Discrete Structures!

CMPSC 102

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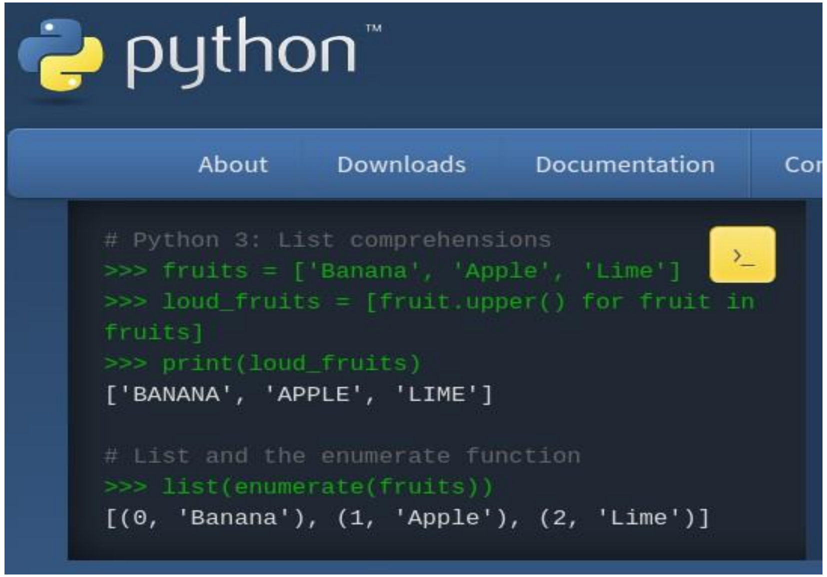
Get Python3

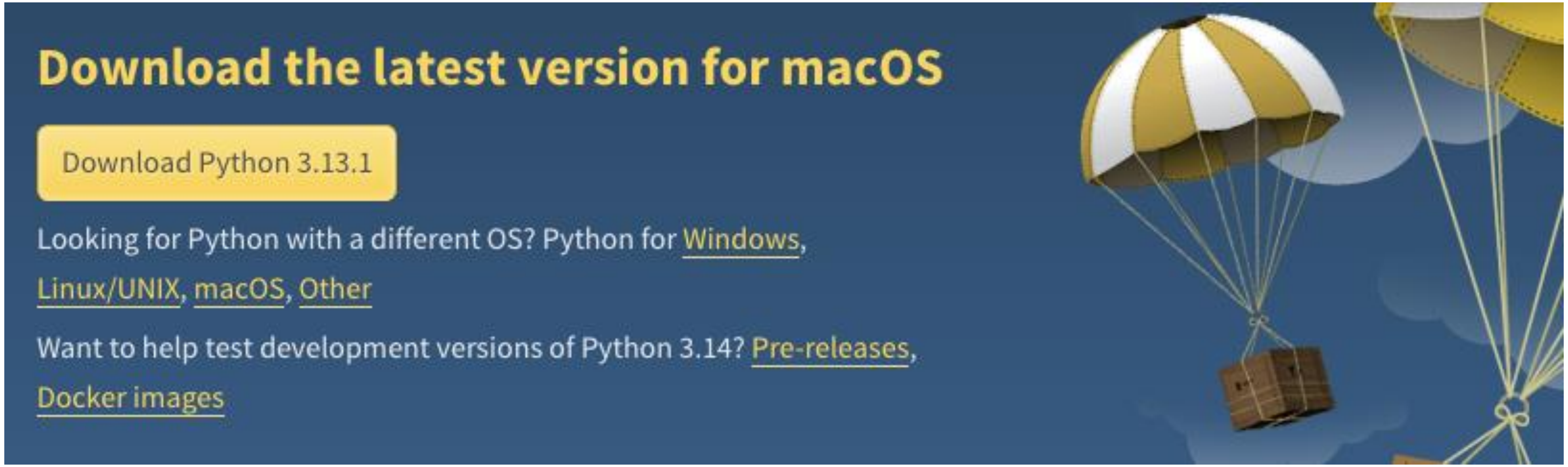


```
# Python 3: List comprehensions
>>> fruits = ['Banana', 'Apple', 'Lime']
>>> loud_fruits = [fruit.upper() for fruit in
fruits]
>>> print(loud_fruits)
['BANANA', 'APPLE', 'LIME']

# List and the enumerate function
>>> list(enumerate(fruits))
[(0, 'Banana'), (1, 'Apple'), (2, 'Lime')]
```

- Get Python3 from the Python Software Foundation: https://www.python.org/downloads/

Install Your Own Python3


Download the latest version for macOS

Download Python 3.13.1

Looking for Python with a different OS? Python for Windows, Linux/UNIX, macOS, Other

Want to help test development versions of Python 3.14? Pre-releases, Docker images

- Download and install the version of Python3 for your OS being sure to add the PATH to the environmental variables (check the path option!)
- Check with the installation material to learn how to launch Python3

Running the Python3 Shell

- Type *python3* in the terminal to start the Python shell.

- Type statements or expressions at prompt:

    - print("Hello, world")
    - x = 12**2
    - print(x)
    - print(x/2)
    - # bla bla bla...
    - # (This is a comment: everything after the # is ignored)

- To exit the Python shell, type: exit() or Ctrl + Z to exit.

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Data Types

- Integers, counting numbers
  - `num_int = 1`
- Floats, decimals
  - `num_float = 3.1415`
- Strings:
  - `s_str = "Hello World”`

Data Types

```
height_int = 5
print(f" The height is: {height_int}")
print(" The height is:", height_int) # print another way

num_float = 3.14
print(f" The float variable is : {num_float}")

s_str = "Hello World"

print(" The integer is equal to: ", s_str)
```

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Key Components

All programs built out of

- **Function calls**: Granting temporary kernel-time and/or using issuing parameters to a sub-sequence of instruction in a program.
- **Assignment statements**: The issuing of a value to a variable or place in memory to contain the value.
- **Iteration constructs**: Structures used in computer programming to repeat the same computer code multiple times (*loops*).
- **Conditional logic**: the use of logical rules in code to govern steps taken.
- **Variable creation**: The introduction of an object in memory to contain some value.
- **Variable computations**: The use of values contained in variables to create new value using an operator.
- **Variable output**: The revealing of some value in a variable by printing or another means.

Key Components

- **Function calls**: Granting temporary kernel-time and/or using issuing parameters to a sub-sequence of instruction in a program.

```
def greet(name):
    print(f"Hello, {name}! Welcome to Python.")

greet("Alice")
```

- **Assignment statements**: The issuing of a value to a variable or place in memory to contain the value.

```
x = 10  # First assignment (also creates x)
x = x + 5  # Reassigning a new value to x
y = x * 2  # Assigning a computed value to y
```

Key Components

- **Iteration constructs**: Structures used in computer programming to repeat the same computer code multiple times (*loops*).

```
fruits = ["apple", "banana", "cherry"]

for fruit in fruits:
    print(fruit)
```

- **Conditional logic**: the use of logical rules in code to govern steps taken.

```
age = 18

if age >= 7:
    print("You are an adult.")
```

Key Components

- **Variable creation: The introduction of an object in memory to contain some value**

```
x = 10  # 'x' is created and assigned the value 10
name = "Alice"  # 'name' is created and assigned a string value
```

- **Variable computations**: The use of values contained in variables to create new value using an operator.

```
a = 10
b = 5
sum_result = a + b       # Addition
diff_result = a - b      # Subtraction
prod_result = a * b      # Multiplication
quotient_result = a / b  # Division (float)
mod_result = a % b       # Modulus (remainder)
exp_result = a ** b      # Exponentiation (10^5)
```

Key Components

- **Variable output:** The revealing of some value in a variable by printing or another means

```
name = "Alice"
age = 25

print(name)  # Output: Alice
print(age)   # Output: 25
```

Application - Using Python to Find a Name in a File

```
file = open("name")
for line in file:
        if line.startswith("John"):
                print(line)
```

- Can you explain the behavior of this program segment?
- What are the **constructs** inside of this program segment?
- What is the purpose of the *open* function?
- What is the purpose of the *line.startswith* function?

Application: Using Python to Find an Email in a File

```
file = open("emails")
for line in file:
        name, email = line.split(",")
        if name == "John Davis":
                print(email)
```

- Can you explain the behavior of this program segment?
- What are the **constructs** inside of this program segment?
- What is the purpose of the *open* function?
- What is the purpose of the *line.split* function?

Runnable Application: Using Python to Find an Email in a File

```
#!/usr/bin/env python3
 """ Demo program"""

myFile_list =["Bob Bye,bob@big.com", "Julie Roth, Jroth@thinktank.com", "John Davis, JDavis@KingOfTheWorld.com"]
print(f"\n Opening myFile :{myFile_list}") # file = open("emails")
for line in myFile_list:
        print(f"\t + line : {line}, {type(line)}")
        name, email = line.split(",")
        if name == "John Davis":
                print(f"\tName found: {email}")
```

- Can you explain the behavior of this program segment?
- What are the **constructs** inside of this program segment?

Runnable Application: Using Python to Find an Email in a File

```
#!/usr/bin/env python3 """ Demo program"""
mylist =[
"Bob Bye,bob@big.com",
"Julie Roth,Jroth@thinktank.com",
"John Davis,JDavis@KingOfTheWorld.com",
"Tylor Swift,tSwift@Swifter.com",
"The Hulk,greenThumb@gardeningHelp.com",
"Sherlock Holmes,sHolmes@consultingDetective.com"
]
print(f"\n Opening mylist :{mylist}")
for line in mylist:
        print(f"\t + line : {line}, {type(line)}")
        name, email = line.split(",")
        if name == "John Davis":
                print(f"\t Name found: {email}")
        if "Sherlock" in name:
                print(f"\t Detective's Name found: {email}")
```

Runnable Application: Using Python to Process and Analyze Data

```
#!/usr/bin/env python3
""" Demo program"""

myFile = [1,2,3,4,5,6,7,8,9,10]
sum = 0
count = 0
for line in myFile:
        n = int(line)
        sum += n
        count += 1
print(sum/count)
```

- Can you explain the behavior of this program segment?
- What are the **constructs** inside of this program segment?

Runnable Application: Using Python to Process and Analyze Data

```
#!/usr/bin/env python3
""" Demo program"""

sum = 0
count = 0
myFile = open("data.txt")
for line in myFile:
        n = int(line)
        sum += n
        count += 1
print(sum/count)
```

- What are the contents of the data.txt file?
- What is the purpose of the for line in file statement?