Chapter 6-A

INTRODUCTION TO PYTHON

A program is a sequence of commands written in a programming language, which provides a solution to a problem C, C++, Java, QBasic, Python are examples of programming language.

A programmer is a person who writes a program.

In this chapter we will get introduced to programming language Python.

History of Programming Language Python

Programming Language Python is a high-level programming language. It was initially designed by Guido van Rossum in 1991 and developed by Python Software Foundation. It is a simple and powerful programming language that can be used for writing variety of programs.

Python Shell

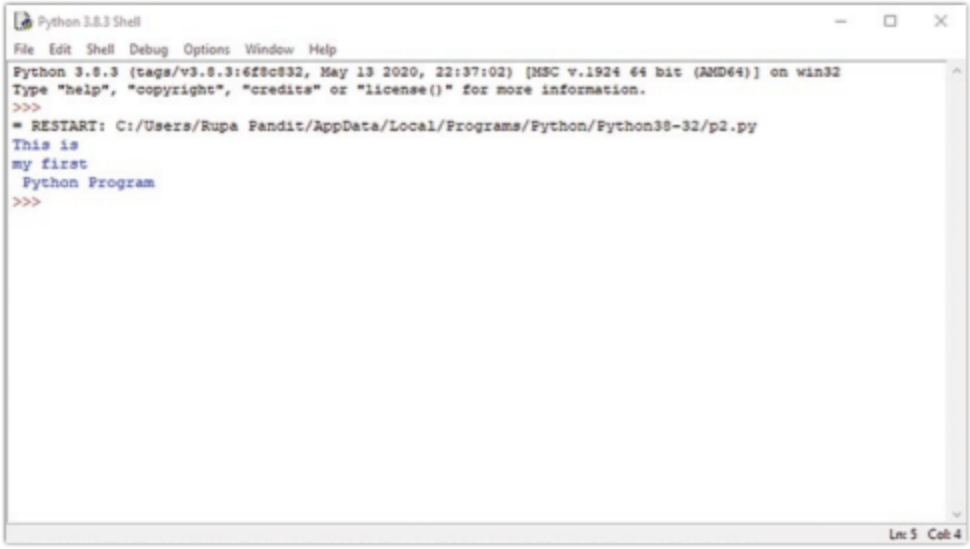
It is also known as Python Interactive Shell. It is used to execute single Python command and get the result.

Python IDLE

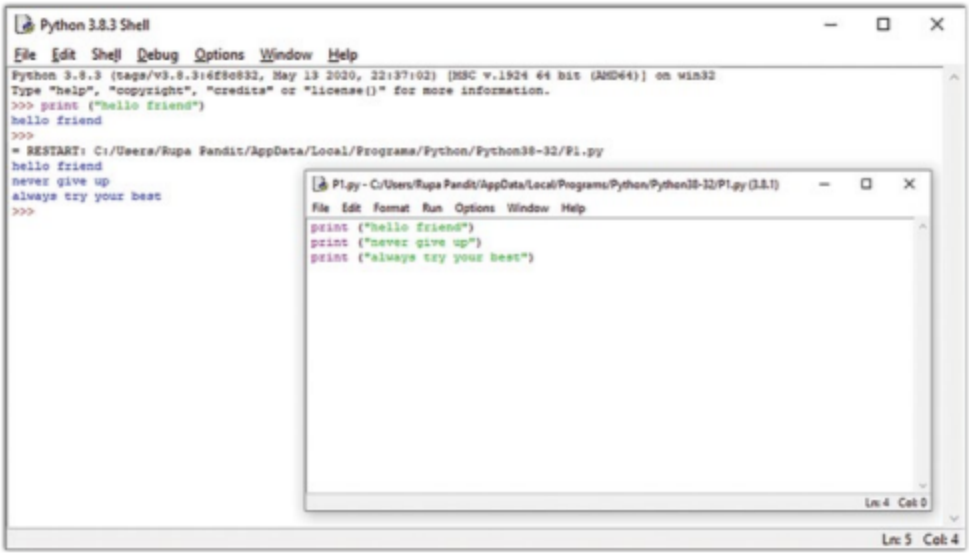
IDLE stands for Integrated Development and Learning Environment. It provides **Python shell** window with effects of colors of commands & messages. It also helps in spacing, auto completion and other advantages.

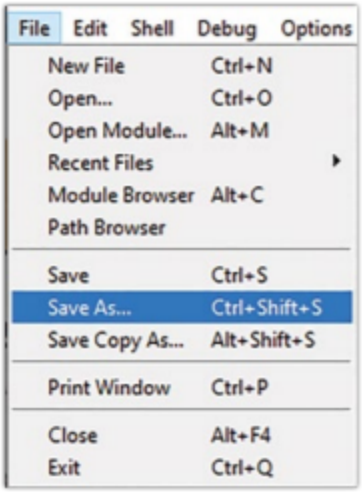
The Python Shell

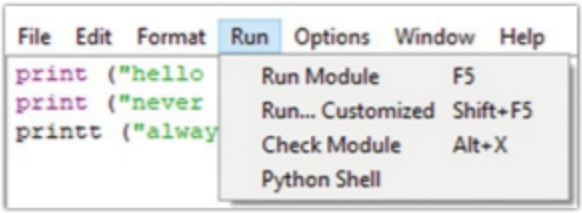
The following figure shows the Python shell



Python File Program







Executing a Python Program

Single line instructions in the shell gets executed as soon as enter is pressed.

For multiple line program, a new file has to be created in the shell. Write the program there and then save it. Then press F5 or click on "Run Module"

Saving a program

To save a program, press <Ctrl+ S>

You can also click on File menu → Save.

To save in another name, click <Ctrl+ Shift+ S> and give the file name

To save for the first time, give the file name

Syntax

Syntax is the specification according to which a program should be written. If the syntax is not correct, then the program reports syntax error and cannot be executed.

Note: A program must be exact and cannot contain anything additional anywhere.

Types of error in a program

There are 3 types of error in a program:

a) Syntax Error

It occurs when the program is not written in proper specification.

For eg: a = ? ;

b) Logical Error

It occurs when the meaning of the step is not correct.

For eg: if '*' is used in place of' '+'

c) Runtime Error

It occurs during the program execution when such data is entered that cause infinite calculation.

For eg: r = a / b; where a, b are user input. Inputting 0 for b will cause runtime error.

Note: *A program cannot run with Syntax error.*

In case of Logical error, it can run but gives wrong results.

Runtime error is a special case of logical error.

Tokens

It is the smallest meaningful element in a program. All that is used in a program is a token.

Keywords

Keywords are reserved words used in a program that have special meaning. These words cannot be used as variable or any other identifier. Python keywords contain lowercase letters only.

The following table contains the keywords used in Python:

and	def	exec	if	not	return
assert	del	finally	import	or	try
break	elif	for	in	pass	while
class	else	from	is	print	with
continue	except	global	lambda	raise	yield

Variable

It is a symbolic name which is stored in a particular place in the computer's memory. When a variable is given a value, that value is placed in the memory space accepted by the variable.

Python has five standard data types –

Numbers String List Tuple Dictionary

[We will learn about List, Tuple , Dictionary in higher classes]

Data type – Number

It stores numeric values. It consists of integer and fractional numbers.

For example – 95, 47.4

Data type – String

It stores a group of characters enclosed within quotation marks. Characters are alphabetic and non-alphabetic values present on the keyboard.

For example- "armada" "3768 B, Lake Garden"

Quotation in Python

Python accepts single (‘), double (“) and triple (‘’’ or “”””) quotes to denote string literals, as long as the same type of quote starts and ends the string.

The triple quotes are used to span the string across multiple lines.

For example, all the following are legal –

```
word = ‘one’
sentence = “One Two Three”
paragraph = “””One Two Three
Four Five Six Seven.”””
```

Identifiers

Identifier is a name given to identify a variable or any other object.

Rules for naming identifiers –

i. Begin with lowercase letter.

ii. Only _ symbol can be used. No other symbol can be used.

iii. Digits can be used but only after alphabets. This presentation is called alphanumeric presentation.

iv. Identifiers are case sensitive. It means "Box" and "box" are different names.

v. No keywords can be used

Assignment Operator

= It is used to assign a value to a variable. It has certain rules of use –

- It assigns a value from right to left.

  A = 6 is valid

  9 = B is invalid

- It cannot assign value to a constant.

  3 = 8 is invalid

- It can have only one variable on its left. Calculation cannot be on the left.

  G = A + 7 is valid

  A + 7 = H is invalid

Arithmetic Operators

These operators are used for calculation. Assume variable a = 10 and b = 20 then

Operator & its Name	Description	Example
+ Addition	Adds values on either side of the operator.	R = a + b → R is 30
- Subtraction	Subtracts right hand operand from left hand operand.	R = b – 5 → R is 15
* Multiplication	Multiplies values on either side of the operator	R = a * b → R = 200
/ Division	Divides left hand operand by right hand operand	R = b / a →R is 2
% Modulus	Divides left hand operand by right hand operand and returns remainder	R = b % a →R = 0
** Exponent	Performs exponential (power) calculation on operators	R = a**2 →R =100

Relational or Comparison Operators

These operators are used to compare the values and give a result of true or false.

Assume variable a = 10 and b = 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. It is same as != operator	(a <> b) is true.
>	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) is true.
>=	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 of right operand, then condition becomes true.	(a <= b) is true.

Difference between = and = = Operators

=	= =
Assignment Operator	Relational Operator
Used to assign a value to a variable	Used to compare to values for equality
The variable on the left gets a value	The result is either true or false
Cannot have constant on left	Can have constant on left
Cannot have calculation on left	Can have calculation on left

PROGRAM EXAMPLES

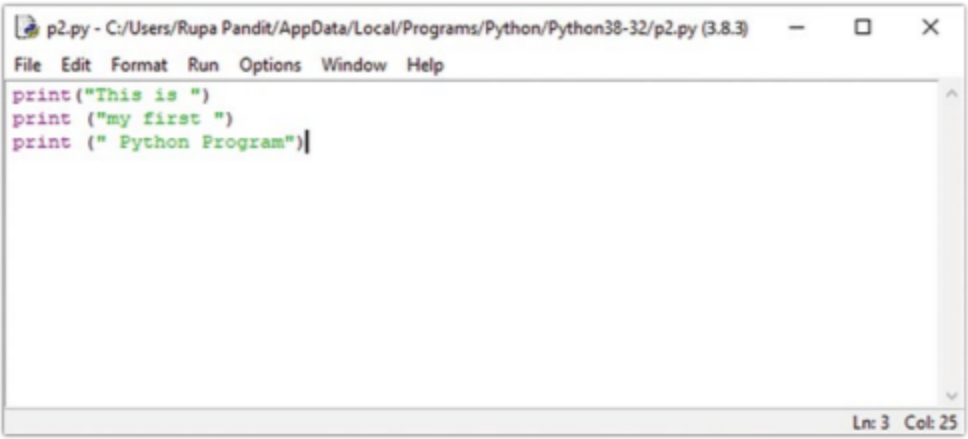
- **print()**

Program 1. **Print the following –**

This is

my first

Python Program



After writing a program, it has to be saved under a name. Then press **F5** key to run it.

print() with end =

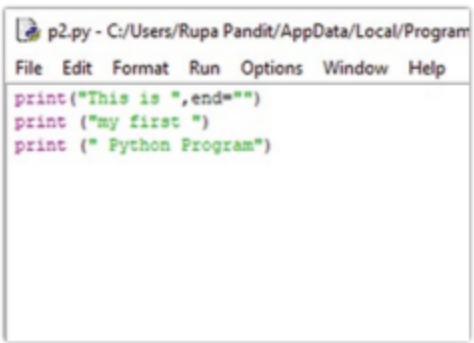
end indicates how will the print statement end. By default end is new line.

Program 2. **Print the following –**

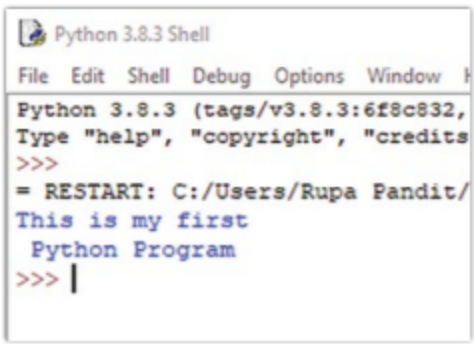
This is my first

Python Program

Program



Output



Note: *That the following commands will also give the same output. The above program only demonstrates the use of end= “”*

print(“This is my first “)

print (“ Python Program”)

Program 3. Print the following –

Winners never Quit -Quitters never Win

Program

p2.py - C:/Users/Rupa Pandit/AppData/Local/Program

File Edit Format Run Options Window Help

```
print("Winners never Quit ", end="-")
print ("Quitters never Win")
```

Output

Python 3.8.3 Shell

File Edit Shell Debug Options Window Help

```
Python 3.8.3 (tags/v3.8.3:6f8c832, May 13 2020
Type "help", "copyright", "credits" or "licens
>>>
= RESTART: C:/Users/Rupa Pandit/AppData/Loc
Winners never Quit -Quitters never Win
>>>
```

Program 4. Input a number. Calculate and print its double.

Program

p2.py - C:/Users/Rupa Pandit/AppData/Local/Program

File Edit Format Run Options Window Help

```
a = (int)(input ('enter a number '))

print("Number = ", a)
b = a * 2
print ("Double = " , b)
```

Output

Python 3.8.3 Shell

File Edit Shell Debug Options Window H

```
Python 3.8.3 (tags/v3.8.3:6f8c832,
Type "help", "copyright", "credits
>>>
= RESTART: C:/Users/Rupa Pandit/
y
enter a number 6
Number =  6
Double =  12
>>>
```

Example Programs

I. Input the price of 1 banana. Calculate and print the price of one dozen banana.

[1 dozen = 12 units]

II. Input the time in hours. Calculate and print the time in minutes.
[1 hr = 60 min]

III. Input the age of two students in g1 and g2. Calculate and print their average age.

[Average = (g1 + g2)/2]

IV. Input the distance travelled by a car in 4 hours. Calculate and print its speed.

[Speed = distance/time]

V. Input the length and breadth of a rectangular park. Calculate and print its perimeter.

[Perimeter = 2 x (length + breadth)]

I. Program

File Edit Format Run Options Window Help

```
P = (int) (input ( "Enter the price of one banana : " ) )

D = 12 * P

print ( " Price of one dozen banana is " , D )
```

Ln: 3 Col: 25

Output

```
Enter the price of one banana : 10
 Price of one dozen banana is  120
```

II. Program

File Edit Format Run Options Window Help

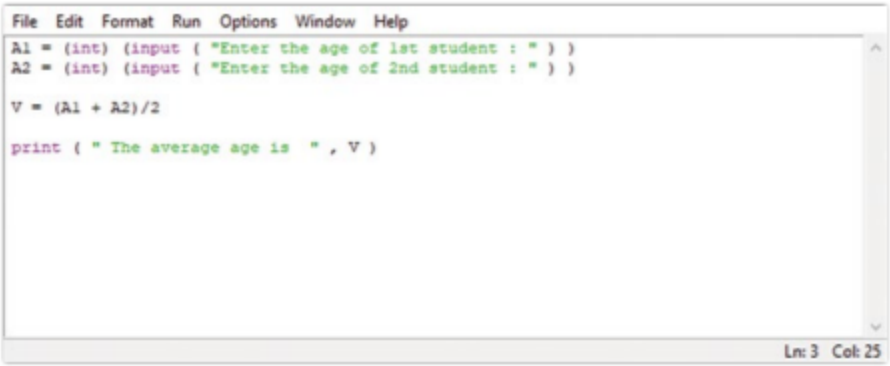
```
H = (int) (input ( "Enter the time in hours  : " ) )

M = H * 60

print ( " Time in minutes is " , M )
```

Ln: 3 Col: 25

Output

```
Enter time in hours 6
 Time in minutes is :  360
```

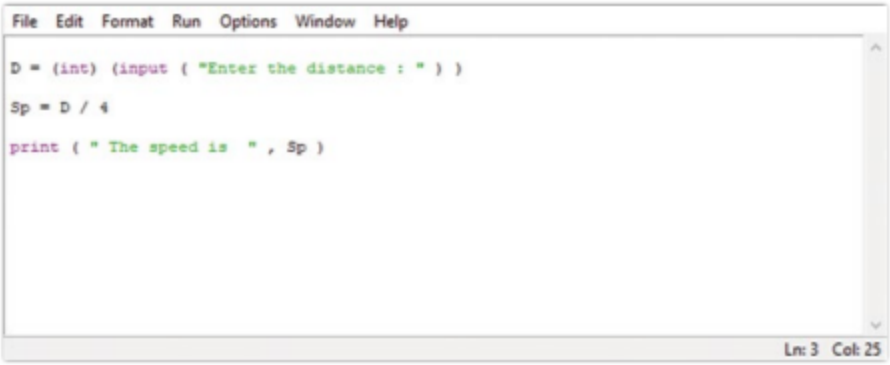
III. Program



Output

```
Enter the age of 1st student : 10
Enter the age of 2nd student : 14
 The average age is   12.0
```

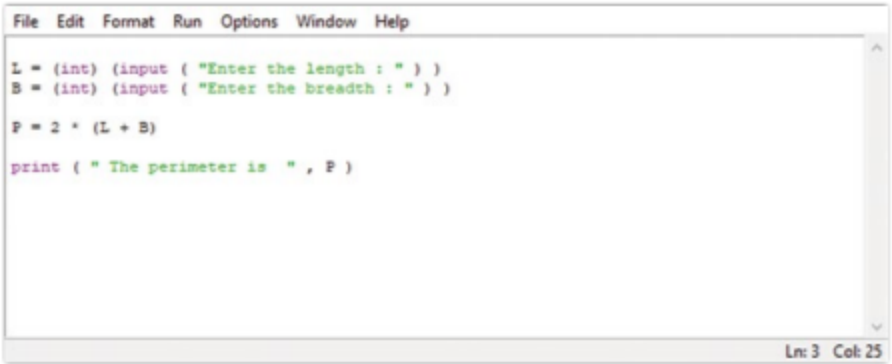
IV. Program



Output

```
Enter the distance : 76
 The speed is   19.0
```

V. Program



Output

```
Enter the length : 11
Enter the breadth : 8
 The perimeter is   38
```

Practice Programs

I. Anas went to buy a big cake and wanted to divide it in 5 friends. Input the weight of the cake in W. Calculate and print how much will each friend get.

[F = W/5]

II. "Subarna Express" had N number of coaches where the capacity of each coach was 80 passengers. Input the number of coaches. Calculate and print the total number of passengers travelling in a journey.

III. Accept the height and base of triangle and display its area.

[Area = 0.5 x height x base]

IV. Input the temperature in Celsius and convert it to Fahrenheit.

[F = 1.8 x C + 32]

V. Input a number in N. Divide it by 10 and store the remainder in R. Print the result.

[Use operator %]