DELHI PUBLIC SCHOOL BANGALORE - EAST

ARTIFICIAL INTELLIGENCE - PYTHON

ALGORITHMS AND FLOWCHARTS

NAME: _____ CLASS: IX SEC: _____ DATE: _____

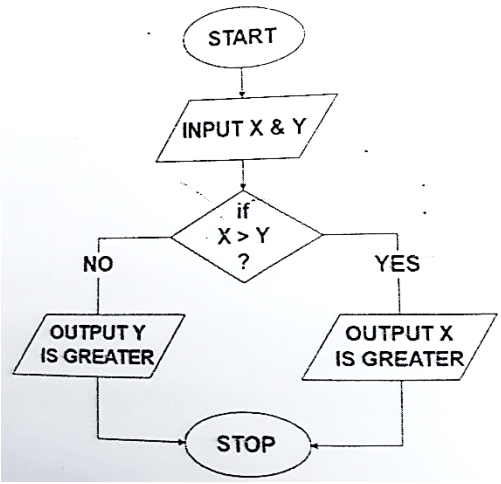
Q1. Multiple Choice Questions:

1. Which translator is used to convert the assembly language code into machine language?
   a. Interpreter
   b. Compiler
   c. Assembler
   d. None of the above

2. Data and information is entered into the computer using the
   a. Output unit
   b. Input unit
   c. Memory unit
   d. Processing unit

3. Which of the following is not a programming language?
   a. Python
   b. Java
   d. C#
   d. Microsoft Windows

4. What is this flowchart for?



   a. Find largest number
   b. Print X & Y
   c. Take X & Y as input
   d. None of the above

5. The _____ converts the program in one go whereas the _____ converts the program one line at a time to machine language.
   a. compiler, interpreter
   b. interpreter, compiler
   c. assembler, translator
   d. translator, compiler

Q2. Fill in the blanks:

a. _____the program involves a clear logical plan explaining the algorithm and flowchart.
b. Coding involves translating the design into an _____using a programming language.
c. _____involves preparing an information manual for end user
d. An arrow is a connector that shows _____between the shapes.
e. A _____is a set of instructions to perform a particular task using any programming language.
f. A _____is a language which follows a set of rules known as a syntax to write a program to implement algorithms.

Q3. Match the following:

1. Draw.io	a. Start/End
2. 	b. diagrammatic representation
3. 	c. online tool to draw flowchart
4. Flowchart	d. Step-by-step procedure
5. Algorithm	e. Decision
6. D in A-B-C-D stands for	f. Code it
7. 	g. process
8. C in A-B-C-D stands for	h. Debug and test

Q4. Answer the following:

1. What is an Algorithm?

2. What is a flowchart?

3. Define computer translator.

4. Write algorithm and draw flowchart for the following:

a. To print numbers 1 to 20

b. To convert temperature from Fahrenheit (°F) to Celsius (°C)

c. To check whether the input number is prime or not?

a. To print numbers 1 to 20
Algorithm:

Flowchart:

b. To convert temperature from Fahrenheit (°F) to Celsius (°C)
Algorithm:

Flowchart:

c. To check whether the input number is prime or not?
Algorithm:

Flowchart:

****

DELHI PUBLIC SCHOOL BANGALORE - EAST

ARTIFICIAL INTELLIGENCE - PYTHON

ALGORITHMS AND FLOWCHARTS-SOLUTIONS

NAME: _____ CLASS: IX SEC: _____ DATE: _____

Q1. Multiple Choice Questions:

1. Which translator is used to convert the assembly language code into machine language?

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d. Processing unit

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d. **Microsoft Windows**

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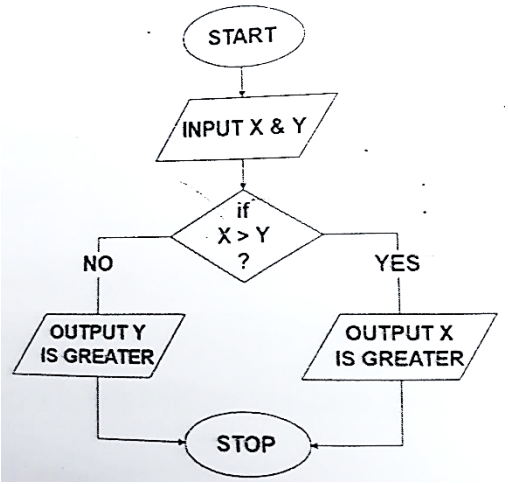


a. **Find largest number**
b. Print X & Y
c. Take X & Y as input
d. None of the above

5. The _____ converts the program in one go whereas the _____ converts the program one line at a time to machine language.

b. **compiler, interpreter**
b. interpreter, compiler
c. assembler, translator
d. translator, compiler

Q2. Fill in the blanks:

a. **Designing** the program involves a clear logical plan explaining the algorithm and flowchart.
b. Coding involves translating the design into an **application/program** using a programming language.
c. **Documentation** involves preparing an information manual for end user.
d. An arrow is a connector that shows **relationships** between the shapes.
e. A **Program** is a set of instructions to perform a particular task using any programming language.
f. A **Programming language** is a language which follows a set of rules known as a syntax to write a program to implement algorithms.

Q3. Match the following:

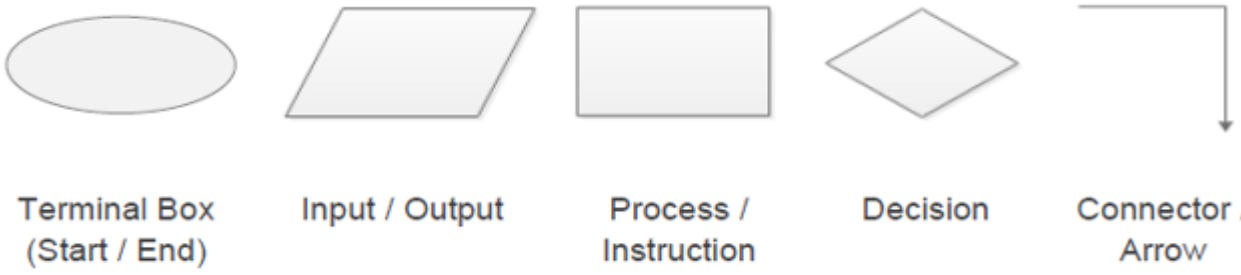
1. Draw.io	a. Start/End
2. 	b. diagrammatic representation
3. 	c. online tool to draw flowchart
4. Flowchart	d. Step-by-step procedure
5. Algorithm	e. Decision
6. D in A-B-C-D stands for	f. Code it
7. 	g. process
8. C in A-B-C-D stands for	h. Debug and test

Output: 1(c), 2(e), 3(g), 4(b), 5(d), 6(h), 7(a), 8(f)

Q4. Answer the following:

1. **What is an Algorithm?**
An algorithm is a step-by-step method to solve the identified problem, in other words, an algorithm is a procedure for solving problems. An algorithm includes calculations, reasoning and data processing.

2. What is a flowchart?
A flowchart is the graphical or pictorial representation of an algorithm with the help of different symbols, shapes and arrows in order to demonstrate a process or a program.
Several standard graphics used in a flowchart are as follows:

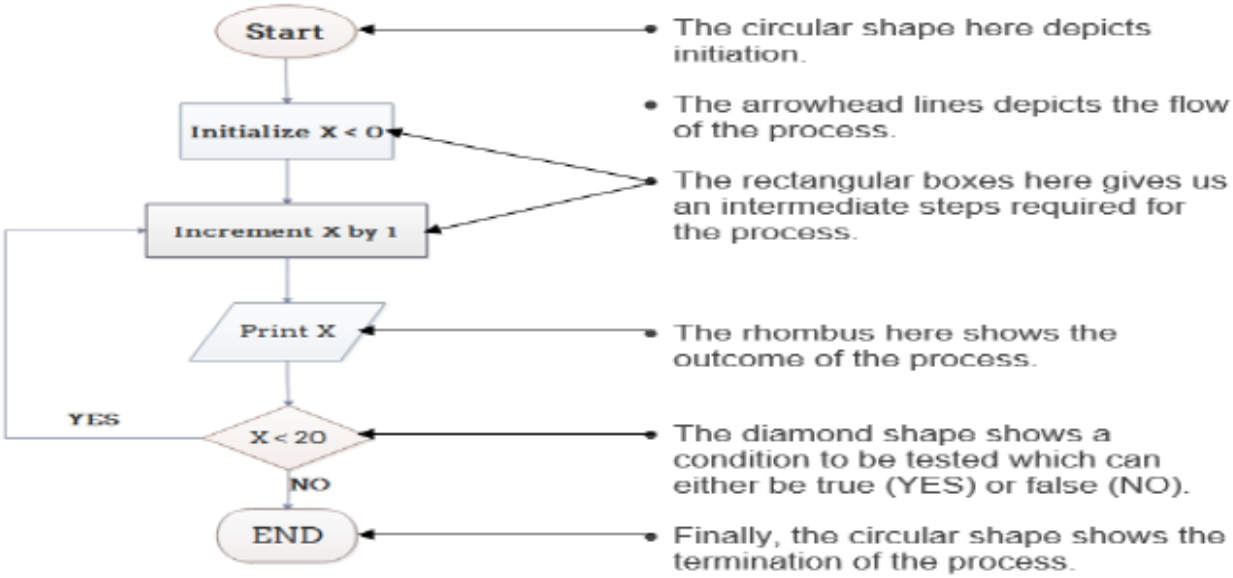


3. Define computer translator.
A computer translator is a processor that converts a program written in one language (known as source code) into machine understandable form (known as machine code or object code). Examples of computer translators are Assemblers, Compilers and Interpreters.

4. Write algorithm and draw flowchart for the following:
a. To print numbers 1 to 20
b. To convert temperature from Fahrenheit (°F) to Celsius (°C)
c. To check whether the input number is prime or not?

a. To print numbers 1 to 20
Algorithm:
Step 1: Initialize X as 0
Step 2: Increment X by 1
Step 3: Print X
Step 4: If X is less than 20 then go back to step 2

Flowchart:



b. **To convert temperature from Fahrenheit (°F) to Celsius (°C)**

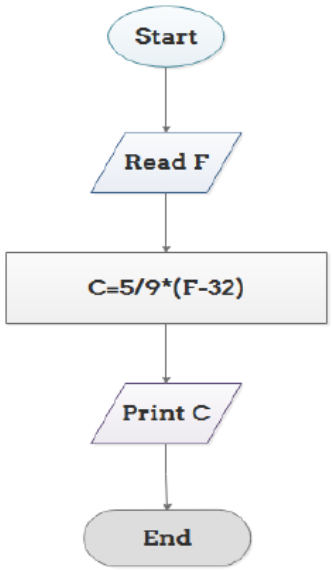
ALGORITHM

Step 1: Read temperature in Fahrenheit

Step 2: Calculate temperature with formula C=5/9*(F-32)

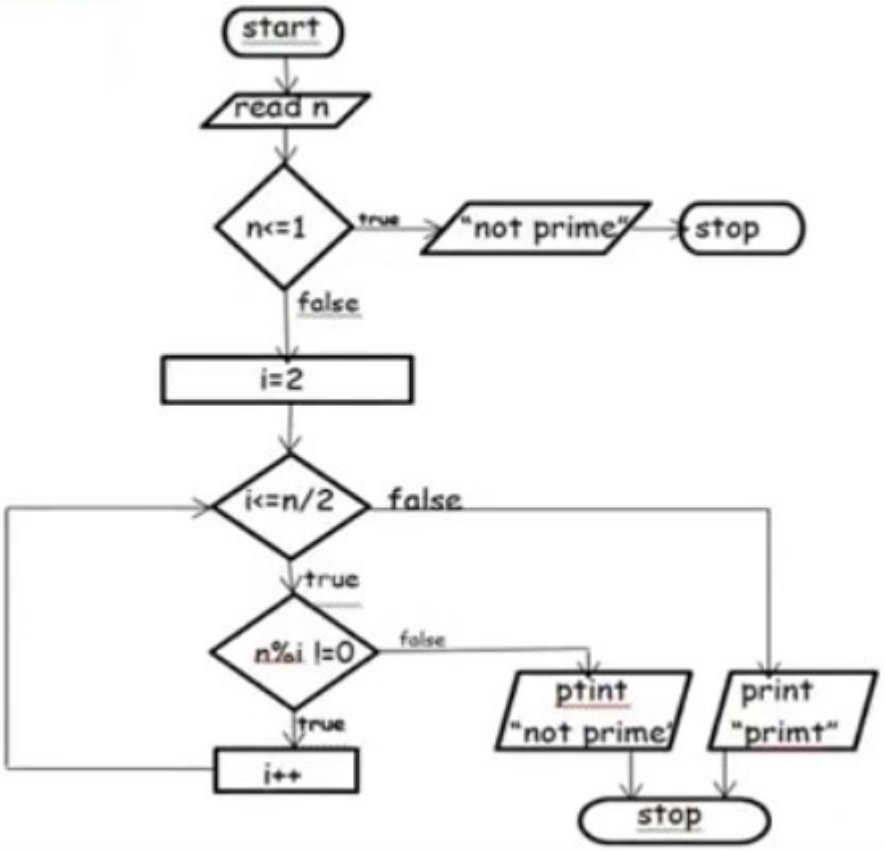
Step 3: Print C

FLOWCHART



c. To check whether the input number is prime or not?

method-2



1. start
2. read n
3. if n<=1 then
   print " not prime"
   goto stop
   end if
4. i=2
5. while i<=n/2
   if n%i == 0 then
   print "not prime"
   goto stop
   end if
   i++
   end while
6. print "prime"
7. *stop*

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DELHI PUBLIC SCHOOL BANGALORE - EAST

ARTIFICIAL INTELLIGENCE

PYTHON PROGRAMMING LANGUAGE

NAME: _____ CLASS: IX SEC: _____ DATE: _____

Q1. **Multiple Choice Questions:**

1. Which one of the following is not true for a variable name?
   a. Spaces are allowed
   b. It can begin with a lowercase alphabet
   c. Letters, numbers and underscore characters are allowed
   d. Special characters like @..% are not allowed

2. The file extension for a Python program is _____
   a. .py
   b. .pyt
   c. .ph
   d. .python

3. The function used to convert a string of digits into an integer.
   a. convert()
   b. int()
   c. string()
   d. str()

4. Strings can be created by enclosing characters inside these.
   a. Single quotes
   b. Double Quotes
   c. Triple quotes
   d. Any of them

5. All control flow statements in Python end with:
   a. Semicolon(;)
   b. Hash sign (#)
   c. Colon (:)
   d. Full Stop (-)

6. A process where a set of instructions are repeated in a sequence for a number of times until a condition is met
   a. Looping
   b. Iteration
   c. Sequential
   d. Selection

7. The function range(4) will return a sequence:
   a. 1, 2, 3, 4
   b. 1, 2, 3
   c. 0, 1, 2, 3
   d. 0, 1, 2, 3, 4

8. The function range(10, 0, -5) will return a sequence:
   a. 10 5
   b. 5 10
   c. 5 0
   d. 0 5

9. Which of the following is NOT a legal variable name?
   a. mark_student
   b. student_mark1
   c. _student_mark
   d. 1student_mark

10. What is the correct syntax to output the type of variable in python?
   a. print(typeof(x))
   b. print(typeof x)
   c. print(type(x))
   d. print(type x)

Q2. Fill in the blanks:

1. _____are the reserved words in Python used by Python interpreter to recognize the structure of the program.
2. _____are name given to class, functions, variables etc. and helps to differentiate one entity from another.
3. Python is a _____language.
4. A _____is a type of variable whose value cannot be changed.

Q3. Answer the following:

1. What is Python?

2. What are the key features of python? Mention various applications along with it.

3. Find the output for the following in the interactive mode:

1. (75+85+65)/3 i.e. the average of three marks _____
2. 22/7 * 5 * 5 i.e. the area of circle having radius as 5 _____
3. "RAVI"+"Kant" _____
4. "###" * 3 _____

4. Explain Multi-line statements.

5. What are comments in python? List down the various types of comments.

6. Explain input() function.

7. What is type conversion? Explain the types of type conversion with the help of an example.

8. Write the Python code to find Area and Perimeter of a rectangle.

9. Try writing your code below:

# To calculate Area of a triangle # with Base and Height _____ #Input Base _____ #Input Height _____ #Calculate Area _____ #Display Area	Base:20 Height:10 Area:100
# To calculating average marks # of 3 subjects _____ #Input English Marks _____ #Input Maths Marks _____ #Input Science Marks _____ #Calculate Total Marks _____ #Calculate Average Marks _____ #Display Total Marks _____ #Display Average Marks	English:80 Maths :75 Science:85 Total Marks : 240 Average Marks: 80.0
# To calculate discounted amount # with discount % _____ #Input Amount _____ #Input Discount% _____ #Calculate Discount _____ #Calculate Discounted Amount _____ #Display Discount _____ #Display Discounted Amount	Amount: 5000 Discount%:10 Discount:500 Discounted Amt:4500
# To calculate Surface Area and Volume # of a Cuboid _____ #Input Length _____ #Input Breadth _____ #Input Height _____ #Calculate Surface Area _____ #Calculate Volume _____ #Display Surface Area _____ #Display Volume	Length:20 Breadth:10 Height:15 Surface Area:1300 Volume:3000

10. What will be the output of the following code?

```
x=2
while x<=10:
   print(x)
   x=x+1
```

11. Write a program to check if a person can vote.

12. Write a program to check the grade of a student.

13. Write a program to input temperature and check if the weather is hot, moderate or cold.

14. Write a program to input marks of 3 subjects and print grades accordingly.

 # Code to input marks of 3 subjects and print grades accordingly.
"""
A school has following rules for grading system:
a. Below 25 - F
b. 25 to 40 - E
c. 41 to 50 - D
d. 51 to 60 - C
e. 61 to 80 - B
f. Above 80 - A
Ask user to enter marks of AI, Maths and Science and print the corresponding grade.
"""

15. Write a program to check if an input number is less than, greater than or equal to 10.

16. Write the Python program to check the number entered is positive, negative or zero.

17. Write a program to find the sum of all numbers stored in a list.

18. Write a program to add natural numbers upto a user entered number.

19. Write a program to find the whether a number is prime or not.

20. Write a program to print numbers from 0 to 9.

Nested Loops

Many times, the data which we work upon might not have just one dimension. It can be multi-dimensional. Hence, we use the concept of Nested Loops in which one or multiple loops come under the initial loop.

```
# sample code of nested for loops

for i in range(5):            # Initial loop running from 0 to 4
   print("start of i = ",i)

   for j in range(5):         # This is a nested loop as tand comes under the other loop
      print ("j = ",j)      # This print statement is under the  nested loop

   print("end of i = ",i)
print("end of nested for loops")
```

In the above code, for each iteration of for i block, a whole for j block is ran. this can be further nested to as many nests as we want. Note that indentation plays a very important role in this. Changing the indentation will result in unexpected answers or might throw an error.

21. Write programs to print the following patterns:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

```
******
```

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

```
******
```

```
*
* *
* * *
* * * *
* * * * *
```

22. Write a program to print 0 to 5 using While loop

23. Write a program to print odd numbers from 1 to n.

24. Write a program to print all numbers divisible by 6 between 1 to 100.

25. Complete the code given below. Fill in the blanks to find the average percentage of a class with 15 students whose marks are given in the list marks.

```
marks = [40,54,81,95,76,69,35,63,99,58,73,85,56,62,93]

sum =_______                    # Variable Intitiation
average = _____________         # Variable Intitiation

_____________________   # Loop statement to run through 15 student's marks
_____________________   # Statements to calculate average % of a class of 15 students

average = _____________ # Calculate average percentage of the class
_____________________   # Print average percentage
```

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DELHI PUBLIC SCHOOL BANGALORE - EAST

ARTIFICIAL INTELLIGENCE

PYTHON PROGRAMMING LANGUAGE- SOLUTIONS

NAME: _____ CLASS: IX SEC: _____ DATE: _____

Q1. **Multiple Choice Questions:**

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4. Strings can be created by enclosing characters inside these.
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b. Double Quotes
c. Triple quotes
d. **Any of them**

5. All control flow statements in Python end with:
a. Semicolon (;)
b. Hash sign (#)
c **Colon (:)**
d. Full Stop (-)

6. A process where a set of instructions are repeated in a sequence for a number of times until a condition is met
a. **Looping**
b. Iteration
c. Sequential
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7. The function range(4) will return a sequence:
a. 1, 2, 3, 4
b. 1, 2, 3
c. **0, 1, 2, 3**
d. 0, 1, 2, 3, 4

8. The function range(10, 0, -5) will return a sequence:
a. **10 5**
b. 5 10
c. 5 0
d. 0 5

9. Which of the following is NOT a legal variable name?
a. mark_student
b. student_mark1
c. _student_mark
d. **1student_mark**

10. What is the correct syntax to output the type of variable in python?
a. print(typeof(x))
b. print(typeof x)
c. print(type(x))
d. print(type x)

Q2. Fill in the blanks:

1. **Keywords** are the reserved words in Python used by Python interpreter to recognize the structure of the program.
2. **Identifiers** are name given to class, functions, variables etc. and helps to differentiate one entity from another.
3. Python is a **case-sensitive** language.
4. A **constant** is a type of variable whose value cannot be changed.

Q3. Answer the following:

1.What is Python?

Python is a programming language created by Guido Van Rossum. The language was released in 1991. It can be used to follow both Procedural approach and Object-Oriented approach of programming.

2. What are the key features of python? Mention various applications along with it.

Artificial intelligence is the trending technology of the future. Python gains a maximum popularity because of the following reasons:

- **Easy to learn, read and maintain:** Python has few keywords, simple structure and a clearly defined syntax.
- **A broad standard library:** Python has a huge bunch of libraries with plenty of built-in functions to solve variety of problems.
- **Interactive Mode:** It allows interactive testing and debugging of snippets of code.
- **Portability and Compatibility:** Python can run on wide variety of operating systems and hardware platforms, has the same interface on all platforms.
- **Extendable:** We can add low level modules to the Python interpreter. These modules enable programmers to customize their tools to be more efficient.
- **Database and scalable:** Python provides interfaces to all major open sources and commercial databases along with a better structure and support for large programs than shell scripting.

Applications of Python

Python is used for a large number of applications. Some of them are mentioned below:

3. Find the output for the following in the interactive mode:

1. (75+85+65)/3 i.e., the average of three marks	**75.0**
2. 22/7 * 5 * 5 i.e., the area of circle having radius as 5	**78.57142857142857**
3. "RAVI"+"Kant"	**RAVIKant**
4. "###" * 3	#########

4. Explain Multi-line statements.

In Python, end of a statement is marked by a newline character. However, Statements in Python can be extended to one or more lines using parentheses (), braces {}, square brackets [], semi-colon (;), continuation character slash (\).

Type of Multi-line Statement	Usage

Using Continuation Character (/)	`s = 1 + 2 + 3 + \`
	`4 + 5 + 6 + \`
	`7 + 8 + 9`

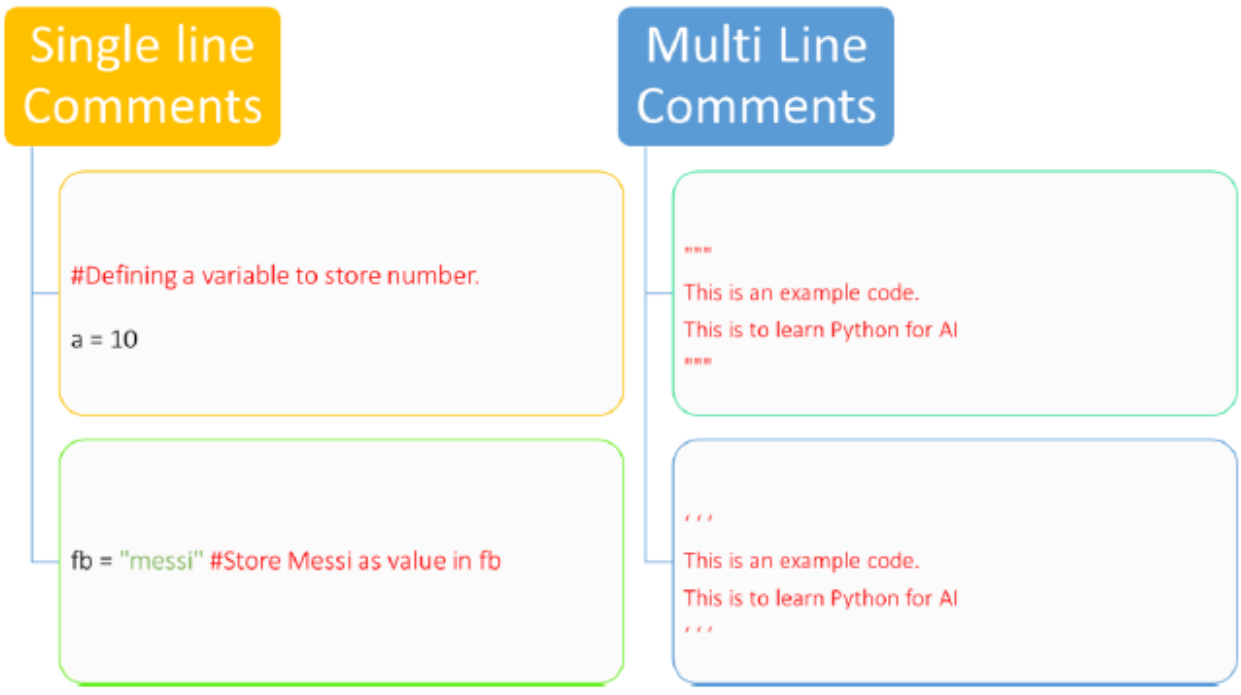
Using Parentheses ()	`n = (1 * 2 * 3 + 4 - 5)`

Using Square Brackets []	`footballer = ['MESSI',`
	`'NEYMAR',`
	`'SUAREZ']`

Using braces {}	`x = {1 + 2 + 3 + 4 + 5 + 6 +` `7 + 8 + 9}`
Using Semicolons (;)	`flag = 2; ropes = 3; pole = 4`

5. What are comments in python? List down the various types of comments.

Comments are the remarks that are added for the programmer to understand the code later and are not executed by the interpreter.



6. Explain input() function.

In python, input() function is used take user's input in the program.

Syntax	Meaning
<String Variable>=input(<String>)	For string input
<integer Variable>=int(input(<String>))	For integer input
<float Variable>=float(input(<String>))	For float (Real no.) input

7. What is type conversion? Explain the types of type conversion with the help of an example.

The process of converting the value of one data type (integer, string, float, etc.) to another data type is called type conversion. Python has two types of type conversion.

1. Implicit Type Conversion
2. Explicit Type Conversion

Implicit Type Conversion

In Implicit type conversion, Python automatically converts one data type to another data type. This process doesn't need any user involvement. Python always converts smaller data type to larger data type to avoid the loss of data.

Example:

```
# Code to calculate the Simple Interest

principle_amount = 2000
roi = 4.5
time = 10

simple_interest = (principle_amount * roi * time)/100

print("datatype of principle amount : ", type(principle_amount))
print("datatype of rate of interest : ", type(roi))


print("value of simple interest : ", simple_interest)
print("datatype of simple interest : ", type(simple_interest))
```

When we run the above program, the output will be

```
datatype of principle amount : <class 'int'>
datatype of rate of interest : <class 'float'>

value of simple interest : 900
datatype of simple interest : <class 'float'>
```

Explicit Type Conversion

In Explicit Type Conversion, users convert the data type of an object to required data type. We use the predefined functions like int(), float(), str(), etc to perform explicit type conversion.

This type of conversion is also called typecasting because the user casts (changes) the data type of the objects.

Syntax:

```
(required_datatype)(expression)
```

Typecasting can be done by assigning the required data type function to the expression.
Example: Adding of string and an integer using explicit conversion

```
Birth_day = 10
Birth_month = "July"

print("data type of Birth_day before type casting :", type(Birth_day))
print("data type of Birth_month : ", type(Birth_month))

Birth_day = str(Birth_day)
print("data type of Birth_day after type casting :",type(Birth_day))

Birth_date = Birth_day + Birth_month

print("birth date of the student : ", Birth_day)
print("data type of Birth_date : ", type(Birth_date))
```

When we run the above program, the output will be

```
data type of Birth_day before type casting : <class 'int'>
data type of Birth_month : <class 'str'>

data type of Birth_day after type casting : <class 'str'>

birth date of the student : ' 10 July '
data type of Birth_date : <class 'str'>
```

8. Write the Python code to find Area and Perimeter of a rectangle.

Python Code	Sample Output

`# To calculate Area and`
`# Perimeter of a rectangle`
`L=int(input("Length"))`
`B=int(input("Breadth"))`
`Area=L*B`
`Perimeter=2*(L+B)`
`print("Area:",Area)`
`print("Perimeter:",Perimeter)`
	`Length:50`
	`Breadth:20`
	`Area:100`
	`Perimeter:140`

9. Try writing your code below:

# To calculate Area of a triangle # with Base and Height _____ #Input Base _____ #Input Height _____ #Calculate Area _____ #Display Area	Base:20 Height:10 Area:100
# To calculating average marks # of 3 subjects _____ #Input English Marks _____ #Input Maths Marks _____ #Input Science Marks _____ #Calculate Total Marks _____ #Calculate Average Marks _____ #Display Total Marks _____ #Display Average Marks	English:80 Maths :75 Science:85 Total Marks : 240 Average Marks: 80.0
# To calculate discounted amount # with discount % _____ #Input Amount _____ #Input Discount% _____ #Calculate Discount _____ #Calculate Discounted Amount _____ #Display Discount _____ #Display Discounted Amount	Amount: 5000 Discount%:10 Discount:500 Discounted Amt:4500
# To calculate Surface Area and Volume # of a Cuboid _____ #Input Length _____ #Input Breadth _____ #Input Height _____ #Calculate Surface Area _____ #Calculate Volume _____ #Display Surface Area _____ #Display Volume	Length:20 Breadth:10 Height:15 Surface Area:1300 Volume:3000

Answers:

```
# To calculate Area of a Triangle
Base=int(input("Enter Base"))
Height=int(input("Enter Height"))
Area=Base*Height/2              #Area=1/2*Base*Height
print("Area: ",Area)

#To calculate Total Marks and Average marks
English=float(input("Enter English Marks"))
Maths=float(input("Enter Maths Marks"))
Science=float(input("Enter Science Marks"))
Sum=English+Maths+Science
Average=Sum/3
print("Total Marks: ",Sum)
print("Average Marks: ",Average)
```

```
# To calculate Discounted amount with discount %
Amount=int(input("Enter Amount: "))
Discount=int(input("Enter Discount%: "))
CDiscount=Amount*Discount/100
DisAmt=Amount-CDiscount
print("Discounted Amount: ",DisAmt)

#To calculate Surface area and Volume of a cuboid
l=int(input("Enter Length: "))
w=int(input("Enter Breath: "))
h=int(input("Enter Height: "))
SurfaceArea=2*(l*w+l*h+h*w)
Volume=l*w*h
print("Surface Area: ",SurfaceArea)
print("Volume: ",Volume)
```

10. What will be the output of the following code?

```
x=2
while x<=10:
   print(x)
   x=x+1
```

output: 2
3
4
5
6
7
8
9
10

11. Write a program to check if a person can vote. (Example of if...else)

```
#A program to check if a person can vote
age=int(input("Enter Your Age: "))
if age>=18:
   print("You are eligible to vote")
else:
   print("You are not eligible to vote")
```

12. Write a program to check the grade of a student (Example of if...elif...else)

```
#To check the grade of a student

marks = 60
if marks > 75:
        print("You get an A grade")
elif marks > 60:
        print("You get a B grade")
else:
        print("You get a C grade")
```

13. Write a program to input temperature and check if the weather is hot, moderate or cold.

```
# Code to input temperature and check if the weather is hot, moderate or cold.
temp = float(input("enter temperature in °Celcius: "))          # User inputs temperature in celcius
if temp > 35:                                                   # Check if temp > 35 or not
    print("Weather is hot.")
# If temperature is not greater than 35, then it is either lesser than or equal to 35. Let us again use the
# alternative conditional statement - the elif condition here.
elif temp >= 20:
    print("Weather is moderate.")
# If none of the above conditions stands true, the else statement executes.
else:
    print("Weather is cold.")
```

14. Write a program to input marks of 3 subjects and print grades accordingly.

```
# Code to input marks of 3 subjects and print grades accordingly.
"""
A school has following rules for grading system:
a. Below 25 - F
b. 25 to 40 - E
c. 41 to 50 - D
d. 51 to 60 - C
e. 61 to 80 - B
f. Above 80 - A
Ask user to enter marks of AI, Maths and Science and print the corresponding grade.
"""
# Take in user input for three marks: AI, Maths and Science
AI = int(input("Enter marks of AI: "))
Maths = int(input("Enter marks of Maths: "))
Science = int(input("Enter marks of Science: "))

average = (AI + Maths + Science) / 3 # Average of marks is calculated

# Now, according to the average marks obtained, the grades are to be assigned.
# Note that any average can just have one type of grade. Hence, if-elif-else ladder will be used here.
if average > 80:
    grade = 'A'

elif average > 60:
    grade = 'B'

elif average > 50:
    grade = 'C'

elif average > 40:
    grade = 'D'

elif average > 25:
    grade = 'E'
else:
    grade = 'F'
# The final value of assigned grade gets printed below
print("Your grade = ", grade)
```

15. Write a program to check if an input number is less than, greater than or equal to 10

```
# Code to check if an input number is less than, greater than or equal to 10
a = int(input("enter a number:"))              # User inputs a number
if a > 10:                                     # Check if a is greater than 10
   print("a > 10")
# if the previous if statement is false, then a is either smaller or equal to 10. Hence, we can use the elif condition co check alternative condition.
elif a < 10:
   print("a < 10")
# if both the above conditions doesn't satisfy, else block will be executed by default, and print a = 10
else:
   print("a = 10")
```

16. Write the Python program to check the number entered is positive, negative or zero. (Nested if Example)

```
# In this program, we input a number
# check if the number is positive or
# negative or zero and display
# an appropriate message
# This time we use nested if
num = float(input("Enter a number: "))
if num >= 0:
        if num == 0:
                print("Zero")
        else:
                print("Positive number")
else:
        print("Negative number")
```

17. Write a program to find the sum of all numbers stored in a list. (Python for Loop)

```
# List of numbers
numbers = [6, 5, 3, 8, 4, 2, 5, 4, 11]
# variable to store the sum
sum = 0
# iterate over the list
for val in numbers:
   sum = sum+val
# Output: The sum is 48
print("The sum is", sum)
```

18. Write a program to add natural numbers upto a user entered number. (Python while Loop)

```
# sum = 1+2+3+...+n
# To take input from the user,
# n = int(input("Enter n: "))
n = 10
# initialize sum and counter
sum = 0
i = 1
while i <= n:
        sum = sum + i
        i = i+1 # update counter
# print the sum
print("The sum is", sum)
```

19. Write a program to find the whether a number is prime or not.

```
# taking input from user
number = int(input("Enter any number: "))

# prime number is always greater than 1
if number > 1:
   for i in range(2, number):
      if (number % i) == 0:
         print(number, "is not a prime number")
         break
   else:
      print(number, "is a prime number")

# if the entered number is less than or equal to 1
# then it is not prime number
else:
   print(number, "is not a prime number")
```

20. Write a program to print numbers from 0 to 9.

```
for i in range(0,10):
   print(i)
```

Nested Loops

Many times, the data which we work upon might not have just one dimension. It can be multi-dimensional. Hence, we use the concept of Nested Loops in which one or multiple loops come under the initial loop.

```
# sample code of nested for loops

for i in range(5):          # Initial loop running from 0 to 4
   print("start of i = ",i)

   for j in range(5):       # This is a nested loop as tand comes under the other loop
      print ("j = ",j)      # This print statement is under the  nested loop

   print("end of i = ",i)
print("end of nested for loops")
```

In the above code, for each iteration of for i block, a whole for j block is ran. this can be further nested to as many nests as we want. Note that indentation plays a very important role in this. Changing the indentation will result in unexpected answers or might throw an error.

21. Write programs to print the following patterns:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

```
# A matrix is formed using 2 dimensions. To work in 2 dimensions, we need two loops working togethe
r in a nested looping configuration.
```

```
# Outer loop handles the number of rows
for i in range(1,6):                    # Loop runs from 1 to 5
# Inner loop to handle number of columns
   for j in range(1, i + 1):             # Loop runs from 1 to i+1
      print(j, end = " ")                # Print statement executes inside the nested loop
   print()   # Once the inner loop gets executed, code reaches to new line with this empty print command
```

******

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

```
# In this code, two nested loops will be used: one for the increasing triangle and other for the decreasing triangle

for i in range(1,6):
   for j in range(1, i + 1):
      print("*", end = " ")
   print()
for i in range(1,5):
   i = 5 - i
   for j in range(1, i + 1):
      print("*",end = " ")
   print()
```

******

```
# In this code, read a number and print a right triangle using "*".
*
* *
* * *
* * * *
* * * * *
n=int(input("Enter the number : "))
if n==0:
        print("Enter a valid number.")
for i in range(1,n+1):
        print("*" * i)
print("\n")
```

22. Write a program to print 0 to 5 using While loop

```
i = 0                  # Initialising variable i as 0
while i <= 5:          # While loop runs till i is less than or equal to 5. i <= 5 is the condition mentioned
                       # for stopping the loop
   print(i)
   i = i + 1           # While loop does not increment by itself.
                       # This statement increments the i variable for next iteration
```

23. Write a program to print odd numbers from 1 to n.

```
n = int( input("enter n: ") )          # User inputs any integer
i = 1
while i <= n:                          # Loop runs from 0 till n
   if i % 2 == 1:                      # Check if the number is odd or even
      print(i)                         # Print the number if it is odd
   i = i + 1                           # Increment the variable for next iteration
```

24. Write a program to print all numbers divisible by 6 between 1 to 100.

```
i = 1
while i <= 100:                        # Loop starting from 1 till 100
   if i % 3 == 0 and i % 2 == 0:       # Check if the number is divisible by both 2 and 3 to check its
                                       # divisibility by 6
      print(i," is divisible by 6")    # Execute when the if statement is true
   i = i + 1                           # Increment the variable for next iteration
```

25. Complete the code given below. Fill in the blanks to find the average percentage of a class with 15 students whose marks are given in the list marks.

```
marks = [40,54,81,95,76,69,35,63,99,58,73,85,56,62,93]
sum = 0          # Variable Intitiation
average = 0      # Variable Intitiation
for m in marks: # Loop statement to run through 15 student's marks
   sum=sum+m     # Statements to calculate average % of a class of 15 students
average = sum/15    # Calculate average percentage of the class
print(average)      # Print average percentage
```

Output: 69.26666666666667

****