks** is 40. State the values of each of the Boolean expression.
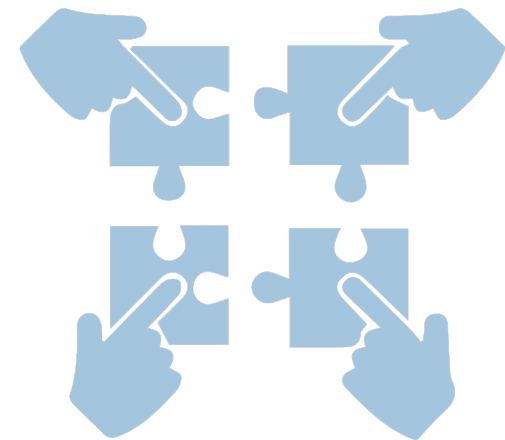
Expression	Value
(numBooks > 5) and (numBooks < 100)	
(numBooks < 5) or (numBooks > 100)	
not(numBooks * 10 == 100)	

POGIL – Activity 6

- Look at Python Activity 6, Question 1
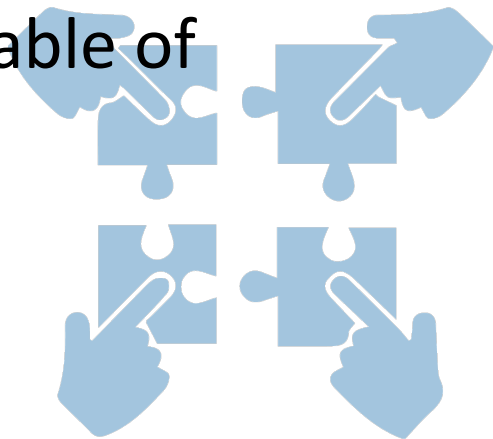- Find a partner and talk through the questions together

POGIL – Activity 6, Question 1

- What is the output of the program?

```
grade = 95
if grade >= 94:
        print("Excellent!")
```

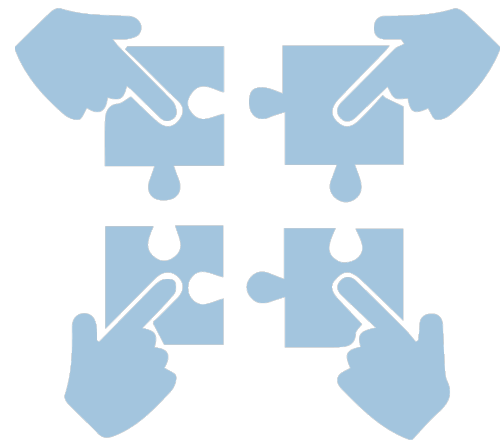- What would the program print if the value stored in the variable of **grade** was 90?

POGIL – Activity 6, Question 2

- Look at Python Activity 6, Question 2
- Find a partner and talk through question 2 together

Explain what the following lines of code do. Each line appears in the program above.

a. `originalPrice = input("Enter the original cost of the item: ")`

b. `percentOff = percent_off(float(originalPrice), float (salePrice))`

c. `print("Original price: $" + originalPrice)`

d. `print("Percent Off: " + str(percentOff) + "%")`

e. `if(percentOff >= 50):`
   `      print("You got a great sale!")`

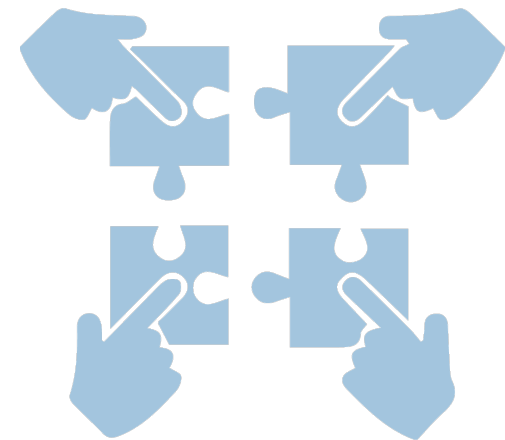# POGIL – Activity 6, Question 2

- Look at Python Activity 6, Question 2
- Find a partner and talk through the question together

What does the line: return int((orig – sa)/orig * 100) do?

```python
1   def main():
2       originalPrice = input("Enter the original cost of the item: ")
3       salePrice = input("Enter the sale price: ")
4
5       percentOff = percent_off(float(originalPrice), float(salePrice))
6
7       print("Original price: $" + originalPrice)
8       print("Sale price: $" + salePrice)
9       print("Percent Off: " + str(percentOff) + ("%"))
10
11      if(percentOff >= 50):
12          print("You got a great sale!")
13
14  def percent_off(orig, sa):
15      return int((orig-sa)/orig * 100)
16
17  main()
```

POGIL – Activity 7, Question 1

- Look at Python Activity 6, Question 2
- Find a partner and talk through the question together

What is nested?

```python
1   def heightMessage(height):
2       female_ht = 162.9 # average US female height (cm)
3       male_ht = 176.4
4
5       if height > male_ht:
6           print("You're taller than the average US male")
7       else:
8           if height >= female_ht:
9               print("You have the height of the average US female, or taller.")
10          else:
11              print("You're not taller than the average.")
12
13  def main():
14      heightMessage(float(input("What is your height in cm? ")))
15
16  main()
```
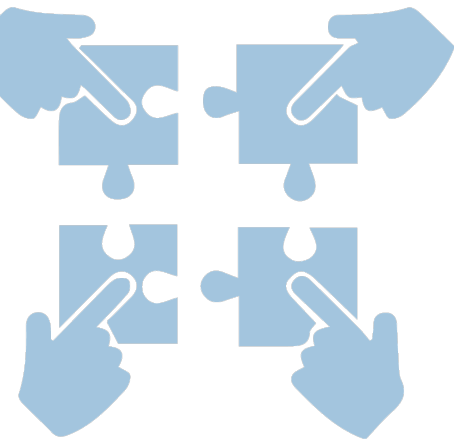
CONDITIONALS ARE SUPER POWERFUL FOR MAKING SOMETHING HAPPEN ONLY WHEN CERTAIN CONDITIONS ARE MET.
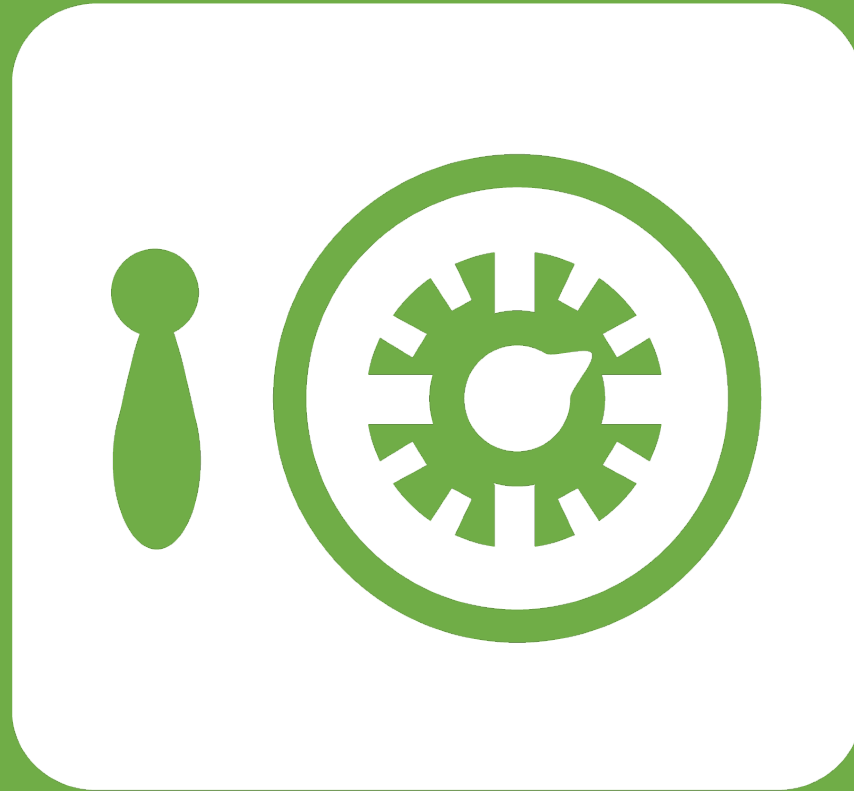
Think data processing.
Clean non-Latin alphabet characters out of a string.
Look at each character IF it's Latin, move on, ELSE remove the character.

QUESTIONS?

Leftover Slides

One-line Python Conditionals

- `x*3+1 if odd(x) else x//2`

Is equivalent to:

- `if odd(x):`
  - `x*3+1`
- `else:`
  - `x//2`

The Syracuse Function

Syracuse Function

1. Start with any positive integer n

2. The next term is determined by n:
   - If n is odd, the next term is 3*n + 1
   - If n is even, the next term is n/2

Collatz (1937): "no matter what value of n, the sequence will always reach 1"
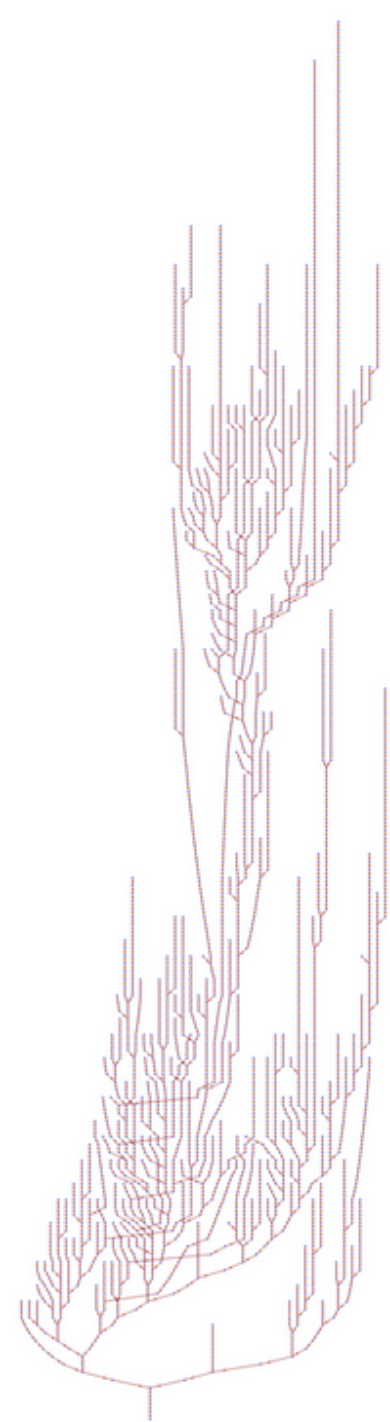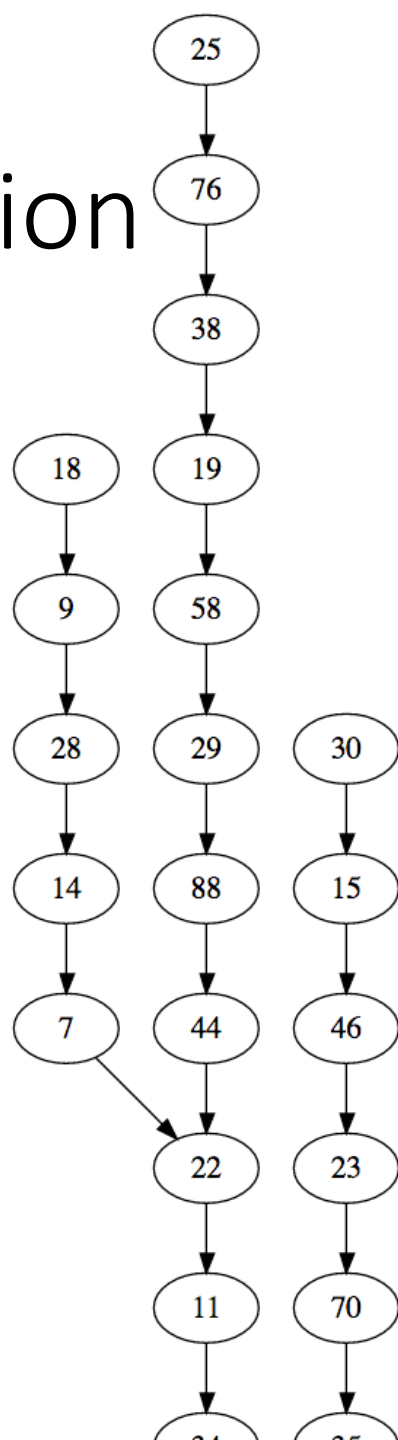
Erdős: "Mathematics may not be ready for such problems."

Lagarias (2010): "this is an extraordinarily difficult problem, completely out of reach of present day mathematics."

Syracuse Function

- The orbit for 4:
    - 4 ➡ 2 ➡ 1

- The orbit for 5:
    - 5 ➡ 16 ➡ 8 ➡ 4 ➡ …

Syracuse Function

How to program the Syracuse Function?

1. Start with any positive integer *n*
2. The next term is determined by n:
   - If n is odd, the next term is 3*n + 1
   - If n is even, the next term is n/2