PYTHON PROGRAMING

Surender Dabur

Python Developer/Ethical Hacker

Axpino Technologies

Python Programing

INTRODUCTION TO PYTHON

Axpino Technologies

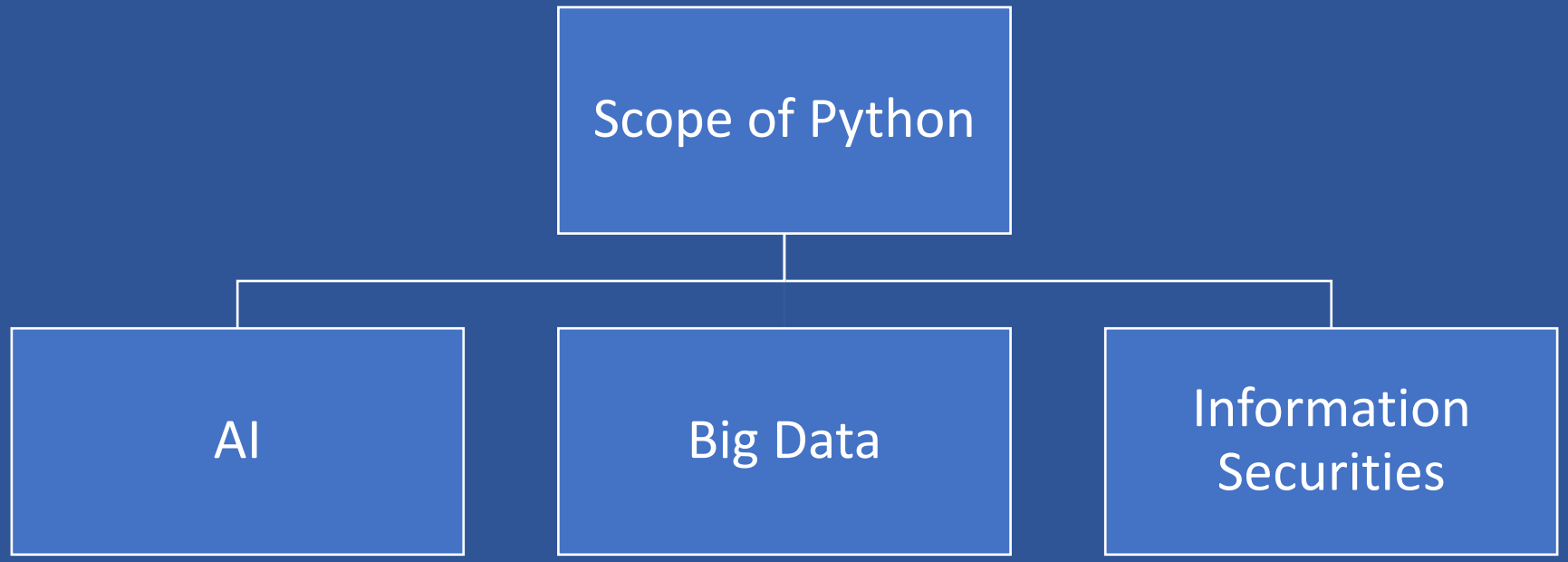
Python Programing

What is Python?

- Python is an interpreted high Level Programing Language
- Python Was Created By Guido van Rossum and its first release was in 1991
- You can develop desktop GUI Applications, Websites and Web Applications using Python which makes it a General Purpose Language.
- Python is Worlds Fastest growing language because of easiness and readability

Why Python?

- Python is more productive than other programing languages
- Companies can optimize their most expensive resource: employees
- Rich set of libraries and frameworks
- Large community


Scope of Python
AI
Big Data
Information Securities

PYTHON SETUP

Software Requirements

Download Python

https://www.python.org/downloads/

Download Notepad++

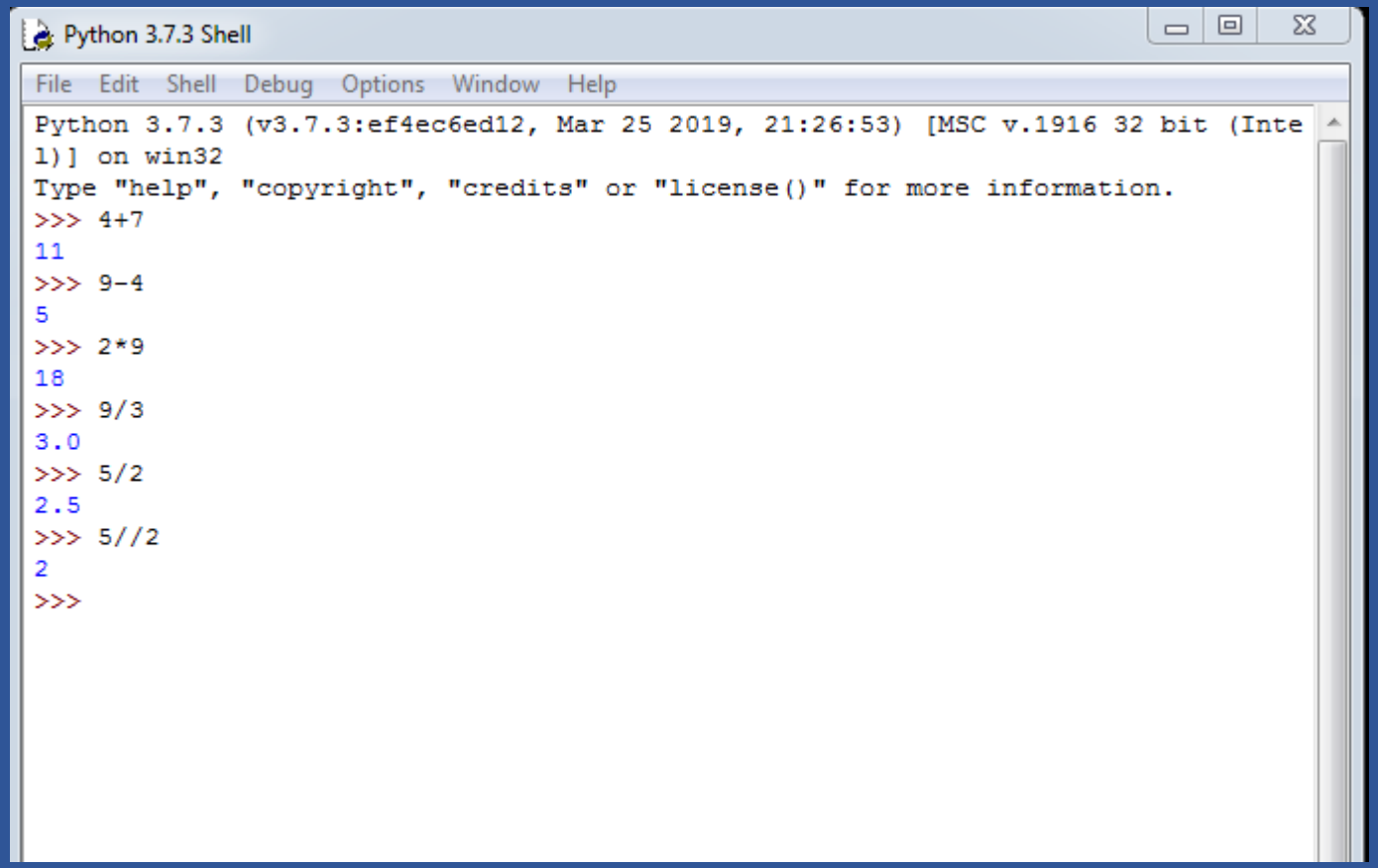
https://notepad-plus-plus.org/download/v7.6.6.html

Getting Started With Python

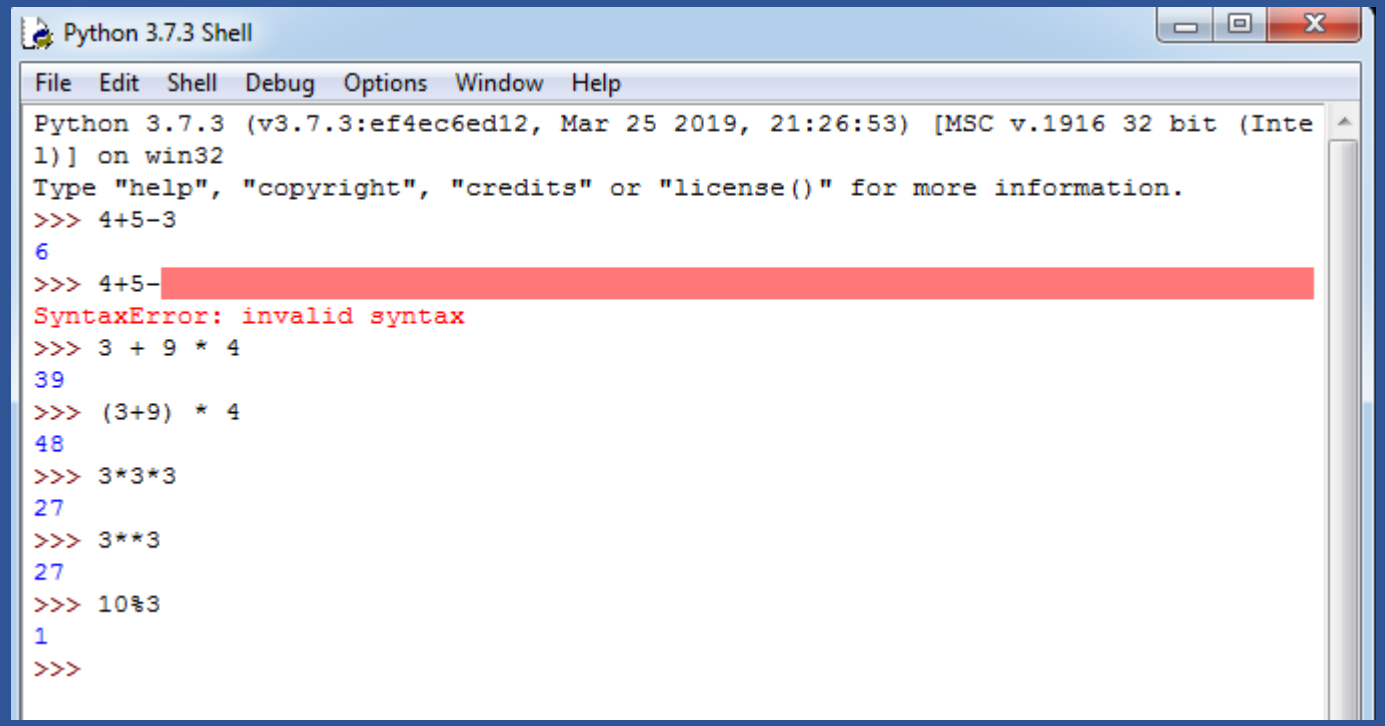
Axpino Technologies

Python Programing

Simple Basics Operations



Simple Basics Operations



Simple Basics Operations

Python 3.7.3 Shell

File Edit Shell Debug Options Window Help

```
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Inte
l)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> 'Harminder'
'Harminder'
>>> print('Harminder')
Harminder
>>> print ('Harminder's Laptop')

SyntaxError: invalid syntax
>>> print ("Harminder's Laptop")
Harminder's Laptop
>>> print("Harminder "Laptop"")
SyntaxError: invalid syntax
>>> print('Harminder "Laptop"')
Harminder "Laptop"
>>> print('Harminder's "Laptop"')

SyntaxError: invalid syntax
>>> print('Harminder\'s "Laptop"')
Harminder's "Laptop"
>>> 'Harminder' + 'Harminder'
'HarminderHarminder'
>>> 2* 'Harminder'
'HarminderHarminder'
>>> print('c:\windows\newfolder')
c:\windows
ewfolder
>>> print(r"c:\windows\newfodler")
c:\windows\newfodler
>>> |
```

Axpino Technologies

Python Programing

Variables

Variable Name
(Glass)

Value
(Water)

Variables

Python 3.7.3 Shell

File Edit Shell Debug Options Window Help

```
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Inte
l)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> x=2
>>> print(x)
2
>>> x+3
5
>>> y=3
>>> x+y
5
>>> x=9
>>> x+y
12
>>> x
9
>>> abc
Traceback (most recent call last):
  File "<pyshell#8>", line 1, in <module>
    abc
NameError: name 'abc' is not defined
>>>
```

Variables

Python 3.7.3 Shell

File Edit Shell Debug Options Window Help

```
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Inte
l)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> x=9
>>> y=3
>>> x+10
19
>>> _+y
22
>>> name= 'Harminder'
>>> name
'Harminder'
>>> name + ' Singh'
'Harminder Singh'
>>> name 'Singh'
SyntaxError: invalid syntax
>>> |
```

Variables

-9	-8	-7	-6	-5	-4	-3	-2	-1
H	A	R	M	I	N	D	E	R
0	1	2	3	4	5	6	7	8

Python 3.7.3 Shell

File Edit Shell Debug Options Window Help

```
Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Inte
tains the files and folders that you have deleted.
its" or "license()" for more information.
>>> name='HARMINDER'
>>> name[0]
'H'
>>> name[4]
'I'
>>> name[9]
Traceback (most recent call last):
  File "<pyshell#3>", line 1, in <module>
    name[9]
IndexError: string index out of range
>>> name[-1]
'R'
>>> name[-2]
'E'
>>> name[-9]
'H'
>>> name[0:3]
'HAR'
>>> name[1:7]
'ARMIND'
>>> name[1:]
'ARMINDER'
>>> name[:4]
'HARM'
>>> name[2:200]
'RMINDER'
>>> len(name)
9
>>>
```

LISTS

LISTS

Defining Lists

nums = [23,34,46,67,89]

List Name

Elements

LISTS

Accessing Elements

-5 -4 -3 -2 -1

nums = [23,34,46,67,89]

0 1 2 3 4

```
>>nums[1]
34
>>nums[4]
89
>>nums[2:]
[46,67,89]
>>nums[-2]
67
```

LISTS

Accessing Elements

names = [‘Vipul’,’Surender’,’Anup’,’Shubham’]

```
>>names
[‘Vipul’,’Surender’,’Anup’,’Shubham’]
>>names[3]
Shubham
>>names[2:]
[‘Anup’,’Shubham’]
>>names[-2]
Anup
```

Lists can have heterogeneous values

LISTS

values = [8.2,'Surender',34]

LISTS

Multi Dimensional Lists

```
names = ['Vipul','Surender','Anup','Shubham']
value = [1,2,3,4]
mi = [names,value]
```

```
>>mi
[['Vipul','Surender','Anup','Shubham'] , [1,2,3,4]]
>>mi[0][3]
Shubham
>>mi[1]
[1,2,3,4]
```

LISTS

Lists are Mutable

(Appending a Element)

```
>> nums = [1,2,3,4,5]
>>nums.append(34)
>>nums
[1,2,3,4,5,34]
```

LISTS

Lists are Mutable

(Inserting a Element)

```
>> nums = [1,2,3,4,5]
>>nums.insert(3,45)
>>nums
[1,2,3,45,4,5]
```

LISTS

Lists are Mutable

(Removing a Element)

```
>> nums = [1,2,3,4,5]
>>nums.remove(5)
>>nums
[1,2,3,4]
```

LISTS

Lists are Mutable

(Removing a Element using index)

```
>> nums = [1,2,3,4,5]
>>nums.pop(2)
>>nums
[1,2,4,5]
```

LISTS

Lists are Mutable

(Removing a Element from Last)

```
>> nums = [1,2,3,4,5]
>>nums.pop()
5
>>nums
[1,2,3,4]
```

LISTS

Lists are Mutable

(Removing multiple Elements)

```
>> nums = [1,2,3,4,5]
>>del nums[0:2]
>>nums
[3,4,5]
```

LISTS

Lists are Mutable

(Adding multiple Elements)

```
>> nums = [1,2,3]
>>nums.extend([4,5,6])
>>nums
[1,2,3,4,5,6]
```

LISTS

Lists are Mutable

(Searching Min Value in a List)

```
>> nums = [23,19,85,13]
>>min(nums)
13
```

LISTS

Lists are Mutable

(Searching Max Value in a List)

```
>> nums = [23,19,85,13]
>>max(nums)
85
```

LISTS

Lists are Mutable

(Calculate Sum of a List)

```
>> nums = [23,19,85,13]
>>sum(nums)
140
```

LISTS

Lists are Mutable

(Sorting a List)

```
>> nums = [23,19,85,13]
>>nums.sort()
>>nums
[13,19,23,85]
```

LISTS

Lists are Mutable

(Sorting a List Descending)

```
>> nums = [23,19,85,13]
>>nums.sort(reverse=true)
>>nums
[85,23,19,13]
```

TUPLE

TUPLE

Defining a Tuple

nums = (23,34,46,67,89)

Tuple Name

Elements

TUPLE

Accessing Elements

-5 -4 -3 -2 -1

nums = (23,34,46,67,89)

0 1 2 3 4

```
>>nums[1]
34
>>nums[4]
89
>>nums[2:]
[46,67,89]
>>nums[-2]
67
```

TUPLE

Accessing Elements

names = ('Vipul','Surender','Anup','Shubham')

```
>>names
('Vipul','Surender','Anup','Shubham')
>>names[3]
Shubham
>>names[2:]
('Anup','Shubham')
>>names[-2]
Anup
```

Tuple can have heterogeneous values

TUPLE

values = (8.2,'Surender',34)

TUPLE

Multi Dimensional TUPLE

```
names = ('Vipul','Surender','Anup','Shubham')
value = (1,2,3,4)
mi = (names,value)
```

```
>>mi
(('Vipul','Surender','Anup','Shubham') , (1,2,3,4))
>>mi[0][3]
Shubham
>>mi[1]
(1,2,3,4)
```

TUPLE

Tuples are Immutable

```
>> tup = (1,2,3,4,5)
>>tup[1] = 36
```

```
>>> tup[1] = 36
Traceback (most recent call last):
  File "<pyshell#12>", line 1, in <module>
    tup[1] = 36
TypeError: 'tuple' object does not support item assignment
>>>
```

SETS

SETS

Defining a SET

nums = {23,34,46,67,89}

Set Name

Elements

SETS can have heterogeneous values

SETS

values = {8.2,'Surender',34}

SETS

Check if element exists in SET

```
values = {8.2,'Surender',34}
print("surender" in values)
```

SETS

Adding Element to SETS

```
values = {8.2,'Surender',34}
Values.add("hello")
```

Adding Multiple Element to SETS

SETS

```
values = {8.2,'Surender',34}
values.update([3,4,5])
```

SETS

Removing Element From SETS

(Gives an Error when Item is not in Set)

```
values = {8.2,'Surender',34}
values.remove('Surender')
```

SETS

Removing Element From SETS

(No Error when Item is not in Set)

```
values = {8.2,'Surender',34}
values.discard('Surender')
```

Removing Random Element From SETS

SETS

```
values = {8.2,'Surender',34}
values.pop()
```

SETS

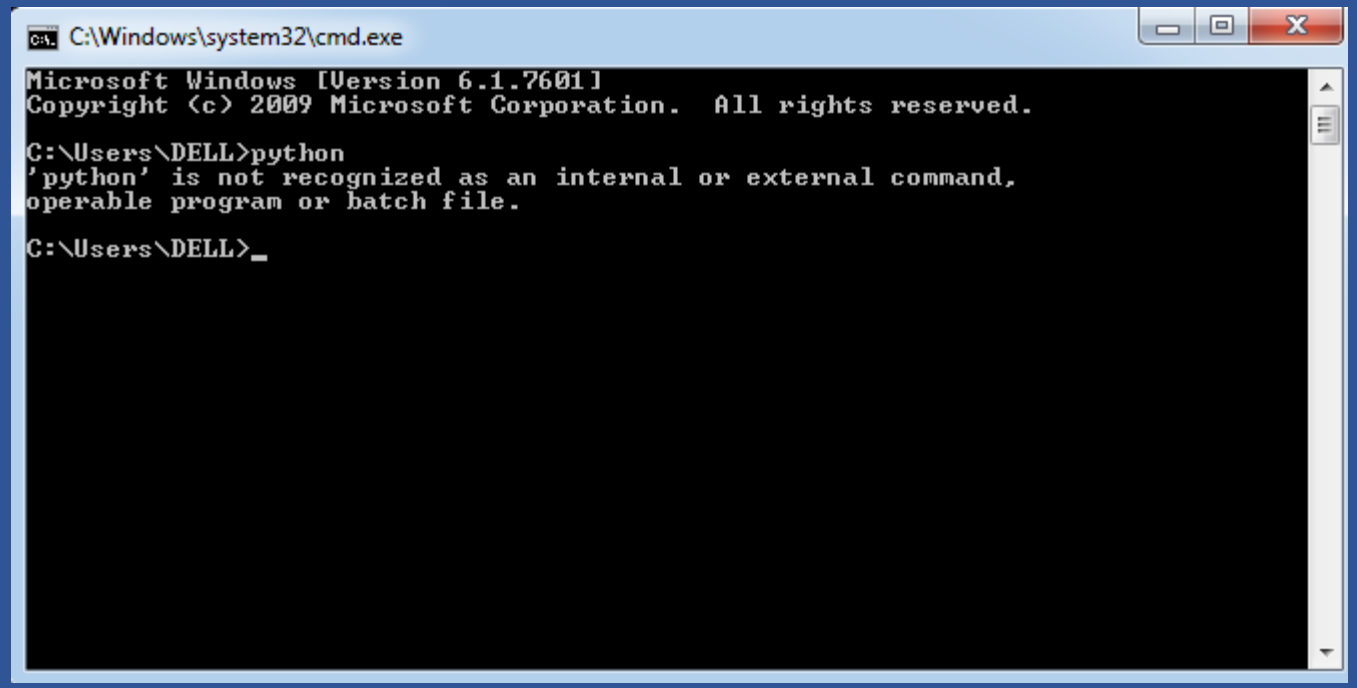
Clearing SET

```
values = {8.2,'Surender',34}
values.clear()
```

SETTING PATH FOR WINDOWS

Checking If already Set

Setting Path for Windows



Copy Following Paths

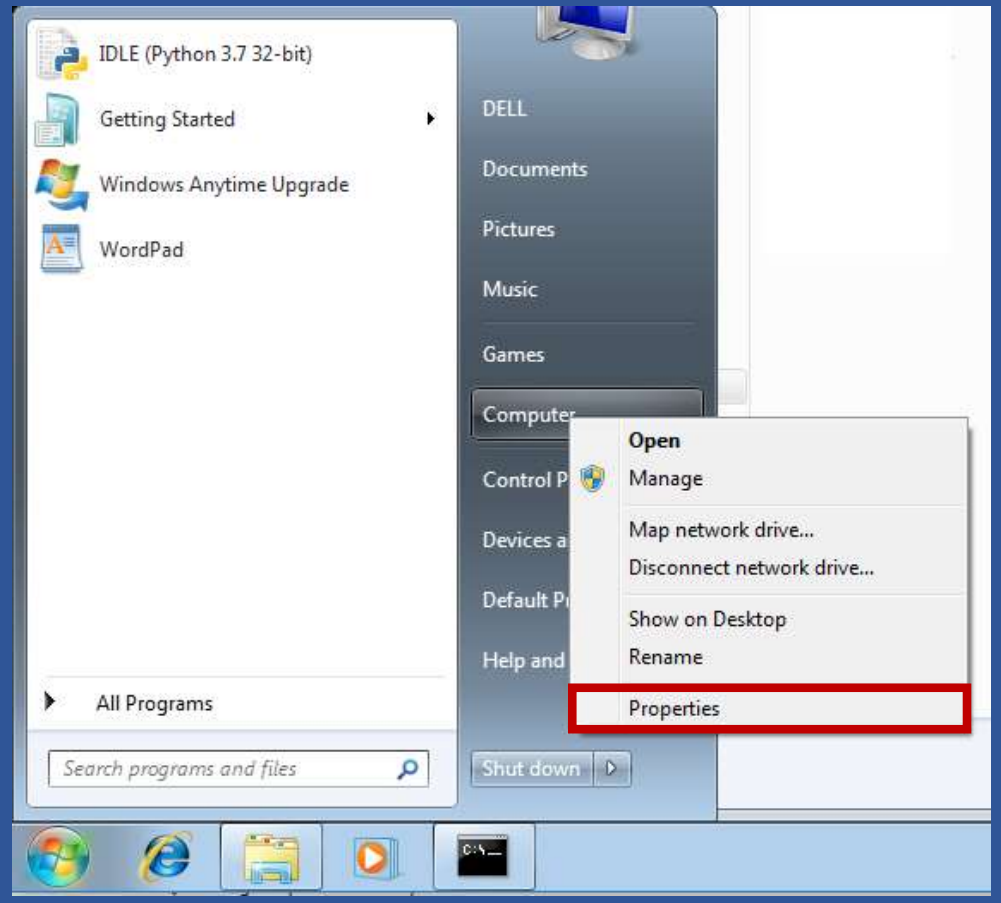
Setting Path for Windows

C:\Users\Your_Username\AppData\Local\Programs\Python\Python37-32

C:\Users\ Your_Username \AppData\Local\Programs\Python\Python37-32\Scripts

Setting Path for Windows

Go to Following Path

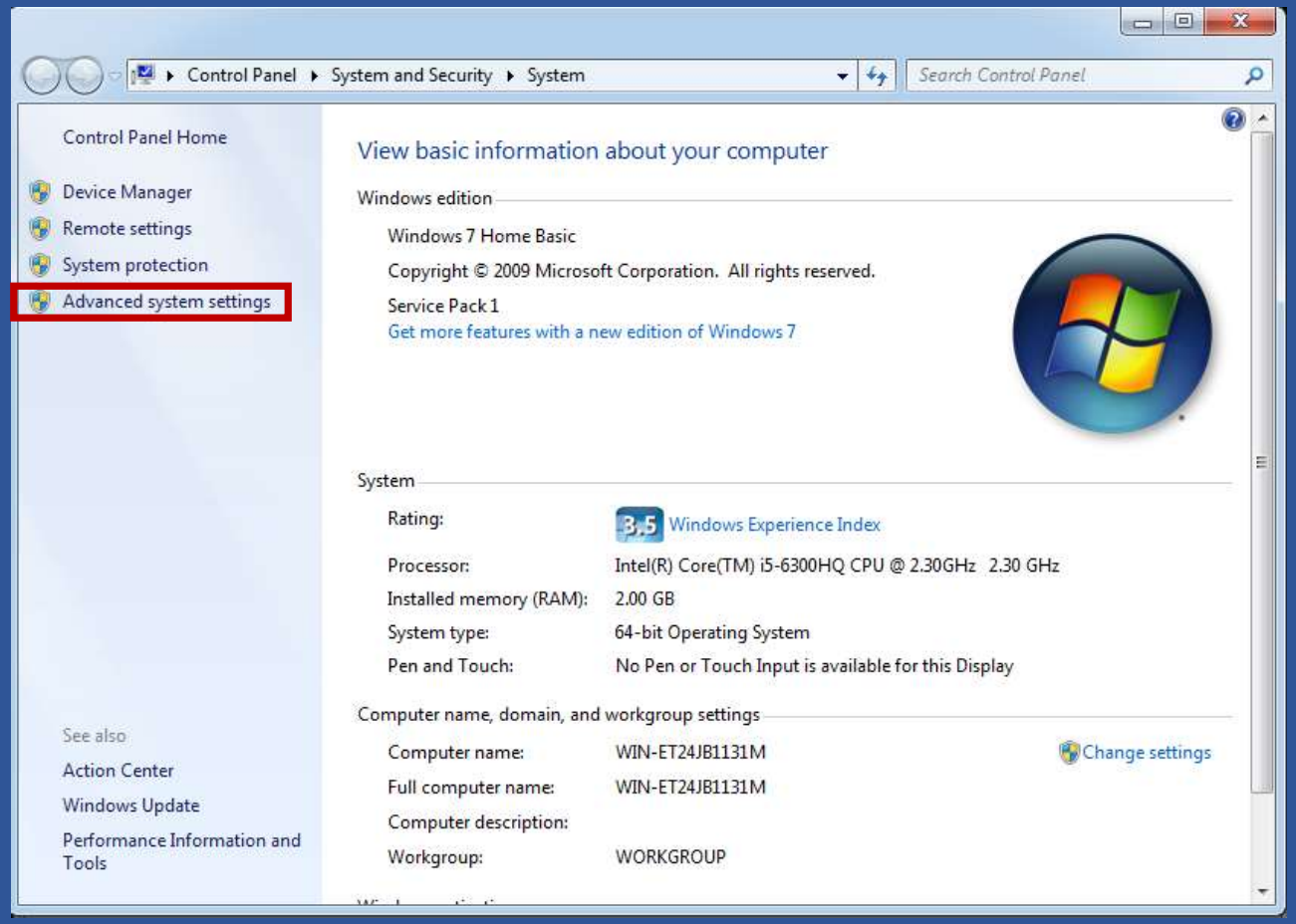


Axpino Technologies

Python Programing

Setting Path for Windows

Go to Following Path

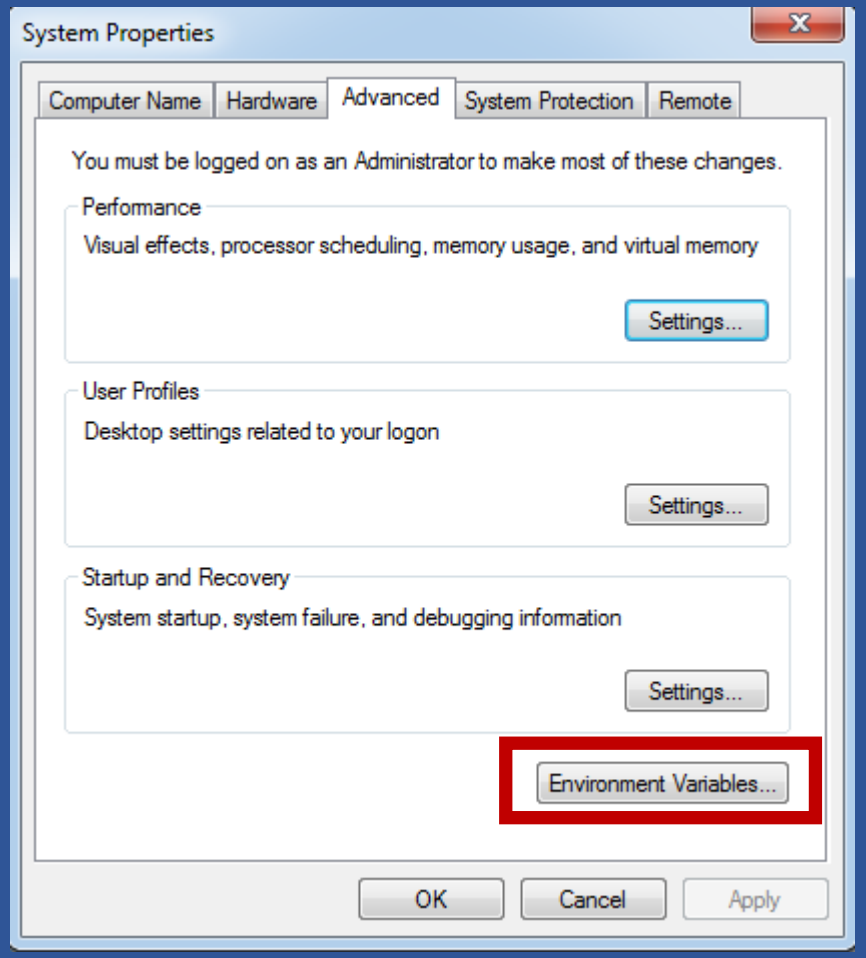


Axpino Technologies

Python Programing

Setting Path for Windows

Go to Following Path

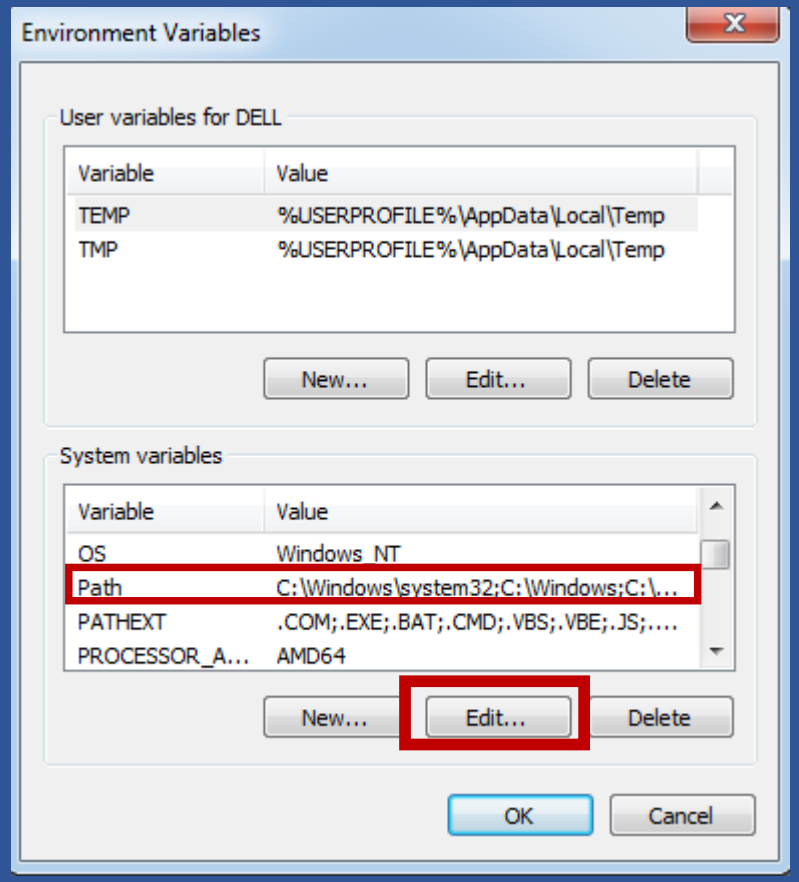


Axpino Technologies

Python Programing

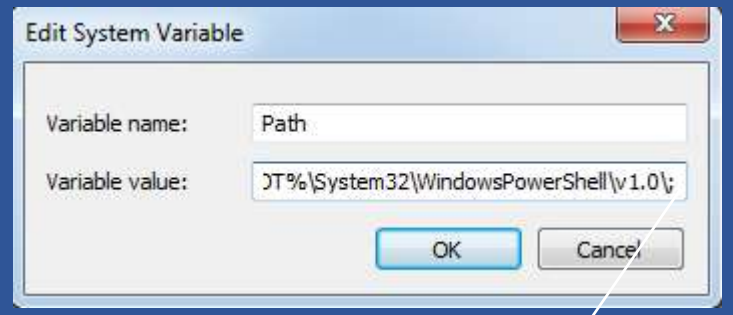
Setting Path for Windows

Go to Following Path



Setting Path for Windows

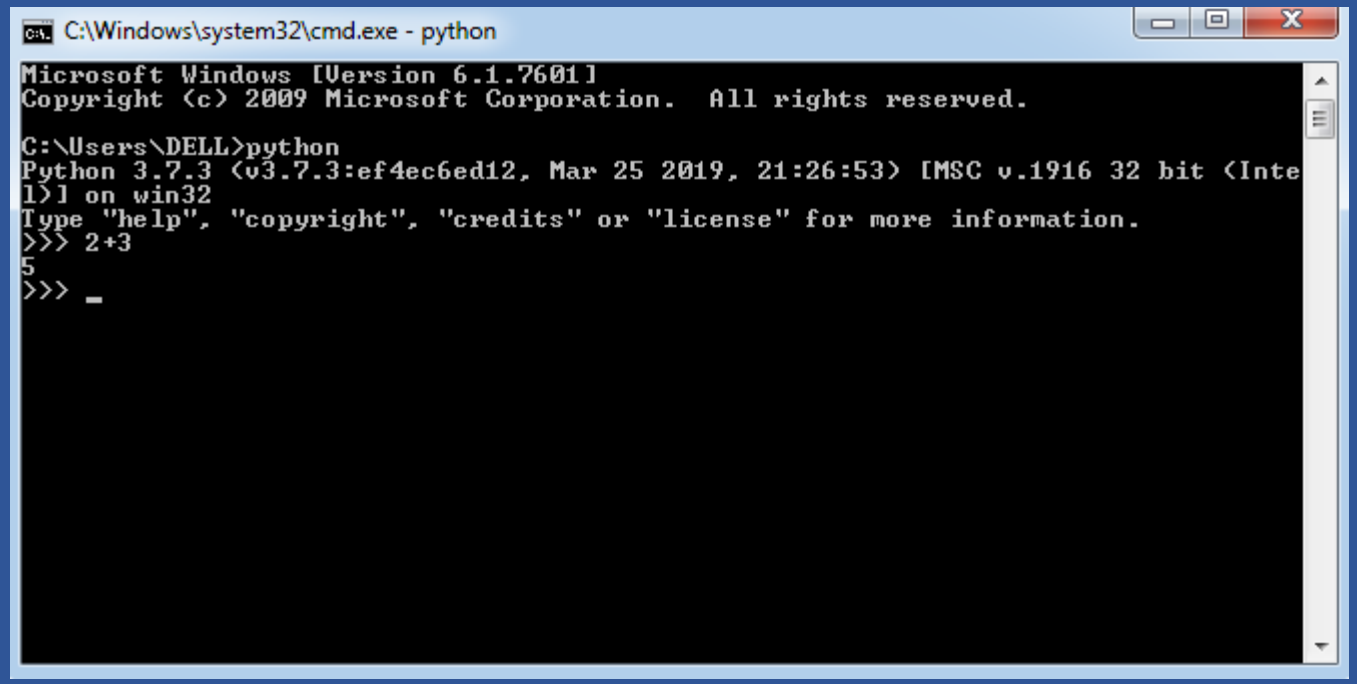
Go to Following Path



1. Copy both the paths after this semicolon
2. Separate both paths with semicolon

Verification

Setting Path for Windows



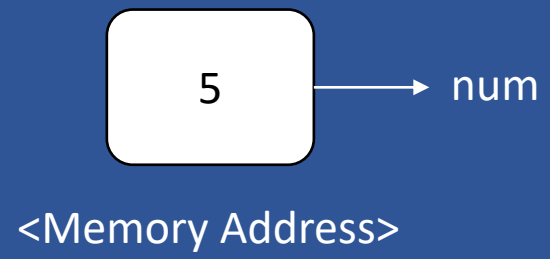
Variable Memory Concept

Variable

(Memory Concept)

Variable Storage

num=5

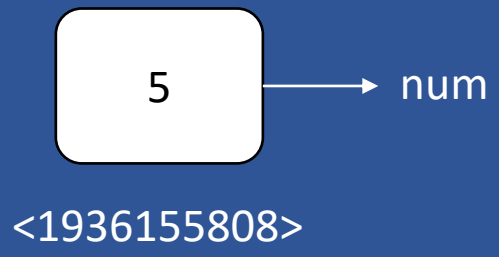


Variable

(Memory Concept)

Getting Address

```
>>num=5
>>Id(num)
1936155808
```

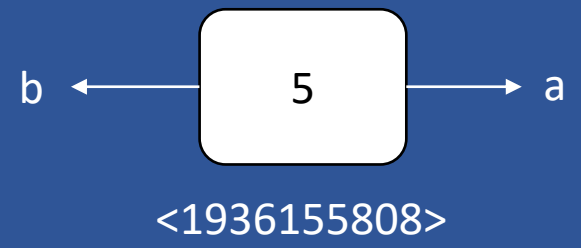


Variable

(Memory Concept)

Variables with Same value has same memory Address

```
>>a=5
>>b=5
>>id(a)
1936155808
>>id(b)
1936155808
```

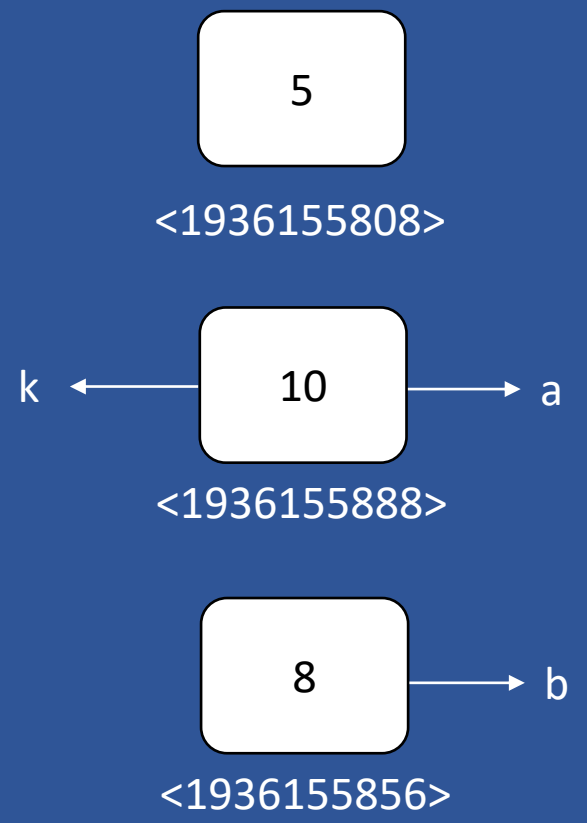


Concept of Garbage Value

Variable

(Memory Concept)

```
>>a=5
>>b=5
>>k=a
>>a=10
>>b=8
>>k=10
```



Variable

(Memory Concept)

Type of a Variable

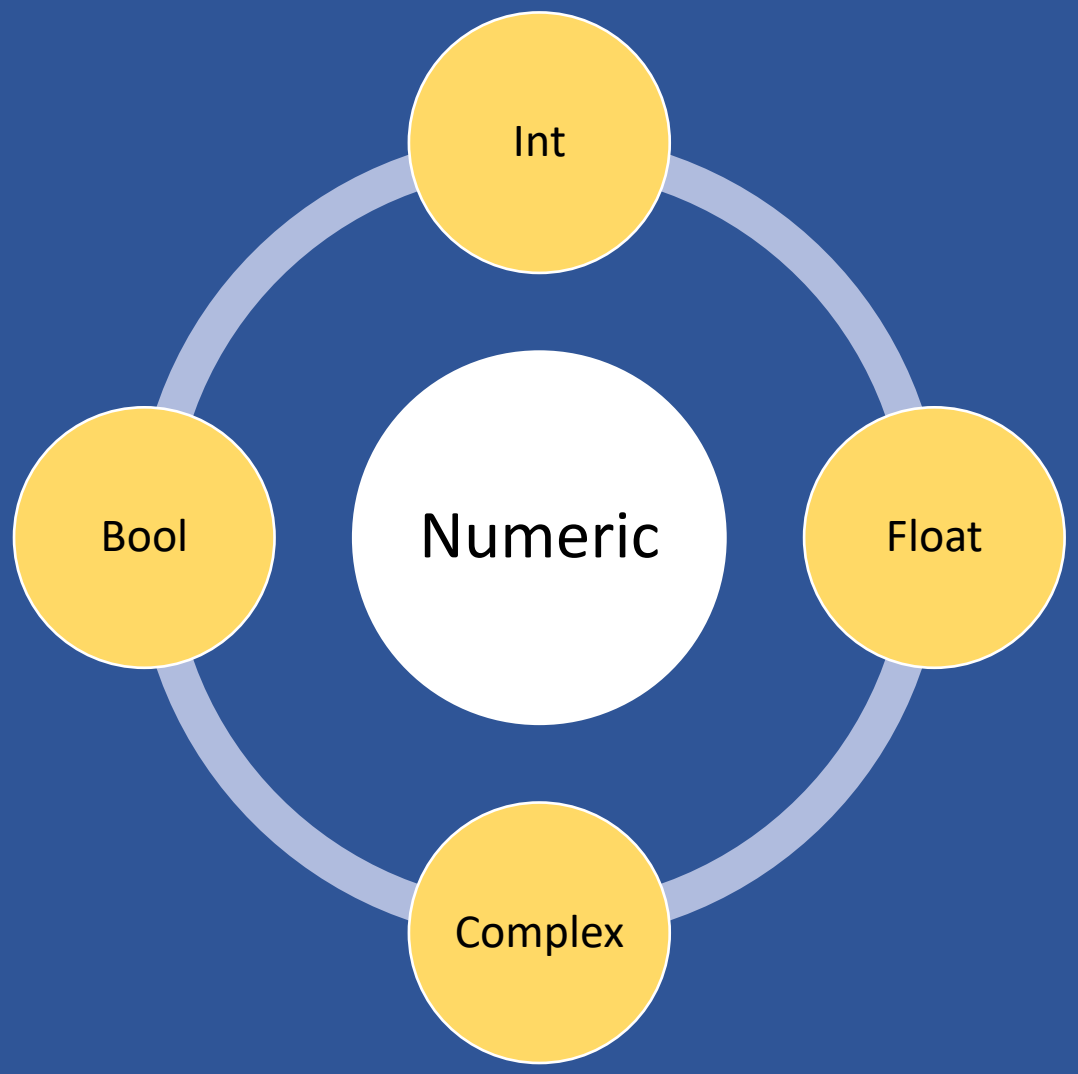
```
>>a=5
>>type(a)
<class 'int'>
>>b=4.6
<class
'float'>
```

Data Types

Data Types

- None
- Numeric
- Sequence
- Dictionary

Data Types



Data Types

Numeric Examples

INT

```
>>num=5
>>type(num)
<class 'Int'>
```

FLOAT

```
>>num=5.7
>>type(num)
<class 'float'>
```

Complex

```
>>num = 6+9j
>>type(num)
<class 'complex'>
```

BOOL

```
>>a=5
>>b=6
>>a<b
True
```

Data Types

Data Types Conversions

INT → FLOAT

```
>>num=5
>>float(num)
>>num
5.0
```

FLOAT → INT

```
>>num=5.7
>>int(num)
>>num
5
```

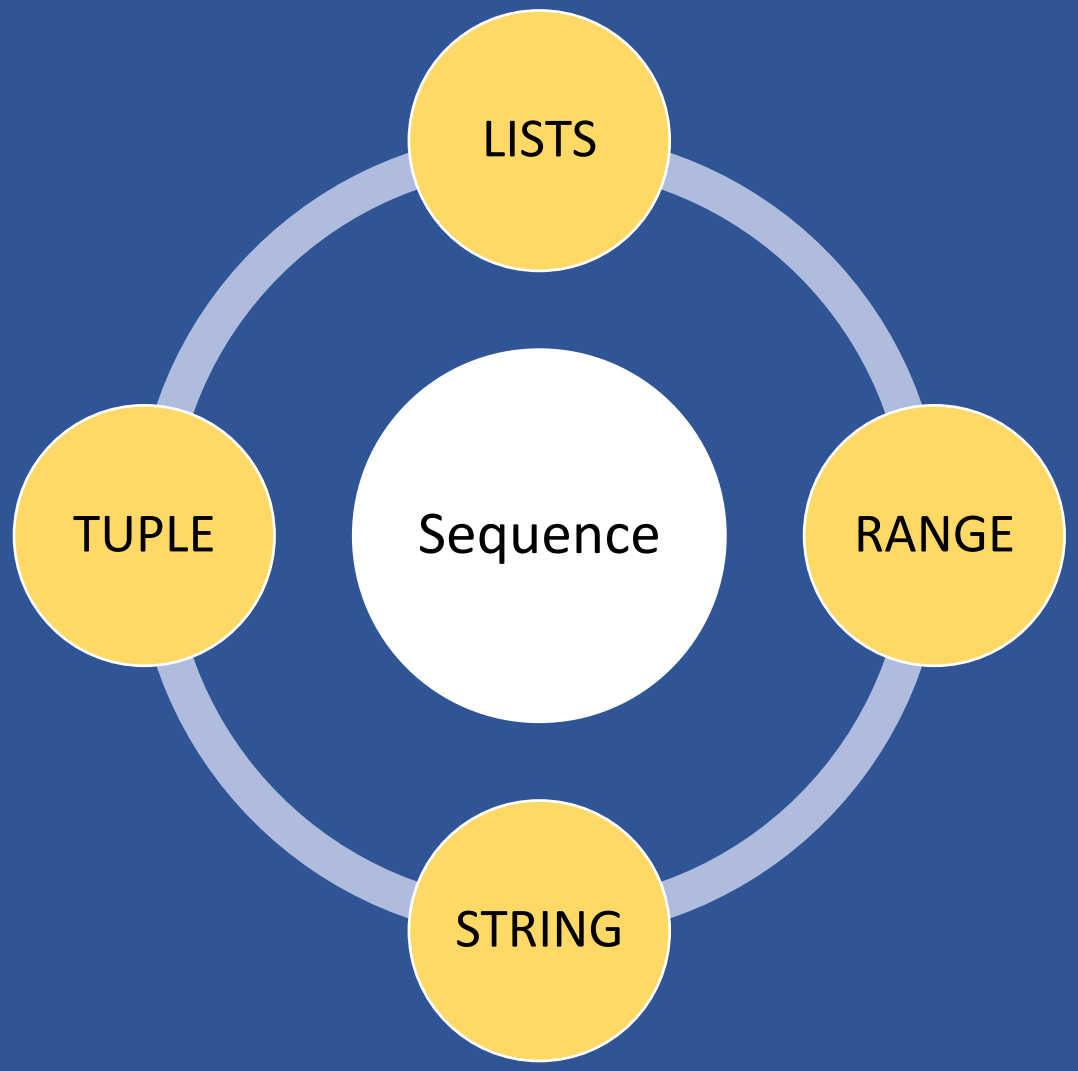
INT → COMPLEX

```
>>a = 6
>>b = 7
>>c = complex(a,b)
>>c
6+7j
```

BOOL → INT

```
>>a=5
>>b=6
>>c = a<b
>>int(c)
1
```

Data Types



Data Types

Sequence Examples

LISTS

```
>>a= [1,2,3,4]
>>type(a)
<class 'List'>
```

TUPLE

```
>>a=(1,2,3,4)
>>type(a)
<class 'Tuple'>
```

STRING

```
>>str = 'Harminder'
>>type(str)
<class 'String'>
```

RANGE

```
>>a=range(0,10,2)
>>type(a)
<class 'Range'>
```

Dictionary

Data Types

Definition

```
>>a= {‘name’:’Harminder’,’class’:’1st’}
>>type(a)
<class ‘Dict’>
```

Accessing Keys

```
>>a= {‘name’:’Harminder’,’class’:’1st’}
>>a.keys()
dict_keys{[‘name’,’class’]}
```

Accessing Values

```
>>a= {‘name’:’Harminder’,’class’:’1st’}
>>a.values()
dict_values{[‘Harminder’,’1st’]}
```

Accessing Specific Index

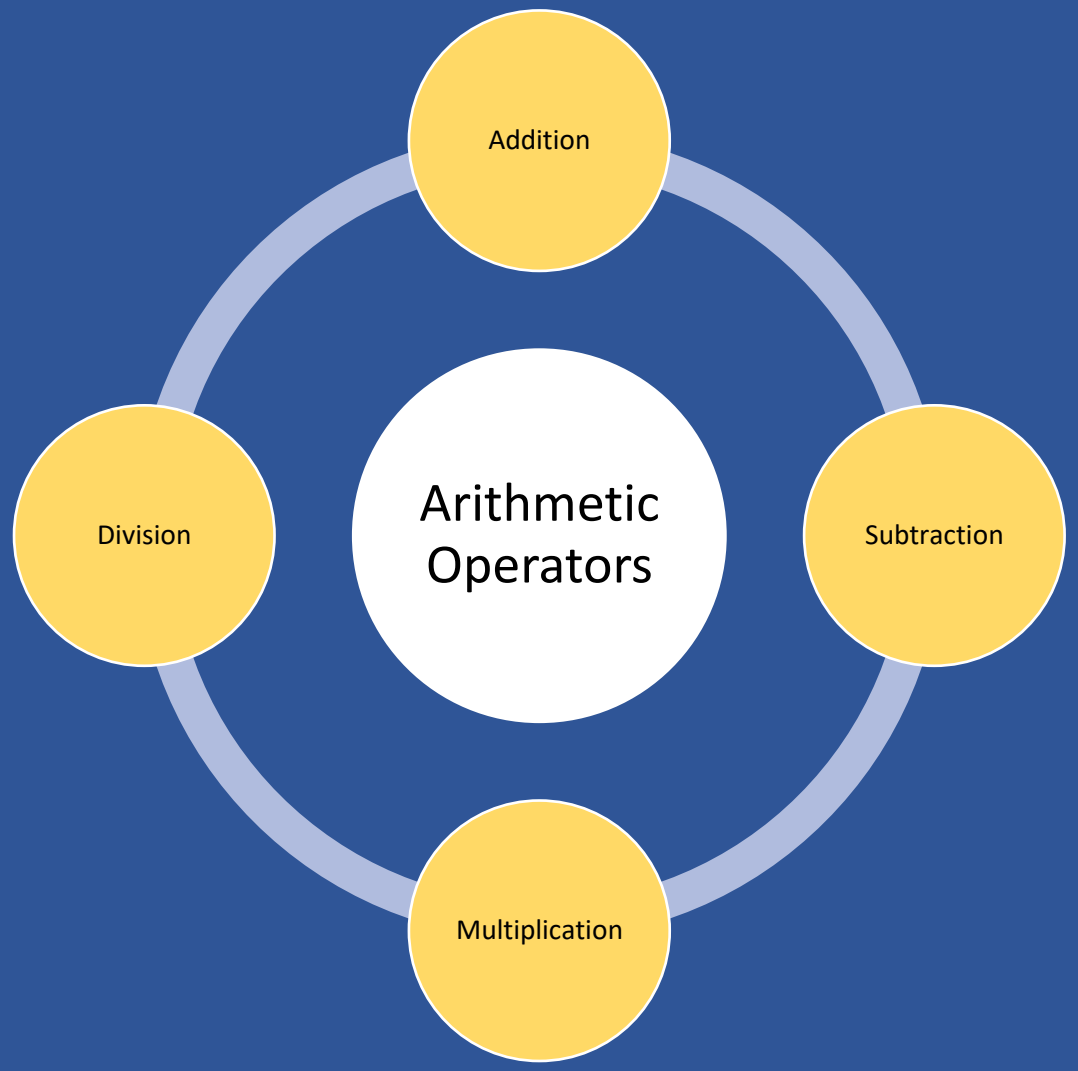
```
>>a= {‘name’:’Harminder’,’class’:’1st’}
>>a[‘class’]
‘1st’
```

OPERATORS

Operators

- Arithmetic Operators
- Assignment Operators
- Relational Operators
- Logical Operators

Operators


Addition
Division
Arithmetic Operators
Subtraction
Multiplication

Operators

Arithmetic Operators

Addition

```
>>a=5
>>b=6
>>a+b
11
```

Subtraction

```
>>a=5
>>b=6
>>b-a
1
```

Multiplication

```
>>a=5
>>b=6
>>a*b
30
```

Division

```
>>a=30
>>b=5
>>a/b
6
```

Operators


Addition Assignment
Division Assignment
Assignment Operators
Subtraction Assignment
Multiplication Assignment

Operators

Assignment Operators

Addition Assignment

```
>>a=5
>>a += 2
>>a
7
```

Subtraction Assignment

```
>>a=5
>>a-=2
>>a
3
```

Multiplication Assignment

```
>>a=5
>>a*=3
>>a
15
```

Division Assignment

```
>>a=25
>>a /= 5
>>a
5.0
```

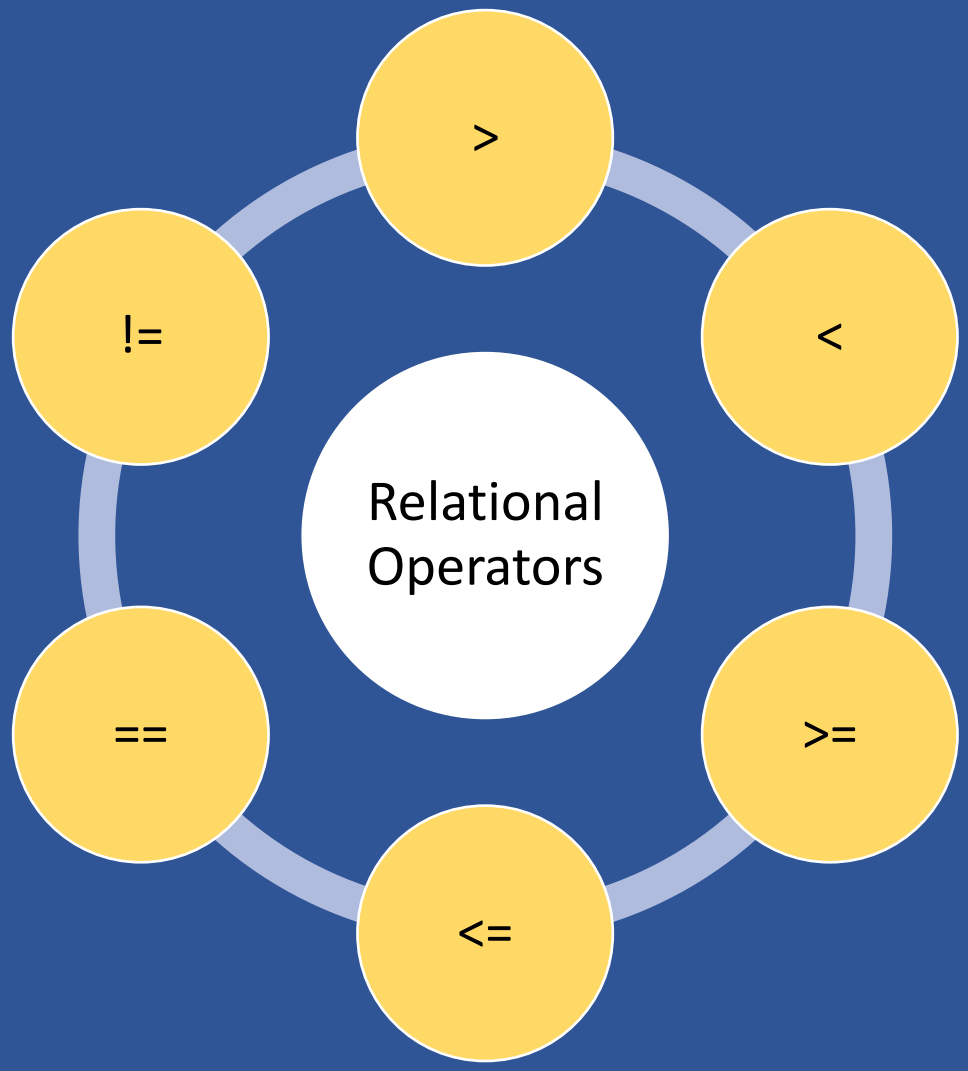
Operators

Assignment Operators

Assigning Multiple Variables at once

```
>>a,b=5,8
>>a
5
>>b
8
```

Operators



Operators

Relational Operators

<

```
>>a=5
>>b=2
>>a<b
False
```

>

```
>>a=5
>>b=2
>>a>b
True
```

>=

```
>>a=5
>>b=2
>>a>=b
True
```

<=

```
>>a=5
>>b=2
>>a<=b
False
```

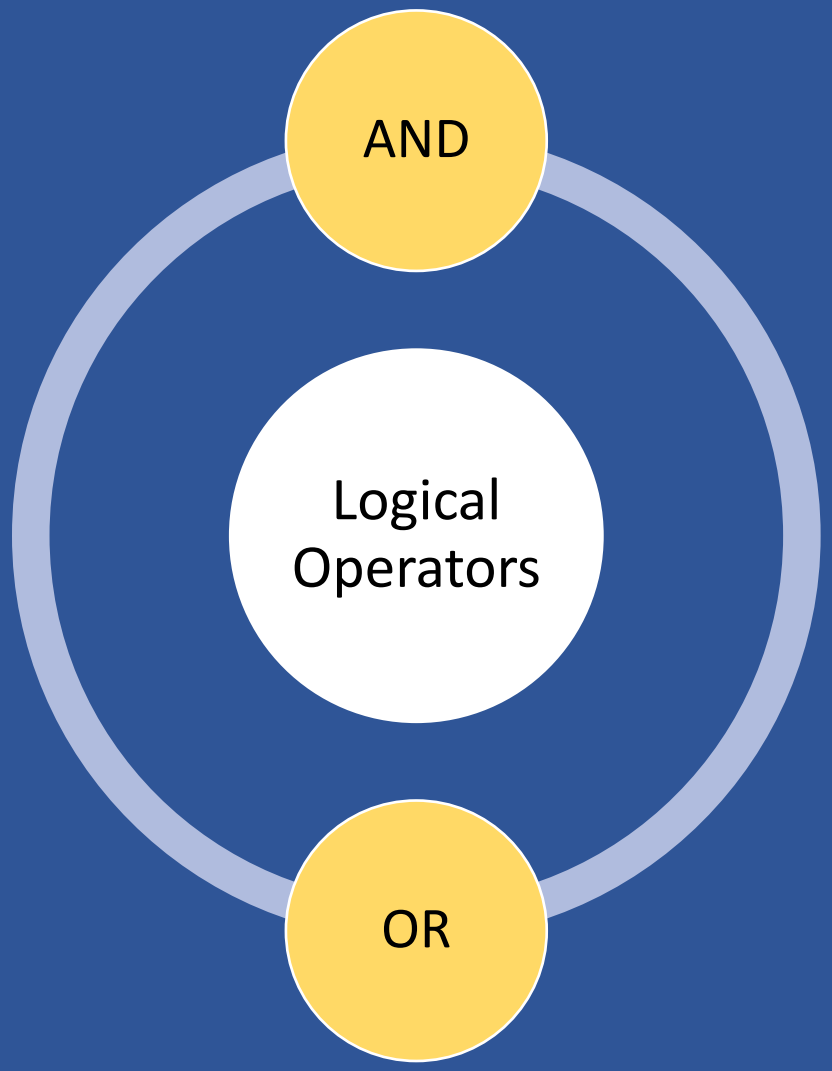
Relational Operators

Operators

==
>>a=5 >>b=5 >>a==b True

!=
>>a=5 >>b=2 >>a!=b True

Operators



Logical Operators

Operators

AND
>>a=5 >>b=2 >>a>5 and b=2 False

OR
>>a=5 >>b=2 >>a>5 or b=2 True

BITWISE OPERATOR

Bitwise Operators

- AND (&)
- OR (|)
- XOR (^)
- Left Shift (<<)
- Right Shift (>>)

Bitwise Operators

Decimal to Binary Conversion

12 → 1100

2	12	
2	6	0
2	3	0
	1	1

Bitwise Operators

Binary to Decimal Conversion

1100 → 12

1 1 0 0

$2^3 + 2^2 + 2^1 + 2^0$

8+4=12

Bitwise Operators

Bitwise (AND)

12 & 13 = 12

00001100 -> 12
00001101 -> 13

00001100 -> 12

Bitwise Operators

Bitwise (OR)

$$12 \mid 13 = 13$$

00001100 -> 12
00001101 -> 13

00001101 -> 13

Bitwise Operators

Bitwise (XOR)

12 ^ 13 = 1

00001100 -> 12
00001101 -> 13

00000001 -> 1

Bitwise Operators

Left Shift (<<)

10 << 2 = 40

00001010.000 -> 10
0000101000.0 -> 40

Right Shift (>>)

10 >> 2 = 2

Bitwise Operators

00001010.000 -> 10
00001010.10000 -> 2

Math Module

Math Module

```
>>Import math
```

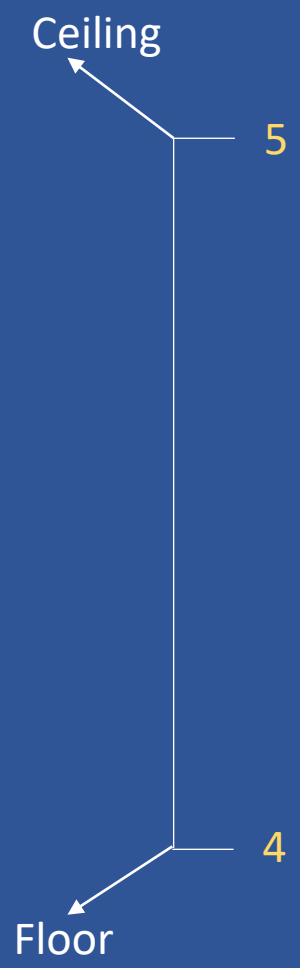
Finding Square Root

Math Module

```
>>Import math
>>x=math.sqrt(25)
>>x
5
```

Math Module

Math Functions



Floor

```
>>x=math.floor(4.9)
>>x
4
```

Ceil

```
>>x=math.ceil(4.1)
>>x
5
```

Power

```
>>x=math.pow(4,2)
>>x
16
```

Math Module

```
>>Import math as m
>>x=m.sqrt(25)
>>x
5
```

Importing Specific functions of Math Module

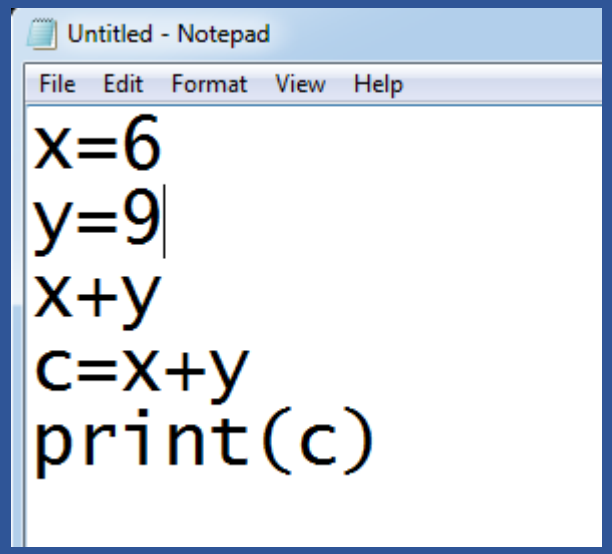
Math Module

```
>>from math import sqrt
```

Creating & Running Python Files

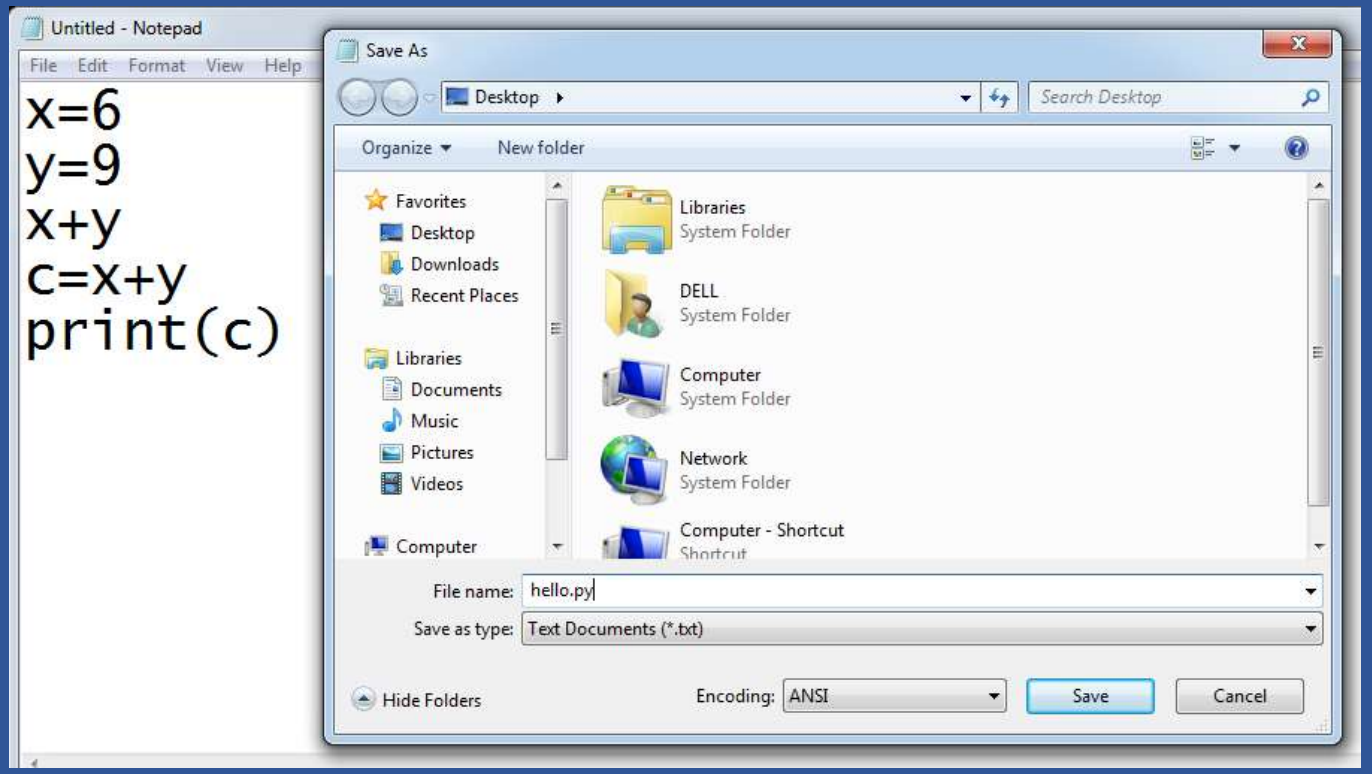
Write a Program on Notepad/IDE

Creating & Running Py Files



Save file with PY Extension

Creating & Running Py Files

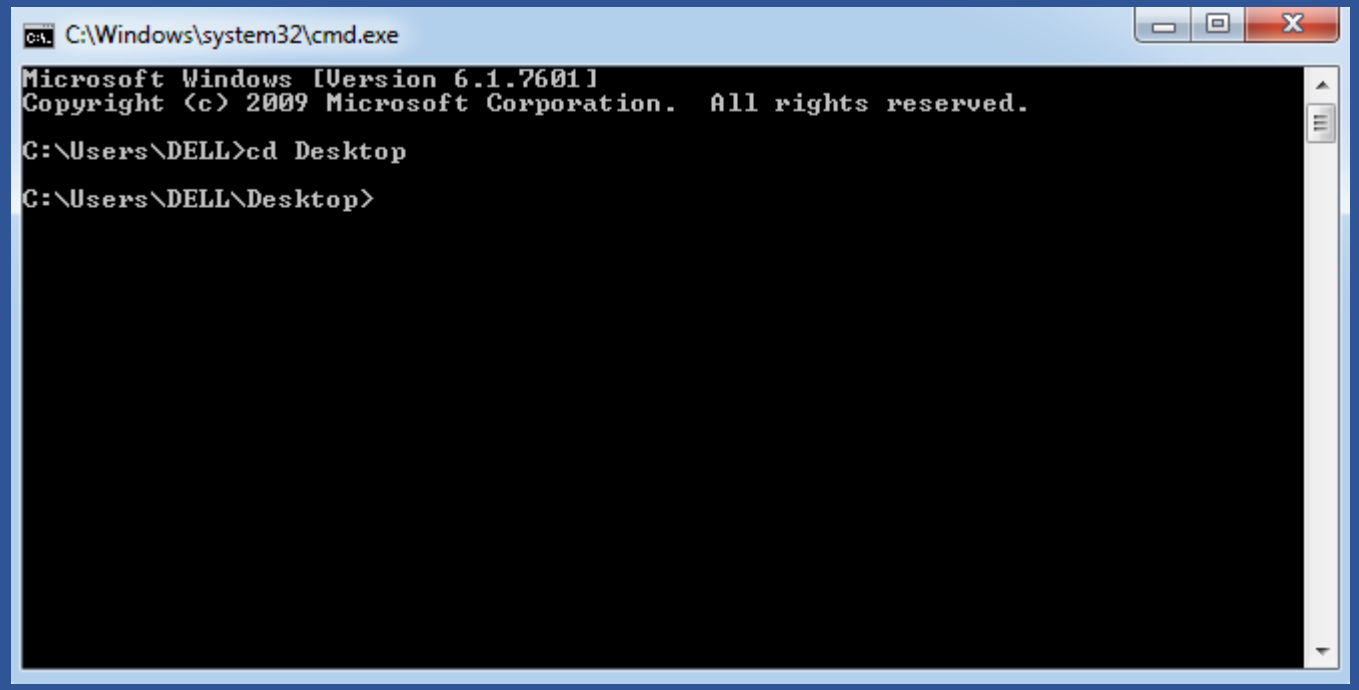


Axpino Technologies

Python Programing

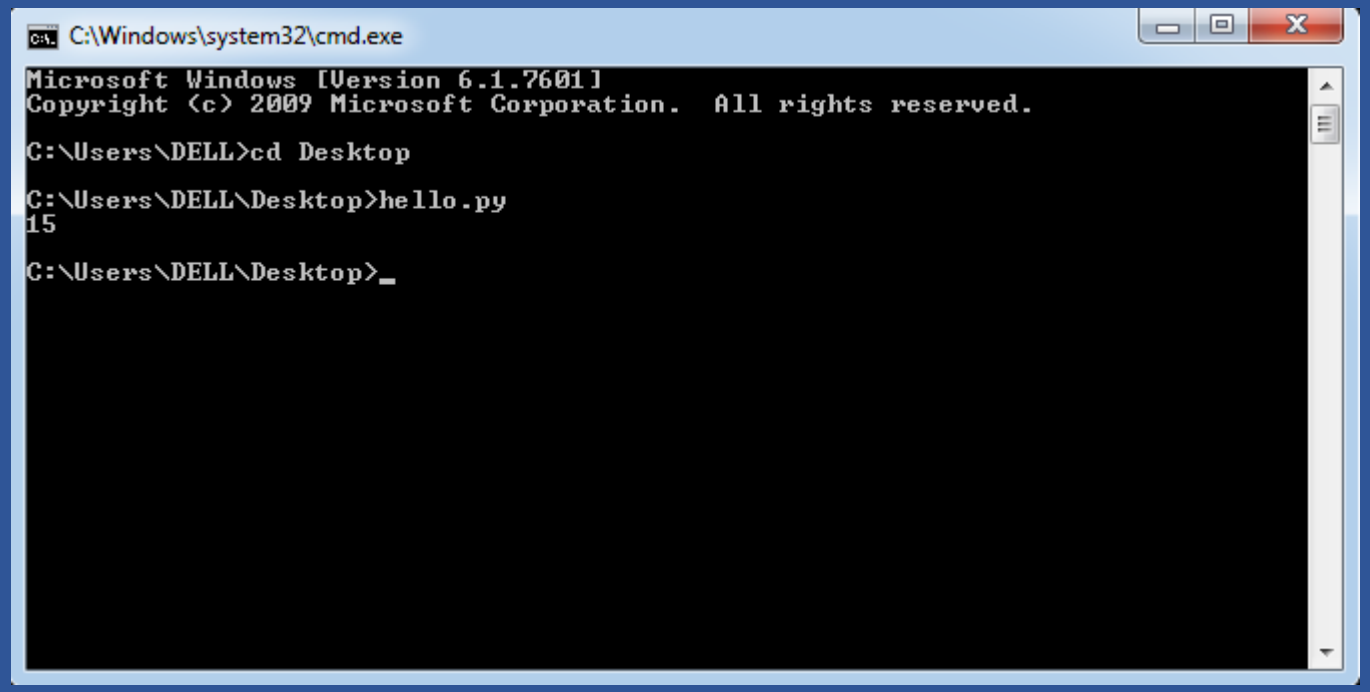
Creating & Running Py Files

Open CMD and Change path to file's location



Call the python file

Creating & Running Py Files



User Input

Input Function

User Input

```
x=input("Please Enter Your Input")
```

Input Function only accept strings

User Input

```
x=input("Please Enter Your Input")
Print(type(a))
```

```
Please Enter Your Input 1
<class 'str'>
```

User Input

Input Function only accept strings

```
x=input("Please Enter First Number")
y=input("Please Enter Second Number")
c=x+y
print(c)
```

```
Please Enter First Number 1
Please Enter Second Number 2
12
```

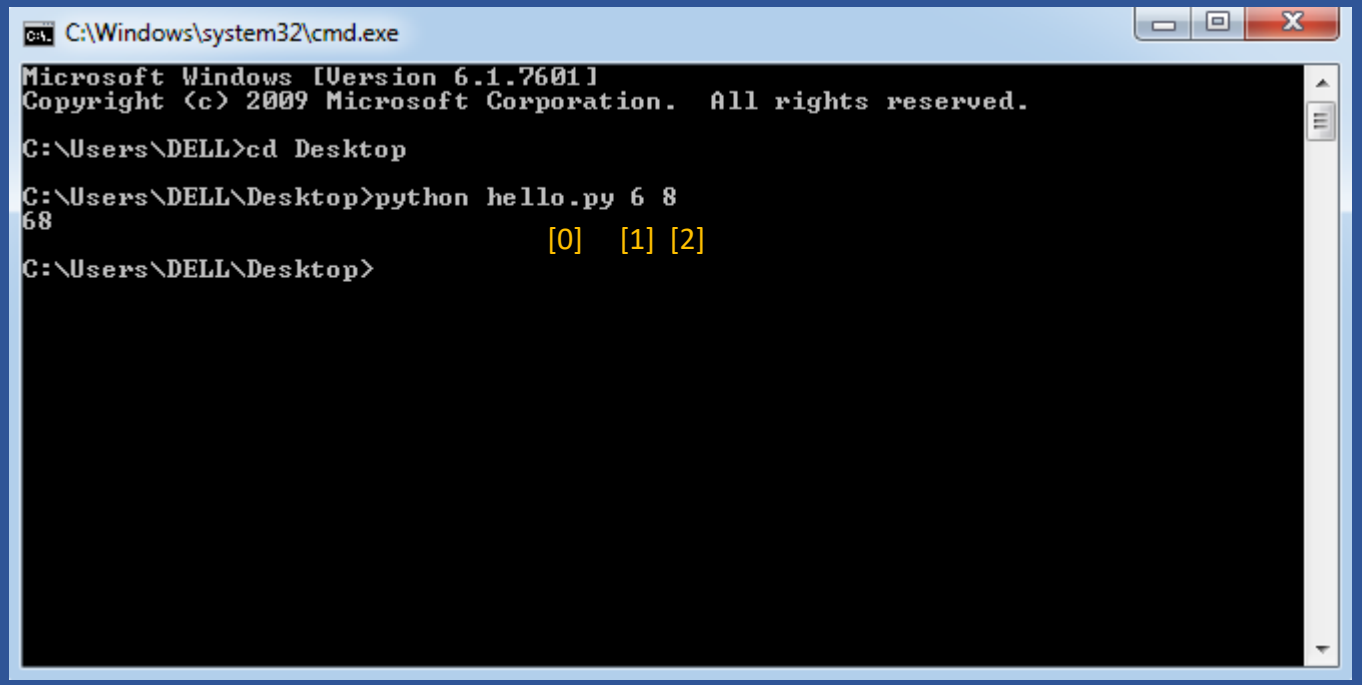
Passing Argument Input in CMD

User Input

```
Import sys
x=sys.argv[1]
y=sys.argv[2]
c=x+y
print(c)
```

Passing Argument Input in CMD

User Input



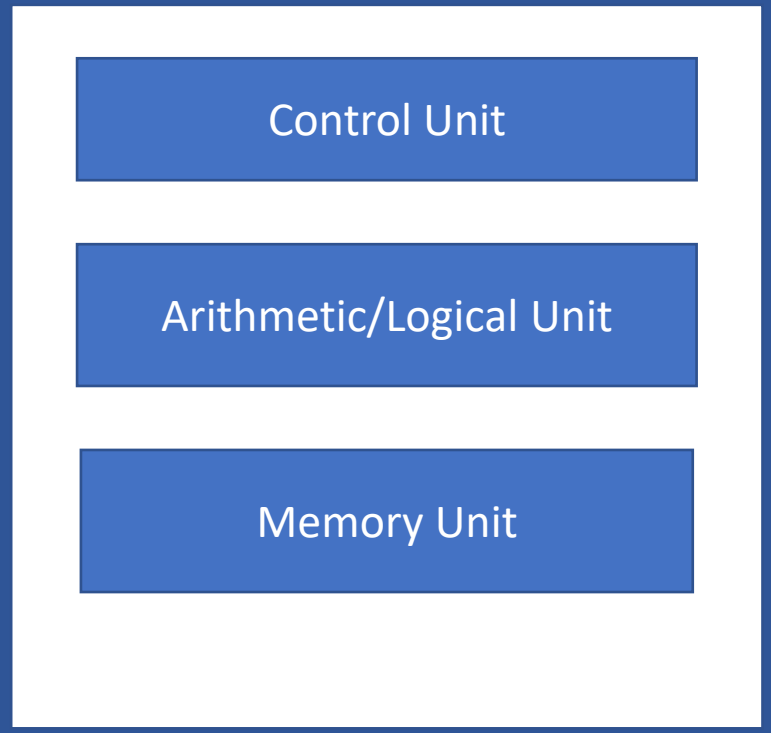
Control Flow Statements

Axpino Technologies

Python Programing

Control Flow Statements

Central Processing Unit



Control Flow Statements

IF Statement

```
X=5
If x==5:
        print("equal to five")
```

Suite

IF Statement Needs Indentation

Control Flow Statements

```
X=5
If x==3:
        print("equal to five")
print("hello")
```

Control Flow Statements

Else Statement

```
X=5
If x==5:
        print("equal to five")
else:
        print("Not Equal")
```

Control Flow Statements

Nested IF Statement

```
X=5
If x>=5:
        print("x is greater")
        if x==5:
                print("x is equal")
else:
        print("x is smaller")
```

Control Flow Statements

Nested IF Statement

```
X=5
If x==1:
        print("One")
elif x==2:
        print("Two")
elif x==3:
        print("Three")
else:
        print("Wrong Input")
```

Loops

Loops

While Loop

```
x=0
while x<=5:
    print(x)
    x=x+1
```

Initialization

Condition

Increment

Loops

While Loop (Reverse)

```
x=5
while x>=0:
    print(x)
    x=x-1
```

Initialization

Condition

decrement

Loops

While Loop (Nested)

```
x=0
while x<=5:
        print("Python",end="")
        j=0
        while j<=5:
                print("Rocks",end="")
                j=j+1
        x=x+1
        print()
```

Loops

For Loop with List

```
a = [“Harminder”,1,”Surender”]

for i in a:
        print(i)
```

Loops

For Loop with String

```
a = “Harminder”

for i in a:
        print(i)
```

Loops

For Loop with Tuple

```
a = (“hi”,”harminder”,”surender”)
for i in a:
        print(i)
```

Loops

For Loop with Sets

```
a = {“hi”,”harminder”,”surender”}
for i in a:
        print(i)
```

Loops

For Loop with Range

```
for i in range(10):
    print(i)
```

Loops

For Loop with Range

```
for i in range(10,21,1):
print(i)
```

Loops

For Loop with Range

```
for i in range(20,0,-1):
print(i)
```

Loops

Nested For Loop

```
for i in range(5):
    for j in range(5):
        print(j,end="")
    print()
```

Loops

Break Statement

```
for i in range(1,10,1):
    if i==5:
        break
    print(i)
```

Loops

Continue Statement

```
for i in range(1,10,1):
    if i==5:
        continue
    print(i)
```

Loops

Pass Statement

```
for i in range(1,100,1):
    if i%2!=0:
        pass
    else:
        print(i)
```

Loops

For Else

```
a=[1,2,3,4,6,7]
for i in a:
        if i%5=0:
                break
else:
        print("Not Found")
```

Functions

Axpino Technologies

Python Programing

Functions

Function Definition

```
def greet():
        print("Hello")
        print("Good Morning")
```

Functions

Passing Parameter to function

Formal Arguments

```
def add(x,y):
        c=x+y
        print(c)

add(4,5)
```

Actual Argument

Functions

Types of arguments

- Position
- Keyword
- Default
- Variable length

Functions

Position Argument

```
def person(name,age):
    print(name)
    print(age)

person("Harminder",29)
```

Functions

Keyword Argument

```
def person(name,age):
        print(name)
        print(age)
person(age=11,name="Harminder")
```

Functions

Default Argument

```
def person(name="Surender",age=26):
        print(name)
        print(age)
person()
```

Functions

Variable Length Argument

```
def sum(a,*b):
    for i in b:
        c=a+i
        print(c)

sum(2,4,6)
```

Functions

Keyworded Variable Length Argument

```
def person(a,**b):
        print(a)
        print(b)

person("Harminder",city="faridabad",age=19)
```

Functions

Keyworded Variable Length Argument

```
def person(a,**b):
        print(a)
        for i,j in b.items():
                print(i,j)

person("Harminder",city="faridabad",age=19)
```

Functions

Returning values from function

```
def add(x,y):
        c=x+y
        return c

a=add(4,5)
print(a)
```

Returning multiple values from function

Functions

```
def add_sub(x,y):
        c=x+y
        d=x-y
        return c,d

a,b=add_sub(4,5)
print(a,b)
```

Functions

Global & Local Variables

```
a=10
def hello():
        a=15
        print(a)

hello()

print(a)
```

Functions

Local Variables can only be used inside function

```
def hello():
        a=15
        print(a)

print(a)
```

This code will generate a Error

Functions

Global Variables can be used anywhere in Program

```
a=10
def hello():
        print(a)

hello()
```

Functions

Changing Value of a global Variable

```
a=10
def hello():
        global a
        a=15
        print(a)

hello()
print(a)
```

Functions

Passing List/tuple/set to a function

```
def hello(a,b,c):
        print(a)
        print(b)
        print(c)

a=[1,2,3,4,5]
b=(1,2,3,4,5)
c={1,2,3,4,5}

hello(a,b,c)
```

Functions

Anonymous Function(LAMBDA)

```
f= lambda a,b:a+b

result = f(5,6)

print(result)
```

Functions

Using Filter with lambda

```
nums = [2,3,45,6,7,8,80]

r= filter(lambda n:n%2==0,nums)

for i in r:
        print(i)
```

Functions

Using Map with lambda

```
nums = [2,3,45,6,7,8,80]

r= map(lambda n:n*2,nums)

for i in r:
        print(i)
```

Functions

Using Reduce with lambda

```
from functools import reduce
nums = [2,3,45,6,7,8,80]

r= reduce(lambda a,b:a+b,nums)

print(r)
```

Functions

Creating Modules in Python

```
def add(a,b):
        c=a+b
        return c

def sub(a,b):
        c=a-b
        return c

def mul(a,b):
        c=a*b
        return c
```

Using User Defined Modules in Python

Functions

```
import hello as h

r=h.add(3,4)

print(r)
```

Special Variable

```
import hi as h

def fun1():
        print("This is function 1")
        h.add()

def fun2():
        print("This is function 2")

def main():
        fun1()
        fun2()
```

```
def add():
        print("This is add function")

def mul():
        print("This is mul function")

def hello():
        add()
        mul()

if __name__ == "__main__":
        hello()
```

main()

Axpino Technologies

Python Programing

Object Oriented Programing

Axpino Technologies

Python Programing

OOP

Class Definition

```
class a:
        def add(self):
                print(“This is add function")

obj = a()
a.add(obj)
obj.add()
```

OOP

Multiple Object of a class

```
class a:
        def add(self):
                print(“This is add function")

obj = a()
obj2=a()
obj.add()
obj2.add()
```

OOP

__init__ Method

```
class a:
        def __init__(self)
                print("This is init function")

obj = a()
```

OOP

Passing Arguments to a Method

```
class person:
        def a(self,name):
                print("Hi",name)

obj = person()
obj.a("Harminder")
```

OOP

Accessing Variable

```
class person:
    x=1

obj = person()
print(obj.x)
```

Binding variable to object

OOP

```
class a:
        def b(self,k=5,n=4):
                self.k=k
                self.n=n
        def c(self):
                print(self.k,self.n)

obj = a()
obj.b(44,67)
obj.c()

obj2 = a()
obj2.b()
obj2.c()
```

Binding variable to object using __init__

OOP

```
class a:
        def __init__(self,k=5,n=4):
                self.k=k
                self.n=n
        def c(self):
                print(self.k,self.n)

obj = a(44,67)
obj.c()

obj2 = a()
obj2.c()
```

Instance Variable

OOP

```
class a:
        def __init__(self):
                self.b=5

c1=a()
c2=a()
print(c1.b)
print(c2.b)
c1.b=10
print(c1.b)
print(c2.b)
```

Class Variable

OOP

```
class a:
        x=4
        def __init__(self):
                self.b=5

c1=a()
c2=a()
print(c1.x)
print(c2.x)
a.x=15
print(c1.x)
print(c2.x)

c1.x=55
print(c1.x)
print(c2.x)
```

Types of Methods

(Instance Methods)

OOP

```
class student:
        def __init__(self,m1,m2,m3):
                self.m1=m1
                self.m2=m2
                self.m3=m3

        def avg(self):
                return (self.m1+self.m2+self.m3)/3

s1 = student(23,56,44)
s2 = student(90,89,45)
print(s1.avg())
print(s2.avg())
```

Types of Methods

(Instance Methods)

- Accessors
- Mutators

```
class student:
        def __init__(self):
                self.a="Harminder"

        def get_a(self):
                print(self.a)

s1 = student()
s1.get_a()
```

OOP

Types of Methods

(Instance Methods)

Accessors

Mutators

```
class student:
        def __init__(self):
                self.a="Harminder"

        def set_a(self):
                self.a="surender"
                return self.a

s1 = student()
print(s1.a)
print(s1.set_a())
```

OOP

Types of Methods

(Class Methods)

OOP

```
class student:
        school="vsics"

        @classmethod
        def get_school(cls):
                print(cls.school)

s1=student()
student.get_school()
```

Types of Methods

(Static Methods)

OOP

```
class student:
        @staticmethod
        def a():
                print("hi")

s1=student()
s1.a()
```

Inner Class

OOP

```
class student:
        def a(self):
                print("hi")
                self.obj = self.b()
                self.obj.hello()

        class b:
                def hello(self):
                        print("hello")

s1=student()
s1.a()
```

Inner Class

(using Object of inner class outside main class)

OOP

```
class student:
        def a(self):
                print("hi")
                self.obj = self.b()

        class b:
                def hello(self):
                        print("hello")

s1=student()
s1.a()
s1.obj.hello()
```

Inner Class

(Defining Object of inner class outside main class)

OOP

```
class student:
        def a(self):
                print("hi")

        class b:
                def hello(self):
                        print("hello")

s1=student()
obj=s1.b()
obj.hello()
```

Inheritance

OOP

```
class a:
        def feature1(self):
                print("Feature 1 is working")

        def feature2(self):
                print("Feature 2 is working")

class b(a):
        def feature3(self):
                print("Feature 3 is working")

        def feature4(self):
                print("Feature 4 is working")

obj1 = b()
obj1.feature1()
```

Multi Level Inheritance

OOP

```
class a:
        def feature1(self):
                print("Feature 1 is working")

        def feature2(self):
                print("Feature 2 is working")

class b(a):
        def feature3(self):
                print("Feature 3 is working")

        def feature4(self):
                print("Feature 4 is working")

class c(b):
        def feature5(self):
                print("Feature 5 is working")

obj1 = c()
obj1.feature1()
```

Multiple Inheritance

OOP

```
class a:
        def feature1(self):
                print("Feature 1 is working")

        def feature2(self):
                print("Feature 2 is working")

class b:
        def feature3(self):
                print("Feature 3 is working")

        def feature4(self):
                print("Feature 4 is working")

class c(a,b):
        def feature5(self):
                print("Feature 5 is working")

obj1 = c()
obj1.feature1()
```

Constructor Behavior in Single/Multi level inheritance

OOP

```
class a:
        def __init__(self):
                print("Init of a")
        def feature1(self):
                print("This is feature 1")
        def feature2(self):
                print("This is Feature 2")

class b(a):
        def __init__(self):
                super().__init__()
                print("Init of b")
        def feature3(self):
                print("This is feature 3")
        def feature4(self):
                print("This is Feature 4")

k = b()
```

Constructor Behavior in Multiple Inheritance (MRO)

OOP

```
class a:
        def __init__(self):
                super().__init__()
                print("Init of a")
        def feature1(self):
                print("This is feature 1")
        def feature2(self):
                print("This is Feature 2")

class b:
        def __init__(self):
                super().__init__()
                print("Init of b")
        def feature3(self):
                print("This is feature 3")
        def feature4(self):
                print("This is Feature 4")

class c(a,b):
        def __init__(self):
                super().__init__()
                print("Init of c")
        def feat(self):
                print("This is feat")

k = c()
```

OOP

Polymorphism

- Duck Typing
- Operator Overloading
- Method Overriding

Using methods in other classes

OOP

```
class b:
        def k(self):
                print("This is k function")

class a:
        def a(self,obj2):
                obj2.k()

obj2=b()
obj = a()
obj.a(obj2)
```

Duck Typing

OOP

```
class b:
        def k(self):
                print("This is k function")

class a:
        def a(self,obj2):
                obj2.k()

class d:
        def k(self):
                print("This is k in d")


obj2=d()
obj = a()
obj.a(obj2)
```

OOP

Operator Overloading

Operators

$$5 + 2$$

Operands

OOP

Operator Overloading

(Everything in python is a class)

```
a=4
b=5
c=a+b
print(c)

print(int.__add__(a,b))
```

OOP

Operator Overloading

(Int class has various methods)

+	• __add__()
-	• __sub__()
*	• __mul__()

OOP

Overloading Addition Operator

```
class a:
        def __init__(self,m1,m2):
                self.m1=m1
                self.m2=m2
        def __add__(obj1,obj2):
                x = obj1.m1+obj2.m1
                y = obj1.m2+obj2.m2
                z = a(x,y)
                return z


s1 = a(3,4)
s2 = a(44,55)

s3 = s1+s2
print(s3.m1)
```

OOP

Overloading Greater than Operator

```
class a:
        def __init__(self,m1,m2):
                self.m1=m1
                self.m2=m2
        def __gt__(obj1,obj2):
                x = obj1.m1+obj1.m2
                y = obj2.m1+obj2.m2
                if x>y:
                        return True
                else:
                        return False

s1 = a(3,4)
s2 = a(44,55)

if s1>s2:
        print("s1 wins")
else:
        print("s2 wins")
```

OOP

Method Overriding

```
class a:
        def greet(self):
                print("Welcome to class a")

class b(a):
        def greet(self):
                print("Welcome to class b")

obj = b()
obj.greet()
```

OOP

Iterator

```
a = [2,33,45,67,890,3]

c = iter(a)

print(c.__next__())

for i in a:
        print(c.__next__())
```

OOP

Generators Example 1

```
def hello():
        yield 1
        yield 2
        yield 3

values=hello()
print(values.__next__())
print(values.__next__())
print(values.__next__())
```

OOP

Generators Example 2

```
def sq():
        n=1
        while n<=10:
                yield n*n
                n+=1

values=sq()

print(next(values))
for i in values:
        print(i)
```

Exception Handling

Exception Handling

Types of Errors

- Compile Time
- Logical
- Runtime Error

Exception Handling

Types of Statements

a=25
b=5

Normal Statement

c=a/b → Critical Statement

Exception Handling

Runtime Error Example

```
a=25
b=0
print(a/b)
```

C:\Windows\system32\cmd.exe

```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\DELL>cd Desktop

C:\Users\DELL\Desktop>python hi.py
Traceback (most recent call last):
  File "hi.py", line 3, in <module>
    print(a/b)
ZeroDivisionError: division by zero

C:\Users\DELL\Desktop>_
```

Exception Handling

Runtime Error Example

```
a=5
b=0

try:
        print(a/b)
except Exception:
        print("You cannot divide a number by zero")

print("bye")
```

Exception Handling

Try/Except/finally

```
a=5
b=2

try:
        print("Calculation mode started")
        print(a/b)

except Exception:
        print("You cannot divide a number by
zero")

finally:
        print("Calculation mode closed")
```

Exception Handling

Handling Specific Errors

```
a=5
b=2

try:
        print("Calculation mode started")
        print(a/b)

except ZeroDivisionError:
        print("You cannot divide a number by
zero")

finally:
        print("Calculation mode closed")
```

Multi Threading

Axpino Technologies

Python Programing

Multi Threading

Multi Threading

```
from threading import *
from time import sleep
class hello(Thread):
        def run(self):
                for i in range(0,50):
                        print("hello")
                        sleep(1)

class hi(Thread):
        def run(self):
                for i in range(0,50):
                        print("hi")
                        sleep(1)

t1=hello()
t2=hi()

t1.start()
sleep(0.2)
t2.start()
```

Concept of Join

Multi Threading

```
from threading import *
from time import sleep
class hello(Thread):
        def run(self):
                for i in range(0,10):
                        print("hello")
                        sleep(1)

class hi(Thread):
        def run(self):
                for i in range(0,10):
                        print("hi")
                        sleep(1)

t1=hello()
t2=hi()

t1.start()
sleep(0.2)
t2.start()

t1.join()
print("bye")
```

File Handling

File Handling

Opening a file in Python

open(“filename”,”mode”)

"r" - Read - Default value. Opens a file for reading, error if the file does not exist

"a" - Append - Opens a file for appending, creates the file if it does not exist

"w" - Write - Opens a file for writing, creates the file if it does not exist

"x" - Create - Creates the specified file, returns an error if the file exists

File Handling

Reading Complete file

```
f=open("hello.txt","r")
print(f.read())
```

File Handling

Reading bits of a file

```
f=open("hello.txt","r")
print(f.read(6))
```

File Handling

Reading one line at a time

```
f=open("hello.txt","r")
print(f.readline())
print(f.readline())
```

Reading Bits of a line

File Handling

```
f=open("hello.txt","r")
print(f.readline())
print(f.readline(4))
```

Writing a file

File Handling

```
f=open("hello.txt","w")
f.write("hi who are you??")
```

Append to a file

File Handling

```
f=open("hello.txt",“a")
f.write("hi who are you??")
```

File Handling

Using for loop with file handler

```
f=open("hello.txt","r")

f1=open("hi.txt","a")

for i in f:
        f1.write(i)
```

File Handling

Removing a file

```
import os
os.remove("hi.txt")
```

File Handling

Removing a file

```
import os

if os.path.exists("hello.txt"):
        os.remove("hello.txt")
else:
        print("no file")
```