Functions

Announcements
- HW #2 due tomorrow @ 11pm

Outline
- Warm-up
- Defining functions
- Calling functions
- Parameters

Warm-up
Write a program that flips a coin 10 times and outputs the fraction of flips that were heads.

```python
import random
heads = 0
for i in range(10):
    flip = random.randrange(0, 2)
    if (flip == 0):
        heads += 1
print("Number of heads: " + str(heads))
```

Functions
- Function --- named sequence of statements
- Motivation
  - Organize program into chunks that mirror how we decompose the solution to a problem
  - Avoid duplicating code at multiple points in a program --- a for loop avoids duplicating code at a single point in a program
- You've already used many built-in functions and module functions in your programs --- e.g., print, input, int, str, forward, right

Defining functions
- Function definition contains:
  - Function name
  - Parameters --- names assigned to values provided to the function
  - Body --- statements to execute when function is called
- Which of the following are valid function definitions? If a definition is invalid, describe what is wrong.
  a) def greet(name):
     print("Hello " + name)
     Valid --- function definition starts with def keyword; parameters are enclosed in parenthesis; colon after parameters; indent function body
  b) def welcome:
     print("Welcome to COSC 101")
     Invalid --- missing parenthesis
  c) def year()
     print("It is 2018")
     Invalid --- missing colon (:)

d) def olympics.location():
    print("The olympics are in Pyeongchang")
    Invalid --- no periods in function names; same restrictions as variables

e) def sports(a, b):
    print("Do you like to play " + a + " or " + b + "?")
    Valid --- parameters separated by commas

f) watch(c):
    print("Did you watch " + c + " yesterday?")
    Invalid --- missing def keyword

Calling functions

- Function all contains:
  - Function name
  - Arguments --- values provided to the function
    - Number of arguments matches the number of parameters

- Assume a program defines the following functions:
  def greet(name):
    print("Hello " + name)

  def welcome():
    print("Welcome to COSC 101")

  def sports(a, b):
    print("Do you like to play " + a + " or " + b + "?")

Which of the following are valid function calls? If a call is invalid, describe what is wrong.

a) greet("Aaron")
   Valid --- function exists; arguments enclosed in parenthesis; number of arguments matches number of parameters

b) welcome
   Invalid --- missing parenthesis

c) sports("basketball", "hockey")
   Valid

d) greet()
   Invalid --- number of arguments does not match number of parameters

e) welcome()
   Valid

f) tvshows("The Big Bang Theory")
   Invalid --- function tvshows has not been defined

- When a function is called:
  - The statements in the body of the function definition are executed in order
  - After executing the last statement in the body, resume execution where the function was called
Example
def demoFn():
    print("demoFn 1")
    print("demoFn 2")

print("before demoFn")
demoFn()
print("after demoFn")

print("before demoFn")
print("demoFn 1")
print("demoFn 2")
print("after demoFn")

Parameters and variables

• Parameters
  ○ Formal
    ■ Specifies what the function needs to work
    ■ List of names included in function definition
    ■ Similar to left-hand side of assignment statement
  ○ Actual
    ■ Values provided (or passed) to the function
    ■ List of values included in function call
    ■ Similar to right-hand side of assignment statement