

Part - B : Chapter - 5 Introduction to Python

1. What is an algorithm?

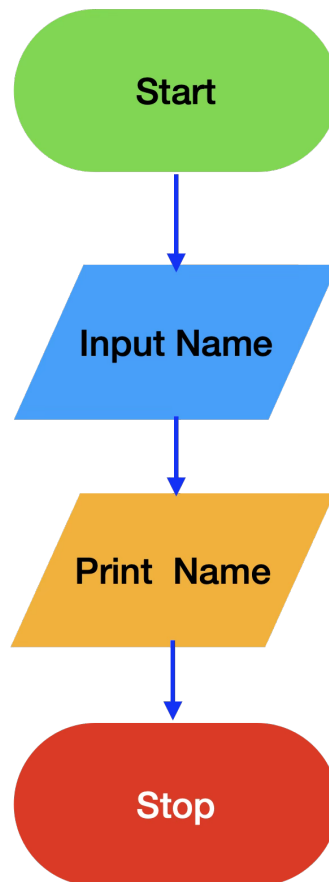
An **algorithm** is simply a **step-by-step procedure to solve a problem or perform a task**.

Characteristics of a good algorithm

- a. **Finite** → must end after some steps
- b. **Clear** → each step is unambiguous
- c. **Input** → takes data
- d. **Output** → produces result
- e. **Efficient** → uses minimum time and steps

2. What is a flowchart?

A **flowchart** is a **diagram that shows the steps of an algorithm using symbols and arrows**.



3. List all the standard graphics for making a flowchart?

Symbol	Name	Function
	Start/end	An oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/Output	A parallelogram represents input or output
	Process	A rectangle represents a process
	Decision	A diamond indicates a decision

4. Define membership operators.

Membership operators are used to **check whether a value exists inside a sequence or collection.**

Types of membership operators in Python

1. **in** → Returns **True** if the value is present
2. **not in** → Returns **True** if the value is not present

3. What is an infinite loop?

An **infinite loop** is a loop that **keeps running forever** because its stopping condition is never met.

```
while True:
    Do some thing
    i = 1
    while i <= 5:
        print(i)
```

4. Write the difference between 'else' and 'elif' statements.

elif (else if) - Used to check another condition if the previous if or elif is false - You can use multiple elif statements - It has a condition	else - Used to handle all remaining cases - It does NOT have a condition - Only one else block is allowed - Always comes at the end
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5. What are nested loops?

Nested loops are loops placed **inside another loop**.

How it works

1. The **outer loop** runs first
2. For each iteration of the outer loop, the **inner loop runs completely**

Example printing pyramid structure:

```
n = 5

for i in range(1, n + 1):
    # print spaces
    for j in range(n - i):
        print(" ", end="")
    # print stars
    for k in range(2 * i - 1):
        print("*", end="")
    print()
```

6. Write the syntax for a nested 'if-else'.

A nested **if-else** means an **if-else** statement inside another **if** or **else** block.

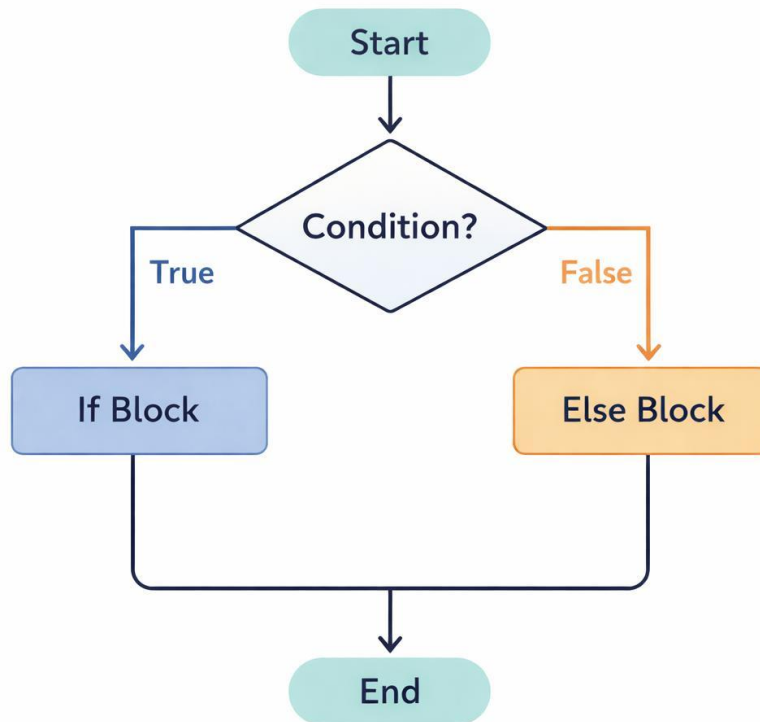
```
if condition1:
    if condition2:
        # statements
    else:
        # statements
else:
    if condition3:
        # statements
    else:
        # statements
```

Long Answer type:**1. Write algorithms to display how a traffic signal works.**

1. Start
2. Turn **RED light ON**
3. Display "STOP"
4. Wait for a few seconds (e.g., 30 seconds)
5. Turn **RED light OFF**
6. Turn **GREEN light ON**
7. Display "GO"
8. Wait for a few seconds (e.g., 30 seconds)
9. Turn **GREEN light OFF**
10. Turn **YELLOW light ON**
11. Display "WAIT / READY"
12. Wait for a few seconds (e.g., 5 seconds)

13. Turn **YELLOW** light OFF
14. Repeat steps from RED light (Step 2)
15. Stop (or continue infinitely)

2. Explain 'if-else' with the help of a flowchart.



3. What is the difference between a division operator and a floor operator?

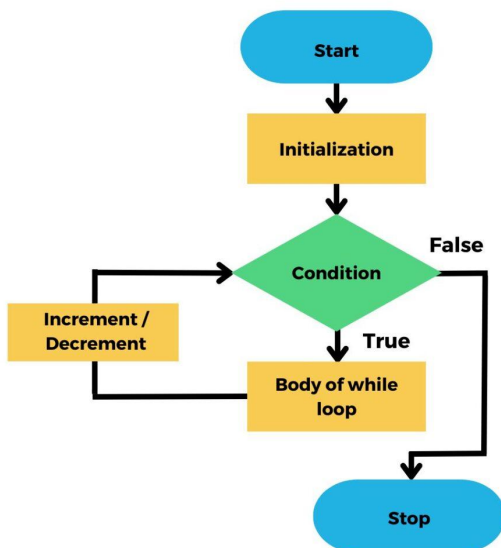
Division Operator /	Floor Division Operator //
• Performs normal division • Returns a floating-point (decimal) value	• Performs division and rounds down to the nearest integer • Returns an integer (or whole number result)
Ex. <code>a = 7</code> <code>b = 2</code> <code>print(a / b)</code>	Ex. <code>a = 7</code> <code>b = 2</code> <code>print(a // b)</code>

4. Describe the use of the input() and print function().

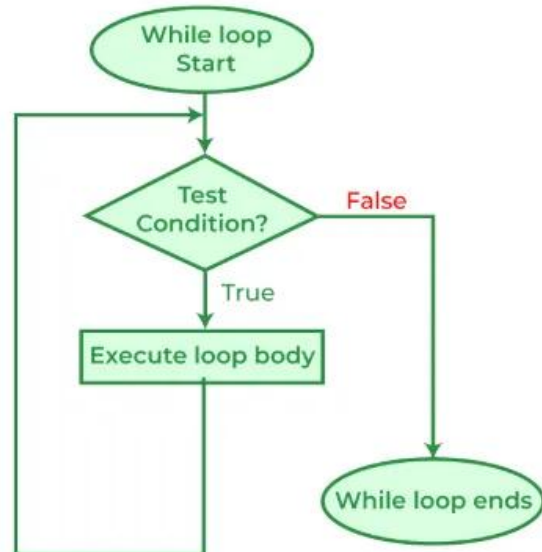
input() Function - Used to take input from the user - Always returns the value as a string Ex. <code>name = input("Enter your name: ")</code>	print() Function Used to display output on the screen Ex. <code>print("Hello ..!")</code>
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5. What is the difference between for loop and while loop? Explain with the help of a flow chart?

For:



While:



6. What are python nested if statements? Explain with an example.

Nested if statements are **if** conditions placed **inside** another **if** or **else** block.

They are used when a decision depends on **multiple conditions** (one inside another).

#syntax

```
if condition1:
    if condition2:
        # statements
    else:
        # statements
else:
    # statements
```

Example: Program for grade taking percentage.

```
marks = int(input("Enter marks: "))
attendance = int(input("Enter attendance percentage: "))

if marks >= 40:
    if attendance >= 75:
        if marks >= 90:
            print("Grade A+")
        elif marks >= 75:
            print("Grade A")
        elif marks >= 60:
            print("Grade B")
        else:
            print("Pass")
    else:
        print("Detained due to low attendance")
else:
    print("Fail")
```

7. What is the difference between a tuple and a list datatype?

List	Tuple
- A list is a collection of items that is mutable (can be changed) - Defined using square brackets <code>[]</code> Example: <pre>numbers = [10, 20, 30] numbers[0] = 100 # allowed print(numbers)</pre>	- A tuple is a collection of items that is immutable (cannot be changed) - Defined using parentheses <code>()</code> Example: <pre>numbers = (10, 20, 30) # numbers[0] = 100 ❌ Error print(numbers)</pre>

8. What is typecasting? Explain its types?

Typecasting means **converting one data type into another**.

Types of Typecasting

- **Implicit Typecasting (Automatic)**
- Done **automatically by Python**
- Converts smaller data type to a larger type

```
a = 5          # int
b = 2.5        # float

c = a + b      # int → float automatically
print(c)
```

- **Explicit Typecasting (Manual)**
- Done **manually by the programmer**
- Uses functions like `int()`, `float()`, `str()`

```
a = "10"
b = 5
```

```
c = int(a) + b    # string → int
print(c)
```

9. Write a program to find numbers that are divisible by 7 and multiples of 5 between 1200 and 2200.

#Using List:

```
result = []
```

```
for i in range(1200, 2201):
    if i % 7 == 0 and i % 5 == 0:
        result.append(i)

print("Numbers divisible by 7 and multiples of 5:")
print(result)
```

#With out List

```
for i in range(1200, 2201):
    if i % 7 == 0 and i % 5 == 0:
        print(i)
```

10. Write a program to input the monthly income of an employee between 40 and 60 years old and calculate the income tax basing on the following

Tax Slab	Rates
3 lakhs	NIL
3 to 5 laksh	5%
5 to 10 lakhs	20%
10 lakhs and above	30%

```
age = int(input("Enter age: "))
income = float(input("Enter monthly income: "))
# Convert monthly income to yearly income
annual_income = income * 12

if age >= 40 and age <= 60:

    if annual_income <= 300000:
        tax = 0

    elif annual_income <= 500000:
        tax = (annual_income - 300000) * 0.05

    elif annual_income <= 1000000:
        tax = (200000 * 0.05) + (annual_income - 500000) *
0.20

    else:
        tax = (200000 * 0.05) + (500000 * 0.20) +
(annual_income - 1000000) * 0.30

    print("Annual Income:", annual_income)
    print("Tax to be paid:", tax)

else:
    print("This tax rule is applicable only for age between 40
and 60")
```