Conditionals and Iterations

Conditional Execution

- To write useful programs we need the ability to check conditions and change the behaviour of the program accordingly.
- Different conditional statements in python are:
  - if
  - if ---else (Alternative Execution)
  - if--- elif---- else (Chained Conditionals)
  - Nested Conditionals (one into another)

Conditional Execution

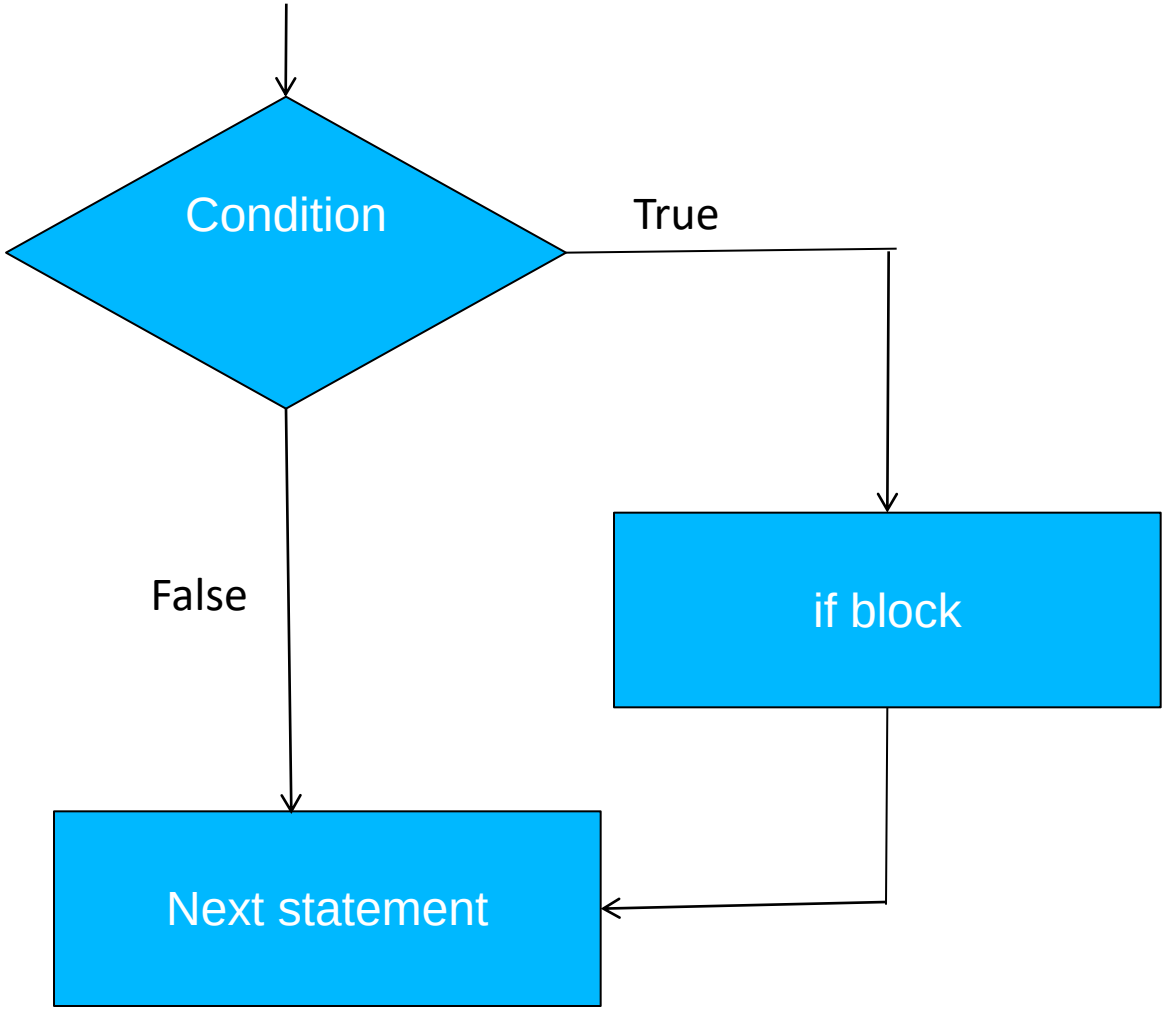
Operator	Description	Example
==	If the values of two operands are equal, then the condition becomes true.	(a == b) is not true.
!=	If values of two operands are not equal, then condition becomes true.	(a != b) is true.
<>	If values of two operands are not equal, then condition becomes true.	(a <> b) 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) 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.

What is conditional statements?

e.g.

```
X=
Y=

if  X>Y:
    print("Hello")
print("I don't know")
```

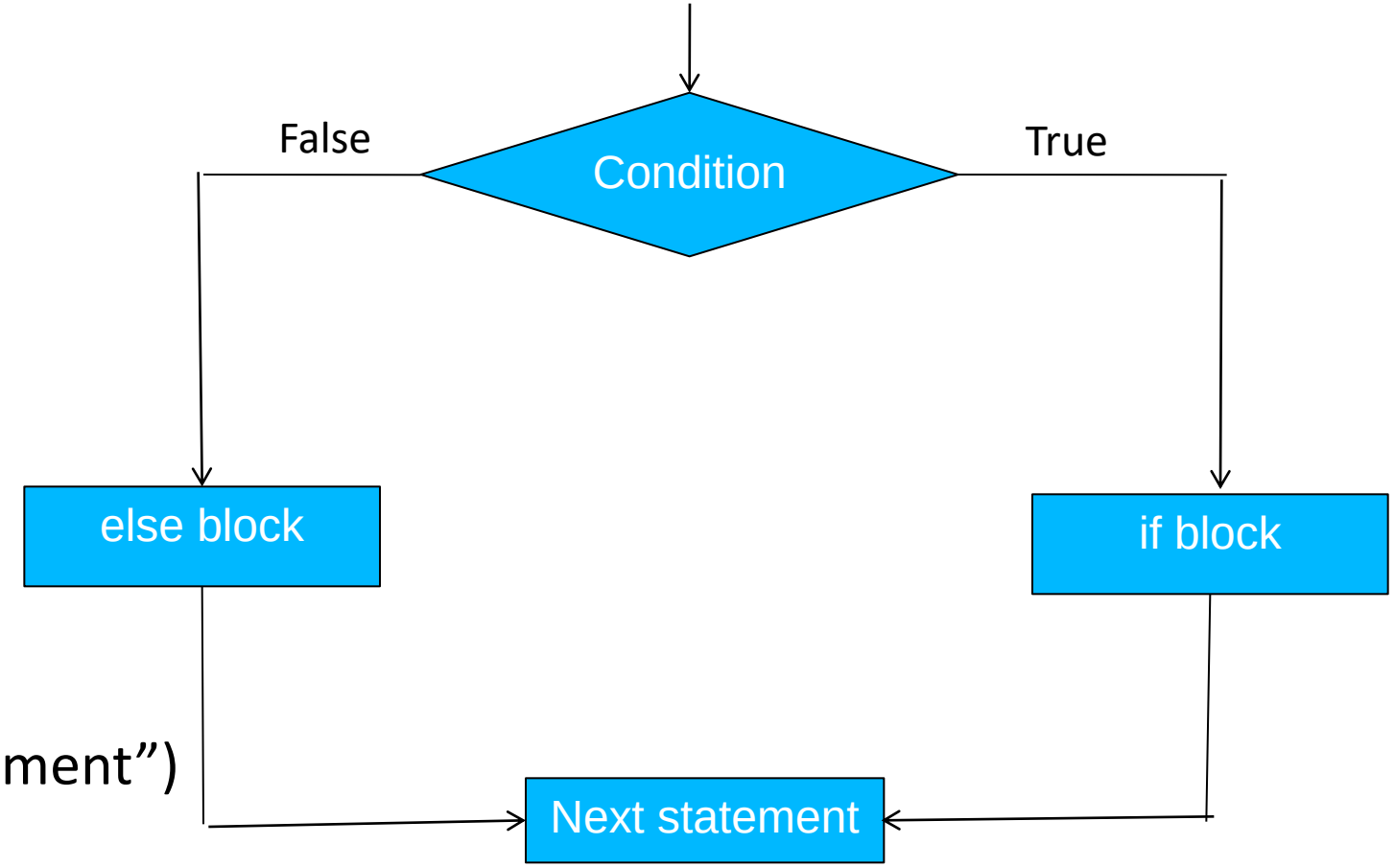


What is conditional statements?

e.g.

X=
Y=

```
if  X>Y:
    print("Hello in if")
else:
    print("Hello in else")
print("out of conditional statement")
```

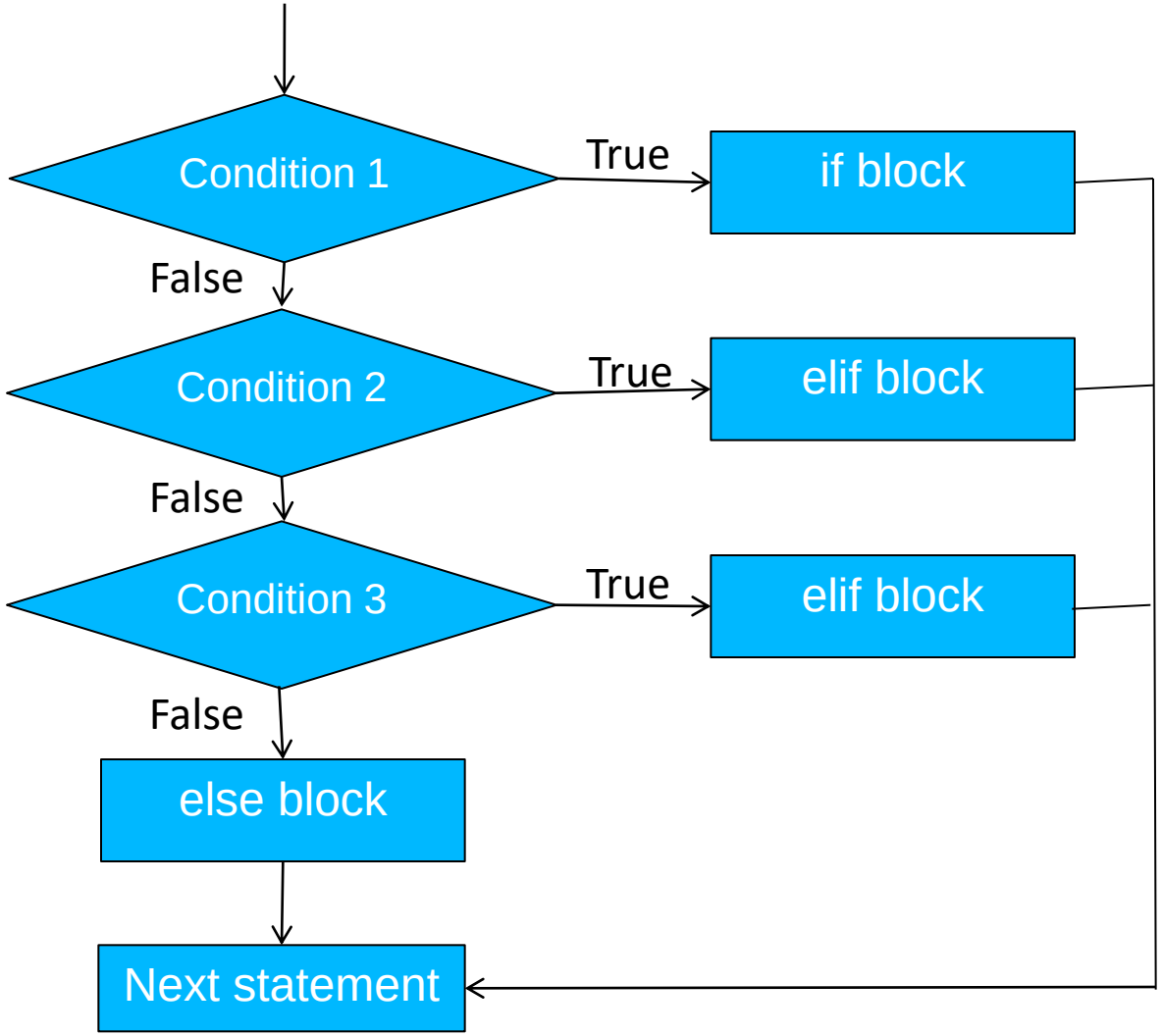


What is conditional statements?

e.g.

```
X=
Y=

if  X>Y:
    print("X is greater than Y")
elif  X<Y:
    print("Y is greater than X")
else:
    print("X is equal to Y")
print("out of conditional statement")
```



If Condition

- There is no limit on the number of statements that can appear in the body of an if statement, but there has to be at least one.
- Occasionally, it is useful to have a body with no statements (usually as a place keeper for code you haven't written yet). In that case, you can use the **pass** statement, which does nothing.

```
if x>0:
print("This statement is not in if")
```

→

```
if x>0:
    pass
print("This statement is not in if")
```

IndentationError: expected an indented block

Alternative Execution

- A second form of the if statement is alternative execution, in which there are two possibilities and the condition determines which one gets executed.
- Eg:

```
if x%2 == 0:
        print( x, "is even“)
else:
        print( x, "is odd“)
```

- The alternatives are called branches.

Chained Conditionals

- Sometimes there are more than two possibilities and we need more than two branches.

```
if x < y:
    print( x, "is less than", y)
elif x > y:
    print (x, "is greater than", y)
else:
    print (x, "and", y, "are equal“)
```

NOTE: There is no limit of the number of elif statements.

Nested conditionals

- One conditional can also be nested within another.

```
if x == y:
    print (x, "and", y, "are equal“)
else:
    if x < y:
        print (x, "is less than", y)
    else:
        print (x, "is greater than", y)
```

```
if 0 < x and x < 10:
    print ("x is a positive single digit.“)
```

- Python provides an alternative syntax that is similar to mathematical notation:

```
if 0 < x < 10:
    print ("x is a positive single digit.“)
```

Shortcuts for Conditions

- Numeric value 0 is treated as False
- Empty sequence "", [] is treated as False
- Everything else is True

```
if m%n:
    (m,n) = (n,m%n)
else:
    gcd = n
```

Avoid Nested If

- For example, We can rewrite the following code using a single conditional:

```
if 0 < x:
        if x < 10:
            print ("x is a positive single digit.“)
```

Better way:

```
if 0 < x and x < 10:
        print ("x is a positive single digit.“)
```

Also possible (Ternary operator)

```
x,y=12,44
st="x is greater than y" if (x>y) else "x is less than or equal to y"
print(st)
```

Note: can not use elif in one line

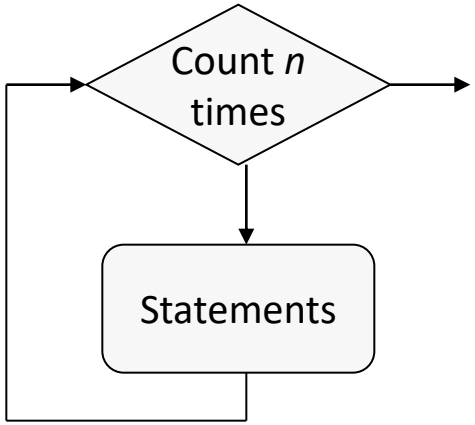
Point to be noted

Python does not have any **switch case** statement

ITERATION

Doing the Same Thing Many Times

- It's possible to do something repeatedly by just writing it all out
- Print 'hello' 5 times



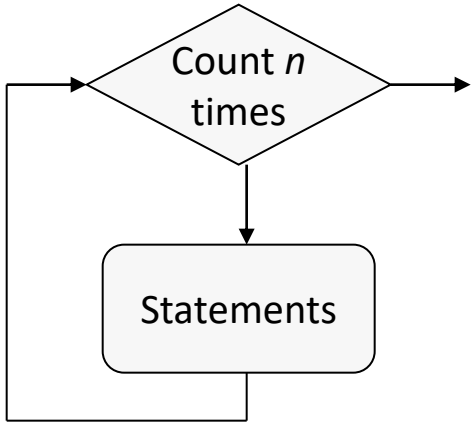

```
>>> print('Hello!')
Hello
>>> print('Hello!')
Hello
>>> print('Hello!')
Hello
>>> print('Hello!')
Hello
>>> print('Hello!')
Hello
```

Iteration and Loops

- A *loop* repeats a sequence of statements
- A *definite loop* repeats a sequence of statements a predictable number of times

0,1,2,3,4

```
>>> for x in range(5): print('Hello!')
...
Hello
Hello
Hello
Hello
Hello
```



The for Loop

- Python's **for** loop can be used to iterate a definite number of times

for <*variable*> in range(<*number of times*>): <*statement*>

- Use this syntax when you have only one statement to repeat

```
for <variable> in range(<number of
times>):
    <statement-1>
    <statement-2>
    …
    <statement-n>
```

- Use *indentation* to format two or more statements below the *loop header*

```
>>> for x in range(3):
...     print('Hello!')
...     print('goodbye')
...
Hello!
goodbye
Hello!
goodbye
Hello!
goodbye
```

Using the Loop Variable

- The *loop variable* picks up the next value in a *sequence* on each pass through the loop
- The expression **`range(n)`** generates a sequence of **`int`**s from **`0`** through **`n - 1`**

loop variable

```
>>> for x in range(5): print(x)
...
0
1
2
3
4
>>> list(range(5)) # Show as a
list
[0, 1, 2, 3, 4]
```

Function to create list

Counting from 1 through *n*

- The expression **range(low, high)** generates a sequence of **int**s from **low** through **high - 1**

```
>>> for x in range(1, 6): print(x)
...
1
2
3
4
5
```

Counting from n through *1*

- The expression **range(high, low, step)** generates a sequence of **int**s from **high** through **low+1.**

```
>>> for x in range(6, 1, -1):
print(x)
...
6
5
4
3
2
```

Skipping Steps in a Sequence

- The expression **range(low, high, step)** generates a sequence of **int**s starting with **low** and counting by **step** until **high - 1** is reached or exceeded

```
>>> for x in range(1, 6, 2): print(x)
...
1
3
5
>>> list(range(1, 6, 2)) # Show as a list
[1, 3, 5]
```

for loop with else

```
for  x in range(1,10,2):
        print(x)
else:
        print("out of for loop")
```

Note:- The else block just after for/while is executed only when the loop is NOT terminated by a break statement.

for loop with break

```
sum=0
for  x  in  range(10):
    n=int(input("Enter even number"))
    if  n%2!=0:
        break
    sum=sum+n
print("Sum =",sum)
```

for loop with continue

```
sum=0
for  x  in  range(10):
    n=int(input("Enter even number"))
    if  n%2!=0:
        continue
    sum=sum+n
print("Sum =",sum)
```

Using a Loop in a Real Problem

- An investor deposits $10,000 with the Get-Rich-Quick agency and receives a statement predicting the earnings on an annual percentage rate (APR) of 6% for a period of 5 years. Write a program that prints the beginning principal and the interest earned for each year of the period. The program also prints the total amount earned and the final principal.

- **Pseudocode:**

```
principal = 10000
rate = .06
term = 5
totalinterest = 0
for each year in term
   print principal
   interest = principal * rate
   print interest
   principal = principal + interest
   totalinterest = totalinterest + interest
print totalinterest
print principal
```

While Loop

I. A **for** loop is used when a program knows it needs to repeat a block of code for a certain number of times.

II. A **while** loop is used when a program needs to loop until a particular condition occurs.

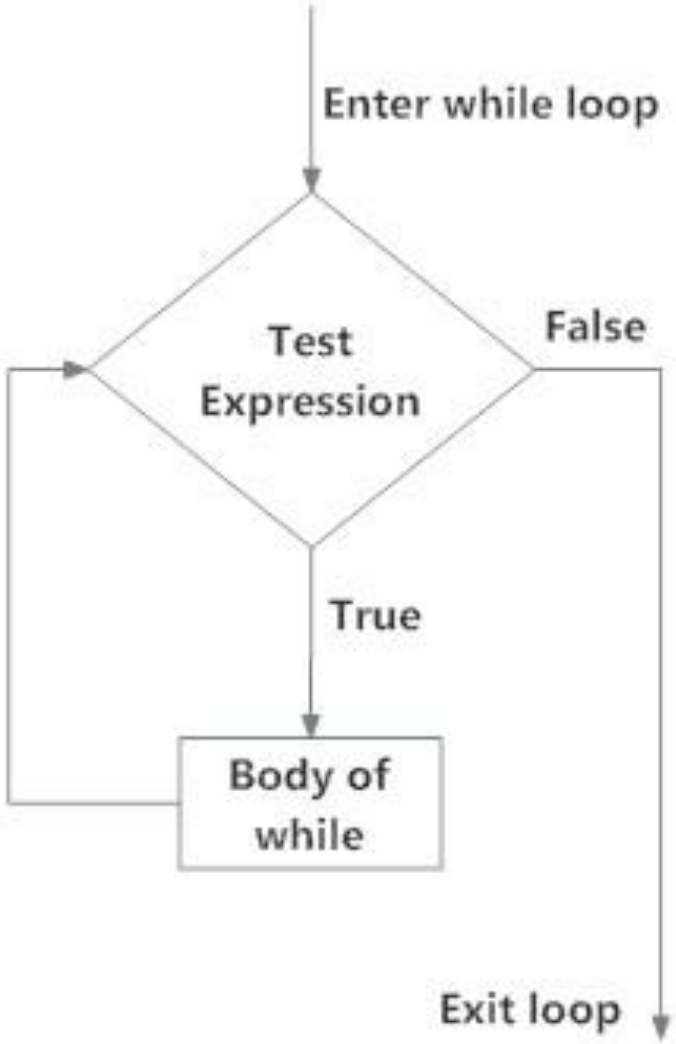


Fig: operation of while loop

While Loop

```
sum,i=0,0
while i<5:
    sum=sum+i
    i+=1    #or i=i+1
print("Sum= ",sum)
```

Exercise

1. Write a password guessing program to keep track of how many times the user has entered the password wrong. If it is more than 3 times, print "You have been denied access." and terminate the program. If the password is correct, print "You have successfully logged in." and terminate the program.
2. Write a program that asks for two numbers. If the sum of the numbers is greater than 100, print "That is a big number" and terminate the program.
3. Write a Python program that accepts a number from the user and reverse it.
4. Write a python program to find those numbers which are divisible by 7 and multiples of 5, between 1500 and 2700.

5. Write a Python program to get the Fibonacci series between 0 to 50.
6. Write a Python program which iterates the integers from 1 to 50. For multiples of three print "Fizz" instead of the number and for the multiples of five print "Buzz". For numbers which are multiples of both three and five print "FizzBuzz“
7. Write a Python program to print alphabet pattern 'A'.
8. Write a Python program to print alphabet pattern 'D‘.
9. Write a Python program to check whether an alphabet is a vowel or consonant.
10. Write a Python program to check a triangle is equilateral, isosceles or scalene.
    Note :An equilateral triangle is a triangle in which all three sides are equal.
    A scalene triangle is a triangle that has three unequal sides.
    An isosceles triangle is a triangle with (at least) two equal sides.