Chapter 1

Programming in python

Indentation

When we start a new paragraph in an article we leave a few blank spaces to the beginning of the first line of the paragraph. This is to indicate the beginning of a paragraph. Adding a few blank spaces in the beginning is called indentation. Python uses indentation to show block structure. Usually we use 4 spaces for indentation.

Comments in python

Comments are written in a program inorder to increase the clarity of the program when it is used on a later occasion. There are two ways to include comments in the program. A single line comment and be entered after a # character. Multi line comments begins with three single quotes and ends with three single quotes(‴.....‴). The comments are ignored by the python

interpreter while executing it.

Data types in python

Python supports the following data types.

1. Numeric data types like integers, floating numbers and complex numbers.
2. String data type, to deal with character strings.
3. Compound data types like lists, tuples, dictionaries etc.

Variables or Identifiers

The identifier is only used to identify an entity uniquely in a program at the time of execution whereas, a variable is a name given to a memory location, that is used to hold a value. Variable is only a kind of identifier, other kinds of identifiers are function names, class names, structure names etc. A variable can be used to represent any of the above data types. Any name can be given to a variable except some reserved key words. It is a good practice to use meaningful names as variables.

Rules for naming the variables

1. Any alphanumeric character combination is permitted.
2. A variable name must start with an alphabet(A to Z or a to z).

3. White space is not permitted in the name.

4. Underscore is permitted.

5. Python does not allow punctuation characters such as @, $ and % within identifiers.

6. Variables are case sensitive. Thus, Manpower and manpower are two different identifiers in Python.

7. Keywords cannot be used as a variable name.

8. Permitted length of the variable name depends on microprocessor type.

In python there is no need to declare the type of variable in advance. The type is assigned at the time of storing a data into the variable. This is known as dynamic data type.

Python key words

Keywords are the reserved words in Python. We cannot use a keyword as a variable name, function name or any other identifier. They are used to define the syntax and structure of the Python language. In Python, keywords are case sensitive. There are 33 keywords in Python 3.7. This number can vary slightly over the course of time. All the keywords except True, False and None are in lowercase and they must be written as they are. The following list shows the reserved words in Python.

False, None, True, and, as, assert, async, await, break, class, continue, def, del, elif, else, except, finally, for, from, global, if, import, in, is, lambda, not, nonlocal, or, pass, raise, return, try, while, with, yield.

Multiple assignment

Equal sign is used while assigning values to variables.

x=10(x is the variable name and 10 is the value assigned to variable x)

y= 100.0 (y is the variable name and 100.0 is the value assigned to variable y)

name = "john"(name is the variable name and a string is assigned to it)

Python allows to assign a single value to several variables simultaneously.

a=b=c=1

Also multiple objects can be assigned to multiple variables

a,b,c=1,2.0,"tom"

Strings

String is a compound data type made up of individual characters. Any collection of alphabets, digits, special characters and white space is known as a character string. Any quantity assigned within the double quotes or single quotes for an input statement will be a string. Because of the compound nature of string, many manipulations are possible on a string. The string addition, multiplication, etc are quite different from the numerical addition and multiplication. Various operations that can be done on a string is given below.

1. Accessing individual characters from a string.

2. Addition- + operator is used for string addition also.

3. Multiplication- * operator is used for multiplication.

These concepts are called string concatenations.

4. Slicing of strings.

Slicing is done to extract a particular part of a string. It is an indexed operation. Indexing using s[a:b] extracts elements from s[a] to s[b-1]. We can also skip one of the indices. If the index on the left side of colon is skipped then slicing starts from the first element and if the index on right side is skipped slicing ends with the last element.

Lists

Lists are defined by enclosing the elements inside a pair of square brackets, separated by commas. The individual elements of the list can be of any data type like integer, float, complex number, string or even another list. List in an important data type in python and is more flexible than string. The major difference between a list and a string is that, list is mutable. Using instructions we can change the order of elements in a list, add new elements, and remove an existing element. This property is called mutability. Strings are immutable. Some examples of list are given below

a=[3,4,5,'hai'] —- 4 members in list

b=[4,8.0,'hello', 2] —- 4 members

c=[2+6j, 9, 4.0, [1,2], 7] —- 5 members

we can also define an empty list, a=[]

Operations on list

1. Indexing - Any element of a list can be changed during the course of execution of a python program.

2. Addition and multiplication - two lists can be added together to form a combined single list. A list can be multiplied by an integer to produce a

larger list.

3. Length of a list- The length of a list means the total number of elements in a list. The length is extracted using len() function.

4. Appending a list- It is possible to add an element to the position after the last element of a list. This is called appending. Appending is carried out by the command 'append()'. Appending is different from replacing an element(muting). Appending will increase the length of the list.

5. Inserting to a list- an element can be inserted to any position of a list. Inserting is done by the 'insert(a,b)' command which has two indices. The first index defines the position and the second one the element to be inserted.

6. deleting a list- It is possible to delete a list completely by 'del' command.

7. Remove from a list- A particular element can be selectively removed by the 'remove' command. The remove command removes a value when it occurs in the list for the first time in the list. An error message is generated if the given value is not found in the list.

8. Reversing a list- A list can be completely reversed. The last element becomes the first element after reversing. If there is a list within a list, that list will not be reversed. The reversal happens only in the case of elements. The reverse function accepts no arguments and only blank parentheses are given with this function.

9. sort, max, min, sum- A list can be sorted in ascending order and maximum and minimum of a list cn be found. Sorting in ascending order and reversing it is a convenient way to sort a list in descending order. The sum of all elements in a list can be evaluated by sum function.

10. In and Not in - In and not in are test statements(operators) to find whether a particular element is in the list or not. The operator will return true or false depending on the result.

11. Count - The count function returns the number of occurrences of a particular element in a list. It will return 0 if the element is not present in the list.

Tuples

A tuple, like a list is a compound data type with an arbitrary number of objects of different types. But tuples are immutable. Their elements cannot be modified and elements cannot be removed or added from a tuple. Tuples can be defined by specifying a set of objects separated by commas. It is optional to use a pair of ordinary parenthesis.

Dictionaries

A dictionary is a special kind of list with paired elements. Every element has two parts separated by : sign. Dictionaries can be created by specifying a set of paired objects separated by commas in a pair of braces. Dictionaries are convenient when saving quantities like phone numbers, students marks etc.

Sets

A set is an unordered collection of distinct objects. Sets do not support indexing, slicing or other sequence like behaviour. Also set doesnot contain duplicate elements. There are two built in set types, set and frozen set. The set is mutable but frozen set is immutable. A set can be defined as set([1,2,7.6,'thomas']).

Operations on set

1.add() function- an element can be added to the given set

2.update function- adds a group of elements to a set

3.copy function- copy function will copy the set, but not the individual elements

4.In and not in- used to check if an object is in the set on not

5.issubset and issuperset- the membership of entire set is tested

6.len function- to find the total number of elements

7.removing elements- three functions are used to remove individual items from a set

a.pop function- simply removes an item from a set. I can choose any element from the set

b.remove- to remove a specified element from the given set. If the specific element is not present in the set an error message will come

c.discard- same functionality as remove, but no error message if the element is not present in list

d.clear- removes all elements from set

8.Union- the merger of two sets. Any element in s1 or s2 will appear in their union

9.Intersection- Any element in both s1 and s2 will appear

10.symmetric difference- symmetric difference of two sets is the set of elements which are in one of either set, but not in both

11.set difference - set difference of s1 and s2 gives the elements that are in s1 but not in s2

Multiple Sets

We can also do some of the operations given above in more than two sets. This is called multipe set operations.

Frozen Sets

A frozen set is basically the same as a set but immutable. once it is created its members cannot be changed. Frozensets can be used as members in other sets. They have the same functions as normal sets except some of the functions that change the contents, are not available. eg update, remove, pop etc.