GOVT. POLYTECHNIC, KANDHAMAL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

LABORATORY MANUAL FOR PYTHON PROGRAMMING LAB

BRANCH – CSE

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INTRODUCTION TO PYTHON PROGRAMMING.

Theory: - Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL). This tutorial gives enough understanding on Python programming language.

Prerequisites

You should have a basic understanding of Computer Programming terminologies. A basic understanding of any of the programming languages is a plus.

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

- **Python is Interpreted** − Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive** − You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented** − Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language** − Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

History of Python

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python is now maintained by a core development team at the institute, although Guido van Rossum still holds a vital role in directing its progress.

Python Features

Python's features include −

- **Easy-to-learn** − Python has few keywords, simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- **Easy-to-read** − Python code is more clearly defined and visible to the eyes.
- **Easy-to-maintain** − Python's source code is fairly easy-to-maintain.
- **A broad standard library** − Python's bulk of the library is very portable and cross-platformcompatible on UNIX, Windows, and Macintosh.
- **Interactive Mode** − Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.
- **Portable** − Python can run on a wide variety of hardware platforms and has the same interface on all platforms.
- **Extendable** − You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.
- **Databases** − Python provides interfaces to all major commercial databases.
- **GUI Programming** − Python supports GUI applications that can be created and ported to many system calls, libraries and windows systems, such as Windows MFC, Macintosh, and the X Window system of Unix.
- **Scalable** − Python provides a better structure and support for large programs than shell scripting.

Apart from the above-mentioned features, Python has a big list of good features, few are listed below −

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports dynamic type checking.
- It supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

Operators are the constructs which can manipulate the value of operands.

Consider the expression 4 + 5 = 9. Here, 4 and 5 are called operands and + is called operator.

Python Variables: Declare, Concatenate, Global & Local

What is a Variable in Python?

A Python variable is a reserved memory location to store values. In other words, a variable in a python program gives data to the computer for processing.

Every value in Python has a datatype. Different data types in Python are Numbers, List, Tuple, Strings, Dictionary, etc. Variables can be declared by any name or even alphabets like a, aa, abc, etc.

How to Declare and use a Variable

Let see an example. We will declare variable "a" and print it.

```
a=100
print a
```

Python 1 Example

```
# Declare a variable and initialize it
f = 0
print f
# re-declaring the variable works
f = 'guru99'
print f
```

List of some different variable types

```
x = 123                     # integer
x = 123L                    # long integer
x = 3.14                    # double float
x = "hello"                 # string
x = [0,1,2]                 # list
x = (0,1,2)                 # tuple
x = open('hello.py', 'r')   # file
```

Constants

A constant is a type of variable whose value cannot be changed. It is helpful to think of constants as containers that hold information which cannot be changed later.

Non technically, you can think of constant as a bag to store some books and those books cannotbe replaced once place inside the bag.

Assigning value to a constant in Python

In Python, constants are usually declared and assigned on a module. Here, the module means a new file containing variables, functions etc which is imported to main file. Inside the module, constants are written in all capital letters and underscores separating the words.

Example 3: Declaring and assigning value to a constant

Create a constant.py

```
1. PI = 3.14
2. GRAVITY = 9.8
```

Create a main.py

```
1. import constant
2.
3. print(constant.PI)
4. print(constant.GRAVITY)
```

When you run the program, the output will be:

```
3.14
9.8
```

Types of Operator

Python language supports the following types of operators.

- Arithmetic Operators
- Comparison (Relational) Operators
- Assignment Operators
- Logical Operators
- Bitwise Operators
- Membership Operators
- Identity Operators

Let us have a look on all operators one by one.

Python Arithmetic Operators

Assume variable a holds 10 and variable b holds 20, then −

Operator	Description	Example
+ Addition	Adds values on either side of the operator.	a + b =30
- Subtraction	Subtracts right hand operand from left hand operand.	a – b = 10
* Multiplication	Multiplies values on either side of the operator	a * b = 200
/ Division	Divides left hand operand by right hand operand	b / a = 2
% Modulus	Divides left hand operand by right hand operand and returns remainder	b % a = 0
** Exponent	Performs exponential (power) calculation on operators	a**b =10 to the power 20
//	Floor Division - The division of operands where the result is the quotient in which the digits after the decimal point are	9//2 = 4 and

	removed. But if one of the operands is negative, the result is floored, i.e., rounded away from zero (towards negative infinity) −	9.0//2.0 = 4.0, 11//3 = -4, -11.0//3 = -4.0

Python Comparison Operators

These operators compare the values on either sides of them and decide the relation among them. They are also called Relational operators.

Assume variable a holds 10 and variable b holds 20, then −

Operator	Description	Example
==	If the values of two operands are equal, then the condition becomes true.	(a == b) is not true.
!=	If values of two operands are not equal, then condition becomes true.	(a != b) is true.
<>	If values of two operands are not equal, then condition becomes true.	(a <> b) is true. This is similar to != operator.
>	If the value of left operand is greater than the value of right operand, then condition becomes true.	(a > b) is not true.

<	If the value of left operand is less than the value of right operand, then condition becomes true.	(a < b) istrue.
>=	If the value of left operand is greater than or equal to the value of right operand, then condition becomes true.	(a >= b) is not true.
<=	If the value of left operand is less than or equal to the value ofright operand, then condition becomes true.	(a <= b) istrue.

Python Assignment Operators

Assume variable a holds 10 and variable b holds 20, then −

Operator	Description	Example
=	Assigns values from right side operands to left side operand	c = a + b assigns value of a + b into c
+= Add AND	It adds right operand to the left operand and assign the result to left operand	c += a is equivalent to c = c + a
-= Subtract AND	It subtracts right operand from the left operand and assign the result to left operand	c -= a is equivalent to c = c - a

*= Multiply AND	It multiplies right operand with the left operand and assignthe result to left operand	c *= a is equivalent
		to c = c * a
/= Divide AND	It divides left operand with the right operand and assign the result to left operand	c /= a is equivalent to c = c / ac /= a is equivalent to c = c / a
%= Modulus AND	It takes modulus using two operands and assign the result to left operand	c %= a is equivalent to c = c % a
**= Exponent AND	Performs exponential (power) calculation on operators and assign value to the left operand	c **= a is equivalent to c = c ** a
//= Floor Division	It performs floor division on operators and assign value tothe left operand	c //= a is equivalent to c = c // a

Python Bitwise Operators

Bitwise operator works on bits and performs bit by bit operation. Assume if a = 60; and b = 13;

Now in binary format they will be as follows − a = 0011 1100 b = 0000 1101

---

a&b = 0000 1100

a|b = 0011 1101 a^b

= 0011 0001

~a = 1100 0011

There are following Bitwise operators supported by Python language[

Show Example]

Operator	Description	Example
& Binary AND	Operator copies a bit to the result if it exists in both operands	(a & b) (means 0000 1100)
| Binary OR	It copies a bit if it exists in either operand.	(a | b) = 61 (means 0011 1101)
^ Binary XOR	It copies the bit if it is set in one operand but not both.	(a ^ b) = 49 (means 0011 0001)
~ Binary Ones Complement	It is unary and has the effect of 'flipping' bits.	(~a) = -61 (means 1100 0011 in 2's complement form due to a signed binary number.

<< Binary Left Shift	The left operands value is moved left by the numberof bits specified by the right operand.	a << 2 = 240 (means 1111 0000)
>> Binary Right Shift	The left operands value is moved right by the number of bits specified by the right operand.	a >> 2 = 15 (means 0000 1111)

Python Logical Operators

There are following logical operators supported by Python language. Assume variable a holds 10 and variable b holds 20 then

]

Operator	Description	Example
and Logical AND	If both the operands are true then condition becomes true.	(a and b) is true.
or Logical OR	If any of the two operands are non-zero then condition becomes true.	(a or b) is true.
not Logical NOT	Used to reverse the logical state of its operand.	Not(a and b) is false.

Used to reverse the logical state of its operand.

Python Membership Operators

Python's membership operators test for membership in a sequence, such as strings, lists, or tuples. There are two membership operators as explained below −

perator	Descriptio n	Example
In	Evaluates to true if it finds a variable in the specified sequence and false otherwise.	x in y, here in results in
		a 1 if x is a member of sequence y.
not in	Evaluates to true if it does not finds a variable in the specified sequence and false otherwise.	x not in y, here not in results in a 1 if x is not a member of sequence y.

Python Identity Operators

Identity operators compare the memory locations of two objects. There are two Identity operators explained below −

Operator	Description	Example
Is	Evaluates to true if the variables on either side of the operatorpoint to the same object and false otherwise.	x is y, here **is** results in 1 if id(x) equals id(y).
is not	Evaluates to false if the variables on either side of the operator point to the same object and true otherwise.	x is not y, here **is not** results in 1 if id(x) is
		not equal to id(y).

Python Operators Precedence

The following table lists all operators from highest precedence to lowest.

Sl.No.	Operator & Description
1	**** Exponentiation (raise to the power)
2	**~ + -** Complement, unary plus and minus (method names for the last two are +@ and -@)
3	*** / % //** Multiply, divide, modulo and floor division
4	**+ -** Addition and subtraction
5	**>> <<** Right and left bitwise shift
6	**&** Bitwise 'AND'
7	**^ |** Bitwise exclusive `OR' and regular `OR'
8	<= < > >= Comparison operators
9	<> == **!=** Equality operators
10	**= %= /= //= -= += *= **=** Assignment operators
11	**Is, is not** Identity operators
12	**In, not in** Membership operators
	not, or, and

TO STUDY STRINGS IN PYTHON

Theory:

String Literals

String literals in python are surrounded by either single quotation marks, or double quotation marks.

'hello' is the same as "hello".

You can display a string literal with the print() function:

Example

print("Hello")

print('Hello') Assign

String to a Variable

Assigning a string to a variable is done with the variable name followed by an equal sign and the string:

Example

```
a =
"Hello"
print(a)
```

Multiline Strings

You can assign a multiline string to a variable by using three quotes:

Example

You can use three double quotes:

```
a = """Lorem ipsum dolor sit
amet, consectetur adipiscing
elit,
sed do eiusmod tempor incididunt
ut labore et dolore magna aliqua.""" print(a)
```

Or three single quotes: **Example**

```
a = '''Lorem ipsum
dolor sit amet, consectetur
adipiscing elit, sed do
eiusmod tempor incididunt
ut labore et dolore magna
aliqua.''' print(a)
```

Strings are Arrays

Like many other popular programming languages, strings in Python are arrays of bytes representingunicode characters.

However, Python does not have a character data type, a single character is simply a string with a length of 1. Square brackets can be used to access elements of the string.

Example

Get the character at position 1 (remember that the first character has the position 0):

```
a = "Hello,
World!"
print(a[1])
```

Example

Substring. Get the characters from position 2 to position 5 (not included):

```
b = "Hello,
World!"print(b[2:5])
```

In-bulit Functions in Python:

1. **Strip():**Removes all leading whitespace in string.
2. **len(string)**:Returns the length of the string
3. **upper()**:Converts lowercase letters in string to uppercase.
4. **Lower(): Vice versa**
5. **split(str="", num=string.count(str))**:Splits string according to delimiter str (space if not provided)and returns list of substrings; split into at most num substrings if given.
6. **replace(old, new [, max])**:Replaces all occurrences of old in string with new or at most maxoccurrences if max given.
7. **find(str, beg=0 end=len(string))**:Determine if str occurs in string or in a substring of string ifstarting index beg and ending index end are given returns index if found and -1 otherwise

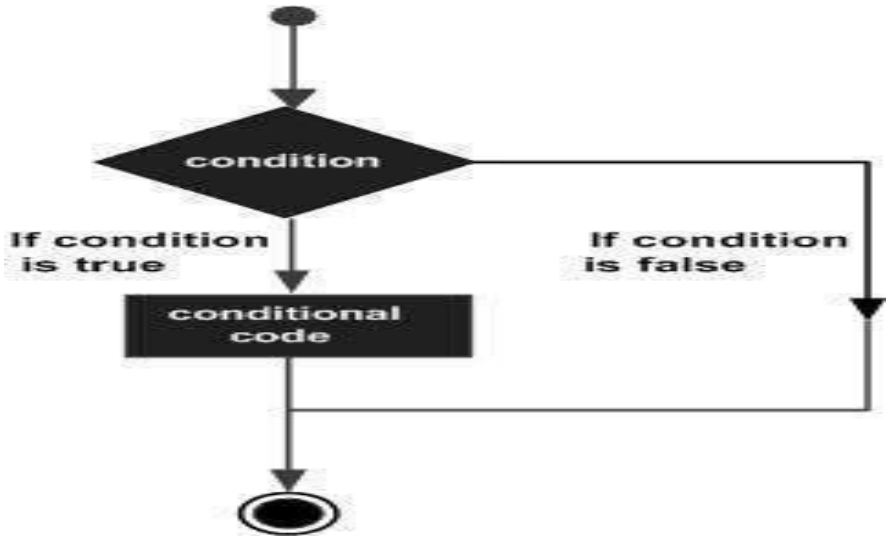
TO STUDY CONDITIONAL STATEMENTS IN PYTHON

Theory:

Decision making is anticipation of conditions occurring while execution of the program and specifying actions taken according to the conditions.

Decision structures evaluate multiple expressions which produce TRUE or FALSE as outcome. You need to determine which action to take and which statements to execute if outcome is TRUE or FALSE otherwise.

Following is the general form of a typical decision making structure found in most of the programming languages −



Python programming language assumes any **non-zero** and **non-null** values as TRUE, and if it iseither **zero** or **null**, then it is assumed as FALSE value.

Python programming language provides following types of decision making statements.

Sr.No.	Statement & Description
1	**if statements** An **if statement** consists of a boolean expression followed by one or more statements.
2	**if...else statements** An **if statement** can be followed by an optional **else statement**, which executes when the boolean expression is FALSE.
3	**nested if statements** You can use one **if** or **else if** statement inside another **if** or **else if**statement(s).

Single Statement Suites

If the suite of an **if** clause consists only of a single line, it may go on the same line as the header statement.

Here is an example of a **one-line if** clause −

```
var = 100 if ( var == 100 ) : print "Value of

expression is 100" print "Good bye!"
```

When the above code is executed, it produces the following result −

```
Value of expression is 100 Good
bye!
```

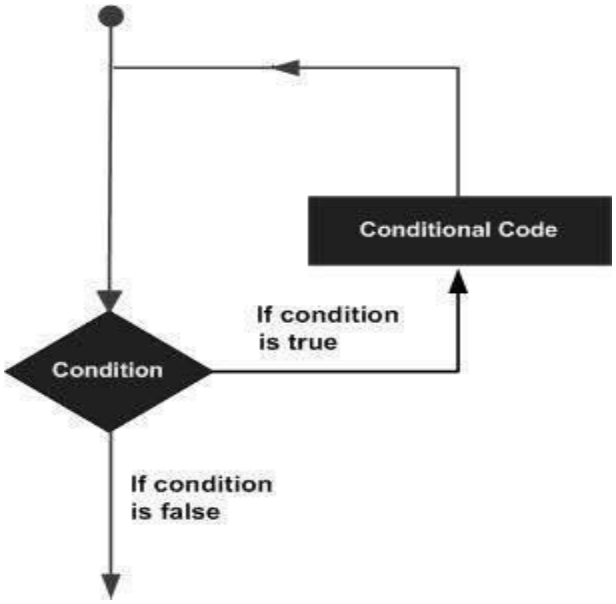
TO STUDY LOOPS IN PYTHON

Theory:

In general, statements are executed sequentially: The first statement in a function is executed first, followed by the second, and so on. There may be a situation when you need to execute a block of code several number of times.

Programming languages provide various control structures that allow for more complicated execution paths.

A loop statement allows us to execute a statement or group of statements multiple times. The following diagram illustrates a loop statement −



Python programming language provides following types of loops to handle looping requirements.

Sr.No.	Loop Type & Description
1	**while loop** Repeats a statement or group of statements while a given condition is TRUE. It tests the condition before executing the loop body.
2	**for loop** Executes a sequence of statements multiple times and abbreviates the code that manages the loop variable.
3	**nested loops** You can use one or more loop inside any another while, for or do..while loop.

Loop Control Statements

Loop control statements change execution from its normal sequence. When execution leaves a scope, all automatic objects that were created in that scope are destroyed.

Python supports the following control statements. Click the following links to check their detail. Let us go through the loop control statements briefly

Sr.No.	Control Statement & Description
1	**break statement** Terminates the loop statement and transfers execution to the statementimmediately following the loop.
2	**continue statement** Causes the loop to skip the remainder of its body and immediately retest itscondition prior to reiterating.
3	**pass statement** The pass statement in Python is used when a statement is required syntacticallybut you do not want any command or code to execute.

TO STUDY PYTHON ARRAYS, LIST, TUPLES, SET, DICTIONARY

Theory:

What is an Array?

An array is a special variable, which can hold more than one value at a time. If you have a list of items (a list of car names, for example), storing the cars in single variables could look like this:

```
car1 = "Ford" car2
=  "Volvo"  car3
="BMW"
```

However, what if you want to loop through the cars and find a specific one? And what if you had not 3 cars, but 300?

The solution is an array!

An array can hold many values under a single name, and you can access the values by referring to an index number.

Access the Elements of an Array

You refer to an array element by referring to the *index number*.

Example

Get the value of the first array item:

```
x = cars[0]
```

Example

Modify the value of the first array item:

```
cars[0] = "Toyota"
```

The Length of an Array

Use the len() method to return the length of an array (the number of elements in an array).

Example

Return the number of elements in the cars array:

```
x = len(cars)
```

Note: The length of an array is always one more than the highest array index.

Looping Array Elements

You can use the for in loop to loop through all the elements of an array.

Example

Print each item in the cars array:

```
for x in
 cars:
 print(x)
```

Adding Array Elements

You can use the append() method to add an element to an array.

Example

Add one more element to the cars array:

```
cars.append("Honda")
```

Removing Array Elements

You can use the pop() method to remove an element from the array.

Example

Delete the second element of the cars array:

```
cars.pop(1)
```

You can also use the remove() method to remove an element from the array.

Example

Delete the element that has the value "Volvo":

```
cars.remove("Volvo")
```

Note: The remove() method only removes the first occurrence of the specified value.

Array Methods

Python has a set of built-in methods that you can use on lists/arrays.

Method	Description
append()	Adds an element at the end of the list
clear()	Removes all the elements from the list
copy()	Returns a copy of the list
count()	Returns the number of elements with the specified value
extend()	Add the elements of a list (or any iterable), to the end of the current list
index()	Returns the index of the first element with the specified value

Note: Python does not have built-in support for Arrays, but Python Lists can be used instead.

insert()	Adds an element at the specified position
pop()	Removes the element at the specified position
remove()	Removes the first item with the specified value
reverse()	Reverses the order of the list
sort()	Sorts the list

Python List:

The list is a most versatile datatype available in Python which can be written as a list of commaseparated values (items) between square brackets. Important thing about a list is that items in a list need not be of the same type.

Creating a list is as simple as putting different comma-separated values between square brackets. For example −

```
list1 = ['physics', 'chemistry', 1997, 2000];
list2 = [1, 2, 3, 4, 5 ]; list3 = ["a", "b", "c", "d"]
```

Similar to string indices, list indices start at 0, and lists can be sliced, concatenated and so on.

Accessing Values in Lists

To access values in lists, use the square brackets for slicing along with the index or indices to obtain value available at that index. For example −

```
list1 = ['physics', 'chemistry', 1997, 2000];
list2 = [1, 2, 3, 4, 5, 6, 7 ];
print "list1[0]: ", list1[0]
print "list2[1:5]: ", list2[1:5]
```

When the above code is executed, it produces the following result −

```
list1[0]: physics list2[1:5]:
[2, 3, 4, 5]
```

Updating Lists

You can update single or multiple elements of lists by giving the slice on the left-hand side of the assignment operator, and you can add to elements in a list with the append() method. For example −

```
list = ['physics', 'chemistry', 1997, 2000];
print "Value available at index 2 : " print
list[2] list[2] = 2001; print "New value
available at index 2 : " print list[2]
```

Note − append() method is discussed in subsequent section. When the above code is executed, it produces the following result −

```
Value available at index 2 :
1997
New value available at index 2 :
2001
```

Delete List Elements

To remove a list element, you can use either the del statement if you know exactly which element(s) you are deleting or the remove() method if you do not know. For example −

```
list1 = ['physics', 'chemistry', 1997, 2000]; print list1
```

```
del list1[2]; print "After deleting value

at index 2 : " print list1
```

When the above code is executed, it produces following result −

```
['physics', 'chemistry', 1997, 2000] After deleting value at index 2 :
['physics', 'chemistry', 2000]
```

Note − remove() method is discussed in subsequent section.

Basic List Operations

Lists respond to the + and * operators much like strings; they mean concatenation and repetition here too, except that the result is a new list, not a string.

In fact, lists respond to all of the general sequence operations we used on strings in the prior chapter.

Python Expression	Results	Description
len([1, 2, 3])	3	Length
[1, 2, 3] + [4, 5, 6]	[1, 2, 3, 4, 5, 6]	Concatenation
['Hi!'] * 4	['Hi!', 'Hi!', 'Hi!', 'Hi!']	Repetition
3 in [1, 2, 3]	True	Membership
for x in [1, 2, 3]: print x,	1 2 3	Iteration

Indexing, Slicing, and Matrixes

Because lists are sequences, indexing and slicing work the same way for lists as they do for strings.

Assuming following input −

```
L = ['spam', 'Spam', 'SPAM!']
```

Python Expression	Results	Description
L[2]	SPAM!	Offsets start at zero
L[-2]	Spam	Negative: count from the right
L[1:]	['Spam', 'SPAM!']	Slicing fetches sections

Built-in List Functions & Methods

Python includes the following list functions −

Sr.No.	Function with Description
1	**cmp(list1, list2)** Compares elements of both lists.
2	**len(list)** Gives the total length of the list.
3	**max(list)** Returns item from the list with max value.
4	**min(list)** Returns item from the list with min value.
5	**list(seq)** Converts a tuple into list.

Python includes following list methods

Sr.No.	Methods with Description
1	**list.append(obj)**
	Appends object obj to list
2	**list.count(obj)** Returns count of how many times obj occurs in list
3	**list.extend(seq)** Appends the contents of seq to list
4	**list.index(obj)** Returns the lowest index in list that obj appears
5	**list.insert(index, obj)** Inserts object obj into list at offset index
6	**list.pop(obj=list[-1])** Removes and returns last object or obj from list
7	**list.remove(obj)** Removes object obj from list
8	**list.reverse()** Reverses objects of list in place
9	**list.sort([func])** Sorts objects of list, use compare func if given

Python Tuple:

A tuple is a sequence of immutable Python objects. Tuples are sequences, just like lists. The differences between tuples and lists are, the tuples cannot be changed unlike lists and tuples use parentheses, whereas lists use square brackets.

Creating a tuple is as simple as putting different comma-separated values. Optionally you can put these comma-separated values between parentheses also. For example −

```
tup1 = ('physics', 'chemistry', 1997, 2000);
tup2 = (1, 2, 3, 4, 5 ); tup3 = "a", "b", "c", "d";
```

The empty tuple is written as two parentheses containing nothing −

```
tup1 = ();
```

To write a tuple containing a single value you have to include a comma, even though there is only one value −

```
tup1 = (50,);
```

Like string indices, tuple indices start at 0, and they can be sliced, concatenated, and so on.

Accessing Values in Tuples

To access values in tuple, use the square brackets for slicing along with the index or indices to obtain value available at that index. For example −

```
tup1 = ('physics', 'chemistry', 1997, 2000); tup2 = (1, 2, 3, 4, 5, 6, 7 ); print

"tup1[0]: ", tup1[0]; print "tup2[1:5]: ", tup2[1:5];
```

When the above code is executed, it produces the following result −

```
tup1[0]: physics tup2[1:5]:
[2, 3, 4, 5]
```

Updating Tuples

Tuples are immutable which means you cannot update or change the values of tuple elements. You are able to take portions of existing tuples to create new tuples as the following example demonstrates −

```
tup1 = (12, 34.56); tup2
= ('abc', 'xyz');


# Following action is not valid for tuples
# tup1[0] = 100;


# So let's create a new tuple as follows
tup3 = tup1 + tup2; print
tup3;
```

When the above code is executed, it produces the following result −

```
(12, 34.56, 'abc', 'xyz')
```

Delete Tuple Elements

Removing individual tuple elements is not possible. There is, of course, nothing wrong with putting together another tuple with the undesired elements discarded.

To explicitly remove an entire tuple, just use the **del** statement. For example −

```
tup = ('physics', 'chemistry', 1997, 2000); print tup; del tup; print "After
deleting tup : "; print tup;
```

This produces the following result. Note an exception raised, this is because after **del tup** tuple does not exist any more −

```
('physics', 'chemistry', 1997, 2000) After
deleting tup :
Traceback (most recent call last): File
"test.py", line 9, in <module> print
tup;
NameError: name 'tup' is not defined
```

Basic Tuples Operations

Tuples respond to the + and * operators much like strings; they mean concatenation and repetition here too, except that the result is a new tuple, not a string.

In fact, tuples respond to all of the general sequence operations we used on strings in the prior chapter −

Python Expression	Results	Description
len((1, 2, 3))	3	Length
(1, 2, 3) + (4, 5, 6)	(1, 2, 3, 4, 5, 6)	Concatenation
('Hi!',) * 4	('Hi!', 'Hi!', 'Hi!', 'Hi!')	Repetition
3 in (1, 2, 3)	True	Membership
for x in (1, 2, 3): print x,	1 2 3	Iteration

Indexing, Slicing, and Matrixes

Because tuples are sequences, indexing and slicing work the same way for tuples as they do for strings. Assuming following input −

```
L = ('spam', 'Spam', 'SPAM!')
```

Python Expression	Results	Description
L[2]	'SPAM!'	Offsets start at zero

L[-2]	'Spam'	Negative: count from the right
L[1:]	['Spam', 'SPAM!']	Slicing fetches sections

No Enclosing Delimiters

Any set of multiple objects, comma-separated, written without identifying symbols, i.e., brackets for lists, parentheses for tuples, etc., default to tuples, as indicated in these short examples −

```
print 'abc', -4.24e93, 18+6.6j, 'xyz';

x, y = 1, 2; print "Value of x , y : ",

x,y;
```

When the above code is executed, it produces the following result −

```
abc -4.24e+93 (18+6.6j) xyz Value
of x , y : 1 2
```

Built-in Tuple Functions

Python includes the following tuple functions −

Sr.No.	Function with Description
1	**cmp(tuple1, tuple2)** Compares elements of both tuples.
2	**len(tuple)** Gives the total length of the tuple.

3	**max(tuple)** Returns item from the tuple with max value.
4	**min(tuple)** Returns item from the tuple with min value.
5	**tuple(seq)** Converts a list into tuple.

Python Sets:

A set is a collection which is unordered and unindexed. In Python sets are written with curly brackets.

Example

Create a Set:

```
thisset = {"apple", "banana", "cherry"}
print(thisset)
```

Note: Sets are unordered, so the items will appear in a random order.

Access Items

You cannot access items in a set by referring to an index, since sets are unordered the items hasno index.

But you can loop through the set items using a `for` loop, or ask if a specified value is present in a set, by using the`in` keyword.

Example

Loop through the set, and print the values:

```
thisset = {"apple", "banana", "cherry"}

for x in thisset:
  print(x)
```

Example

Check if "banana" is present in the set:

```
thisset = {"apple", "banana", "cherry"}

print("banana" in thisset)
```

Change Items

Once a set is created, you cannot change its items, but you can add new items.

Add Items

To add one item to a set use the add() method.

To add more than one item to a set use the update() method.

Example

Add an item to a set, using the add() method:

```
thisset = {"apple", "banana", "cherry"}

thisset.add("orange")

print(thisset)
```

Example

Add multiple items to a set, using the update() method:

```
thisset = {"apple", "banana", "cherry"}

thisset.update(["orange", "mango", "grapes"])

print(thisset)
```

Get the Length of a Set

To determine how many items a set has, use the len() method.

Example

Get the number of items in a set:

```
thisset = {"apple", "banana", "cherry"}

print(len(thisset)
```

Remove Item

To remove an item in a set, use the remove(), or the discard() method.

Example

Remove "banana" by using the remove() method:

```
thisset = {"apple", "banana", "cherry"}

thisset.remove("banana") print(thisset)
```

Note: If the item to remove does not exist, remove() will raise an error.

Example

Remove "banana" by using the discard() method:

```
thisset = {"apple", "banana", "cherry"}

thisset.discard("banana")


print(thisset)
```

Note: If the item to remove does not exist, discard() will **NOT** raise an error.

The return value of the pop() method is the removed item.

Example

Remove the last item by using the pop() method:

```
thisset = {"apple", "banana", "cherry"}

x = thisset.pop()

print(x) print(thisset)
```

Note: Sets are *unordered*, so when using the pop() method, you will not know which item that gets removed.

Example

The clear() method empties the set:

```
thisset = {"apple", "banana", "cherry"}

thisset.clear()

print(thisset)
```

Example

The del keyword will delete the set completely:

```
thisset = {"apple", "banana", "cherry"}

del thisset

print(thisset)
```

Dictionary

A dictionary is a collection which is unordered, changeable and indexed. In Python dictionaries are written with curly brackets, and they have keys and values.

Example

Create and print a dictionary:

```
thisdict = {
  "brand": "Ford",
  "model":  "Mustang",
  "year": 1964
}
print(thisdict)
```

Accessing Items

You can access the items of a dictionary by referring to its key name, inside square brackets:

Example

Get the value of the "model" key:

```
x = thisdict["model"]
```

There is also a method called get() that will give you the same result:

Example

Get the value of the "model" key:

```
x = thisdict.get("model")
```

TO STUDY FUNCTIONS IN PYTHON

Theory:

A function is a block of code which only runs when it is called. You can pass data, known as parameters, into a function. A function can return data as a result.

Creating a Function

In Python a function is defined using the def keyword:

Example

my_function(): print("Hello from a function")

Calling a Function

To call a function, use the function name followed by parenthesis:

Example

def my_function(): print("Hello from a function") my_function()

Parameters

Information can be passed to functions as parameter. Parameters are specified after the function name, inside the parentheses. You can add as many parameters as you want, just separate them with a comma.The following example has a function with one parameter (fname). When the function is called, we pass along a first name, which is used inside the function to print the full name:

Example

def my_function(**fname**): print(fname + " Refsnes")

my_function(**"Emil"**) my_function(**"Tobias"**)
my_function(**"Linus"**) **Default Parameter**

Value

The following example shows how to use a default parameter value. If we call the function without parameter, it uses the default value:

Example

```
def my_function(country = "Norway"):
  print("I am from " + country)

my_function("Sweden")
my_function("India")
my_function()
my_function("Brazil")
```

Passing a List as a Parameter

You can send any data types of parameter to a function (string, number, list, dictionary etc.), andit will be treated as the same data type inside the function. E.g. if you send a List as a parameter, it will still be a List when it reaches the function:

Example

```
def my_function(food): for x in food:
   print(x)

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

my_function(fruits)
```

Return Values

To let a function return a value, use the return statement:

Example

```
def my_function(x):
  return 5 * x

print(my_function(3)) print(my_function(5))
print(my_function(9)) Recursion
```

Python also accepts function recursion, which means a defined function can call itself. Recursion is a common mathematical and programming concept. It means that a function calls itself. This has the benefit of meaning that you can loop through data to reach a result.

The developer should be very careful with recursion as it can be quite easy to slip into writing a function which never terminates, or one that uses excess amounts of memory or processor power. However, when written correctly recursion can be a very efficient and mathematicallyelegant approach to programming.

In this example, tri_recursion() is a function that we have defined to call itself ("recurse"). We use the k variable as the data, which decrements-1) every time we recurse. The recursion ends when

the condition is not greater than 0 (i.e. when it is 0).

To a new developer it can take some time to work out how exactly this works, best way to find out is by testing and modifying it.

Example

Recursion Example

```
def tri_recursion(k):
  if(k>0):
    result  =  k+tri_recursion(k-
    1)print(result)
else:     result
= 0
  return result

print("\n\nRecursion Example Results") tri_recursion(6)
```

TO STUDY CLASSES IN PYTHON

Theory:

Python Classes/Objects

Python is an object oriented programming language.

Almost everything in Python is an object, with its properties and methods.A

Class is like an object constructor, or a "blueprint" for creating objects.

Create a Class
To create a class, use the keyword class:

Example

Create a class named MyClass, with a property named x:

```
class MyClass:
  x = 5
```

Create Object

Now we can use the class named myClass to create objects:

Example

Create an object named p1, and print the value of x:

```
p1 = MyClass()
print(p1.x)
```

The __init__() Function

The examples above are classes and objects in their simplest form, and are not really useful in real life applications.

To understand the meaning of classes we have to understand the built-in __init__() function. All classes have a function called__init_(), which is always executed when the class is being initiated.

Use the___init_() function to assign values to object properties, or other operations that are necessary to do when the object is being created:

Example

Create a class named Person, use the __init_() function to assign values for name and age:

```
class Person:
  def___init_(self, name, age):
    self.name = name
    self.age = age

p1    =    Person("John",    36)

print(p1.name) print(p1.age)
```

Note: The __init__() function is called automatically every time the class is being used to create a new object.

Experiment 1:

Write instructions to perform each of the steps below

(a) Create a string containing at least five words and store it in a variable.

CODE-

```
name="Hello  my name is Akash Ghadai"
```

(b) Print out the string.

CODE-

```
print(name)
```

OUTPUT-

```
Hello my name is Akash Ghadai
```

(c) Convert the string to a list of words using the string split method.

CODE-

```
x=name.split()
```

(d) Sort the list into reverse alphabetical order using some of the list methods (you might need to use dir(list) or help(list) to find appropriate methods).

CODE-

```
x.reverse()
```

(e) Print out the sorted, reversed list of words.

CODE-

```
print(x)
```

OUTPUT-

```
['Ghadai', 'Akash', 'is', 'name', 'my', 'Hello']
```

Experiment 2:

Write a program that determines whether the number is prime.

CODE-

```
num=int(input("Enter a number."))
if num % 2 ==0:
print("{} is not prime number".format(num))
else:
print("{} is a prime number.".format(num))
```

OUTPUT-

```
Enter a number.29
29 is a prime number.
```

Experiment 3:

Find all numbers which are multiple of 17, but not the multiple of 5, between 2000 and 2500?.

CODE-

```
for num in range(2000,2501):
if(num % 17==0) and (num % 5!=0):
 print("",num)
```

OUTPUT-

```
2006
 2023
2057
2074
 2091
 2108
2142
 2159
 2176
 2193
 2227
 2244
 2261
 2278
 2312
 2329
 2346
 2363
 2397
 2414
 2431
 2448
 2482
 2499
```

Experiment 4:

Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.

CODE-

```
 a=20
b=30
print("a={}".format(a))
print("b={}".format(b))
a=a^b
b=b^a
a=a^b
print("a={}".format(a))
print("b={}".format(b))
```

OUTPUT-

```
a=20
b=30
a=30
b=20
```

Experiment 5:

Find the largest of n numbers, using a user defined function largest().

CODE-

```
 def largest(num1,num2):
if num1 > num2 :
 print("{} is largest number".format(num1))
else:
 print("{} is larger number".format(num2))
num1=int(input("Enter num1 value"))
num2=int(input("Enter num2 value"))
largest(num1,num2)
```

OUTPUT-

```
 Enter num1 value20
Enter num2 value30
30 is larger number
```

Experiment 6:

Write a function my Reverse () which receives a string as an input and returns the reverse of the string.

CODE-

```
def reverse(user_input):
reverse_string=user_input[::-1]
 return reverse_string
user_input=input("Enter your name")
final=reverse(user_input)
print(final)
```

OUTPUT-

```
Enter your nameAkash
hsakA
```

Experiment 7:

Check if a given string is palindrome or not.

CODE-

```
def ispalindrome(string):
 if(string == string[::-1]):
return "The string is a palindrome"
 else:
return"The string is not palindrome"
string=input("Enter a string : ")
print(ispalindrome(string))
```

OUTPUT-

```
Enter a string : wow
The string is a palindrome
```

Experiment 8:

WAP to convert Celsius to Fahrenheit.

CODE-

```
 celsius=int(input("Enter the temperature in celsius : "))
fahrenheit=(1.8 * celsius)+32
print("Temperature in fahrenheit: ",fahrenheit)
```

OUTPUT-

```
Enter the temperature in celsius : 10
Temperature in fahrenheit:  50.0
```

Experiment 9:

Find the ASCII value of charades.

CODE-

```
chr=input("Please enter a character : ")
print("The ASCII value of "+chr+" is",ord(chr))
```

OUTPUT-

```
Please enter a character : z
The ASCII value of z is 122
```

EXPERIMENT 10:

WAP for simple calculator.

CODE-

```
num1=int(input("Enter num1 value : "))
num2=int(input("Enter num2 value : "))
print("Choose one")
operator=int(input("1 = +\n2 = *\n3 = -\n4 = /\n"))
if operator == 1:
result=num1+num2
 print("{} + {} = {}".format(num1,num2,result))
elif operator == 2:
  result=num1*+num2
 print("{} * {} = {}".format(num1,num2,result))
elif operator == 3:
  result=num1-num2
  print("{} - {} = {}".format(num1,num2,result))
elif operator == 4:
  result=num1/num2
 print("{} / {} = {}".format(num1,num2,result))
```

OUTPUT-

```
Enter num1 value : 20
Enter num2 value : 30
Choose one
1 = +
2 = *
3 = -
4 = /
2
20 * 30 = 600
```