INF 502 – SOFTWARE DEVELOPMENT METHODOLOGIES

Week 2

Part II – Python basics

First things first...

- Connect to iClicker for in-class participation and attendance

https://join.iclicker.com/7YDD3

Functions

- Functions break up your code into reusable chunks
- They take arguments and can return values
  - Increases maintainability
  - Makes easy to use

```python
#function that answers if a number is even or not
def isEven (number):
    #is the remainder when dividing number by 2 equals to 0
    if (number % 2 == 0):
        #yes, the number is even
        return True
    return False


isEven(10)
True


isEven(17)
False
```
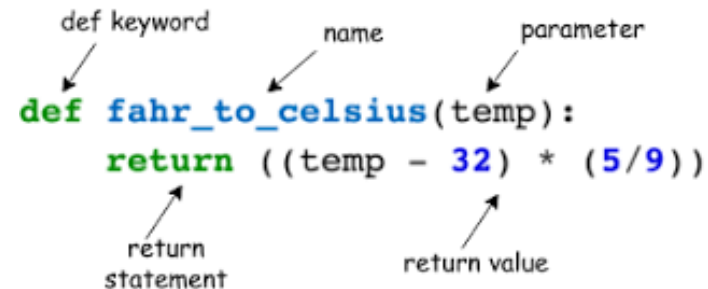
Functions

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```python
# Calculates the body mass index (weight in kg, height in m)
def BMI(weight, height):
    bmi = weight/(height**2) #height to the power of 2
    return bmi


BMI(98, 1.85)
28.634039444850252
```

Functions

- Two type of functions: **user-defined functions** and **user-defined**

  - `BMI(weight, height) -> Body mass index calculator`

  - `len(s) -> Return the length (the number of items) of an object.`

10-Minutes and go

Create a function called "convert_lb_to_kg" which receives the weight in pounds and converts to kilograms

Create a function called "convert_ft_in_to_m" which receives the height in feet and inches (2 parameters) and converts to meters

Use the 3 functions we have now to calculate the BMI with inputs using imperial metrics.

Combining Functions and Conditionals

Create a function to return the BMI interpretation according to CDC (centers for disease and control)

The program must print one of these BMI interpretations for Adults (20 years old or older)
Below 18.5 = Underweight
18.5-24.9 = Normal or Healthy Weight
25.0-29.9 = Overweight
30.0 or Above = Obese

Lists

- A Python list is an **ordered**, **mutable** sequence of objects
- Lists can contain a mixture of any sort of object: numbers, Booleans, strings, other lists, …
- Lists can grow or shrink

```
>>> list_of_numbers = [1,2,3,4,5]
>>> len(list_of_numbers)
5
>>> list_of_numbers[0]
1
>>> list_of_numbers[4]
5
>>> list_of_numbers[-2]
4
```

Lists

```
#extending it
>>> list_of_numbers.extend([6,7,8])
>>> print(list_of_numbers)
[1,2,3,4,5,6,7,8]

#slicing it
>>> piece = list_of_numbers[:4] #beginning to 4
>>> print (piece)
[1,2,3,4]
>>> piece = list_of_numbers[2:6] #from position 2 to 6
>>> print (piece)
[3,4,5,6]

#shrinking it
>>> del list_of_numbers [2:5]
>>> print(list_of_numbers)
[1,2,6,7,8]
```

Lists

```
#merging
>>> list1 = [1,2,3]
>>> list2 = [4,5,6]
>>> list3 = list1 + list2
>>> print(list3)
[1,2,3,4,5,6]
>>> list1.extend(list2)
>>> print(list1)
[1,2,3,4,5,6]

#sorting
>>> list1 = [-1,4,0,9,2,7]
>>> list1.sort()
>>> print (list1)
[-1,0,2,4,7,9]
```

```
#other functions
>>> list1.append(<value>)
>>> list1.insert(<pos>,<value>)
>>> list1.remove(<value>)
>>> list1.clean()
>>> list1.remove(<value>)
>>> list1.index(<value>)
>>> list1.reverse()
>>> list1.set()
>>> <value> in list1
```

Iterations (Loops)

- Starting with the **for** (highly used with iterable objects)

```python
list_of_numbers = [1,2,3,4,5]

for element in list_of_numbers:
    print (element)
```

- But… also for counting

```python
for x in range(10): #will iterate from 0 to 9
    if (x%3==0):
        continue
    print (x)

#what is the output?
```

Iterations (Loops)

- Now iterating over a list of lists

```python
# grades is a list that stores the name and the grade
# of students. Each position of the list has one list
# with two positions. The first stores the name, and
# the second stores the grade

grades = [["John",60],["Paul", 84],["Ben", 70], ["Tony",35]]
for entry in grades:
    if (entry[1]>60):
        print(entry[0] + ": approved")
    else:
        print(entry[0] + ": talk to the instructor")
```

Iterations (Loops)

- Now iterating over a list of lists

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# of students. Each position of the list has one list
# with two positions. The first stores the name, and
# the second stores the grade

grades = [["John",60],["Paul", 84],["Ben", 70], ["Tony",35]]
for name, grade in grades:
    if (grade>60):
        print(name + ": approved")
    else:
        print(name + ": talk to the instructor")
```

Iterations (Loops)

- Now iterating over a list of lists

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for name, grade in grades:
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        print(name + ": approved")
    else:
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```

Iterations (Loops)

- Using While Loop

```
i = 1
while i <= 10:
    print(i)
    i += 1
```

Tutorial time

I will create a program that stores a set of numbers in a list.

The list will be filled with random numbers. The user needs to be able to:

- Add a number to the list
- Present the number of elements in the list, and list the numbers (one per line)
- Clear the list
- Exit the application

Tuples

- A Python tuple is an ordered, **immutable** sequence of objects

- Like lists, but cannot be altered
  - Do not have methods like reverse(), sort()

```
>>> my_tuple = (6,34,6,7,2)
>>> len(mytuple)
5
>>> my_tuple[3]
7
>>> my_tuple[1:4]
[34, 6, 7]
>>> my_tuple[2]=8
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: 'tuple' object does not support item assignment
```

10-minute madness

Write a program which repeatedly reads integers until the user enters "done". Once "done" is entered, print out the total, count, and average of the numbers. If the user enters anything other than an integer, print an error message and skip to the next number.

Hint: isDigit( ) → returns True if the variable is a digit

Dictionaries

- A dictionary associates values with unique keys
  - Use braces instead of square brackets

```
>>> grades = {"John": 60, "Paul": 84, "Ben": 70, "Tony": 35}
>>> print(grades["John"])
60
>>> grades["Kate"] = 100              # adds another entry
>>> grades["John"] = 90               # changes John's grade
>>> print(grades)
{'John': 90, 'Paul': 84, 'Ben': 70, 'Tony': 35, 'Kate': 100}
```

Dictionaries

```
>>> "John" in grades
True
>>> "Igor" in grades
False
>>> grades.get("Joel", -1) # will return -1 (avoid errors)
>>> grades.get("John", -1) # will return 90 (exists)

>>> all_keys = grades.keys().    # return a list of all keys
>>> all_values = grades.values() # return a list of all values
>>> all_pairs = grades.items()   # a list of (key, value) tuples
```

Dictionaries

```python
# Nested structures... why not?
family = {"John": {"age": 30, "weight": 170, "city": "Flagstaff"},
          "Paul": {"age": 45, "weight": 200, "city": "Buenos Aires"},
          "Anna": {"age": 26, "weight": 130, "city": "Paris"}}
# Lazy iteration
for member in family:
    print(member)

for member in family:
    print(family[member])
```

Training a bit

- Given the grades dictionary provided previously
  `{'John': 90, 'Paul': 84, 'Ben': 70, 'Tony': 35, 'Kate': 100}`

Create a program that enables the user to choose one of the options:
1. See the grade of someone by providing a name
2. Add a new student and grade
3. Change a grade given a name of an existing student
4. List all the grades in the dictionary

Each of the options needs to be implemented as a different function.

If we still have time (Extra!)

Mountain Heights

- Wikipedia has a list of the [tallest mountains in the world](#), with each mountain's elevation. Pick five mountains from this list.
  - Create a dictionary with the mountain names as keys, and the elevations as values.
  - Create a function that receives the dictionary as a parameter and prints out just the mountains' names and elevations, as a series of statements telling how tall each mountain is: "Everest is 8848 m tall."

Mountain Heights 2

- Change your function adding a second parameter (Boolean) called sorted. When this parameter is True, your algorithm needs to print the same statements as before, but in alphabetical order.

Be ready for what's next...

Watch for HW2 due date!

Practice time!