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PYTHON PROGRAMMING

Conditions and Loops

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Introduction to Branching and Looping

- Generally, Programs contain set of Statements.
- Set of statements, gets executed sequentially in the order in which they are written and appear.
- But, situations may arise where we may have to change the *order of execution of statements depending on specific conditions*.
- This involves a kind of decision making from a set of logical conditions/tests.
- Decision structures is to evaluate one or multiple expressions/logical conditions, which return TRUE or FALSE outcomes.
- We can then determine what actions the program should take by defining the statements to execute when the outcome is TRUE or FALSE.

Branching Statements

- Python has three major decision making instructions—

  if statement

  if-else statement

  if...elif...else statement

Branching: if statement

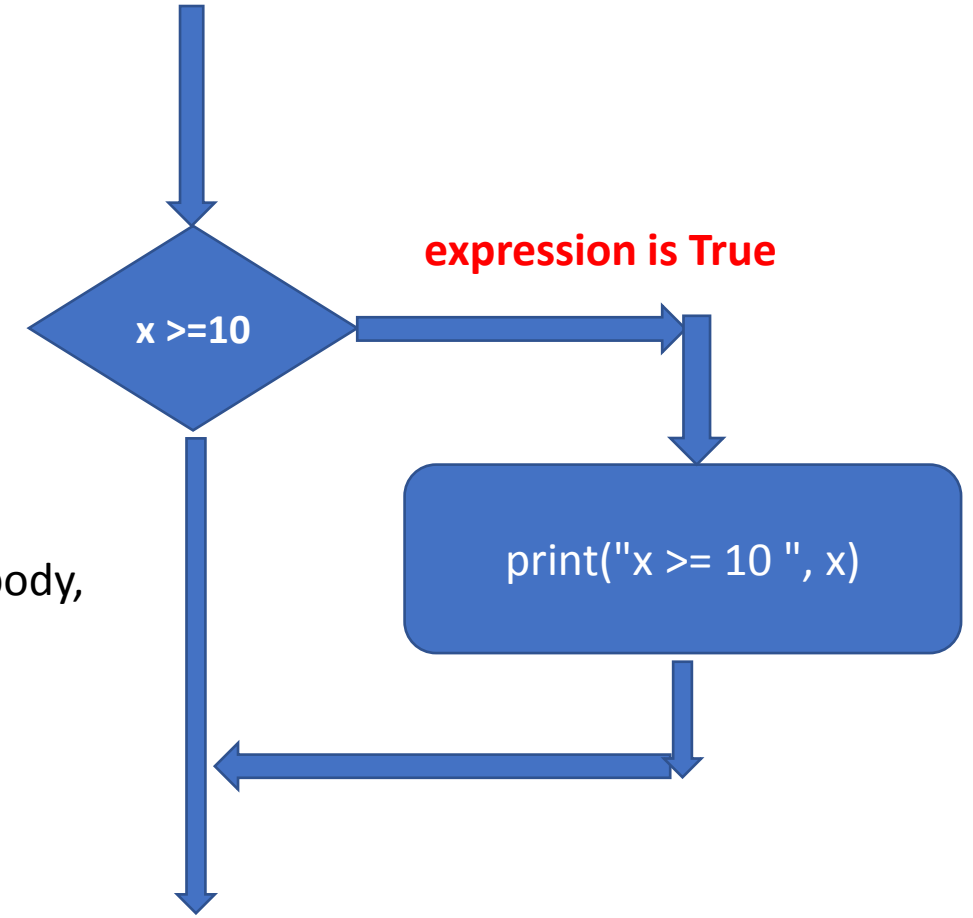
- The if statement is used to carry out a logical expression, returns Boolean.

- The expression in parentheses must produce a Boolean result
- At run time, the computer evaluates the expression as True/False
- If True, the computer executes Statement(s).
- If False, goes out of if condition
- if keyword and ends with a colon (:)
- In Python, the *if* block statements are determined through indentation and the first un-indented statement marks the end.

Example on if statement

- **If the expression returns True, prints statements.**

```
x = 10
if (x >= 10 ):
   print("x >= 10 ",x)
```

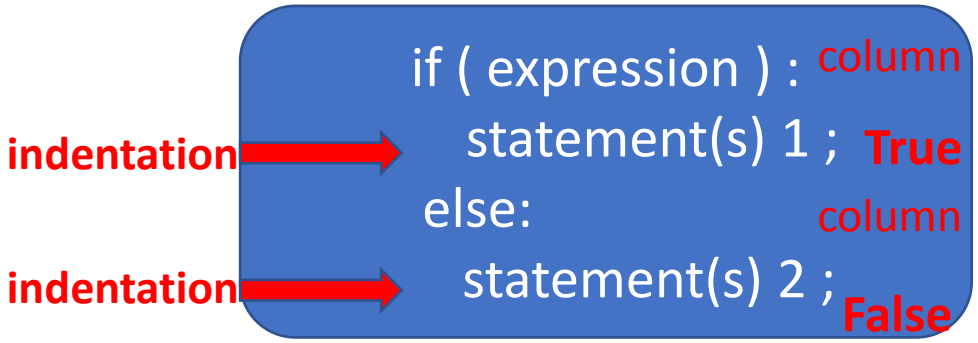


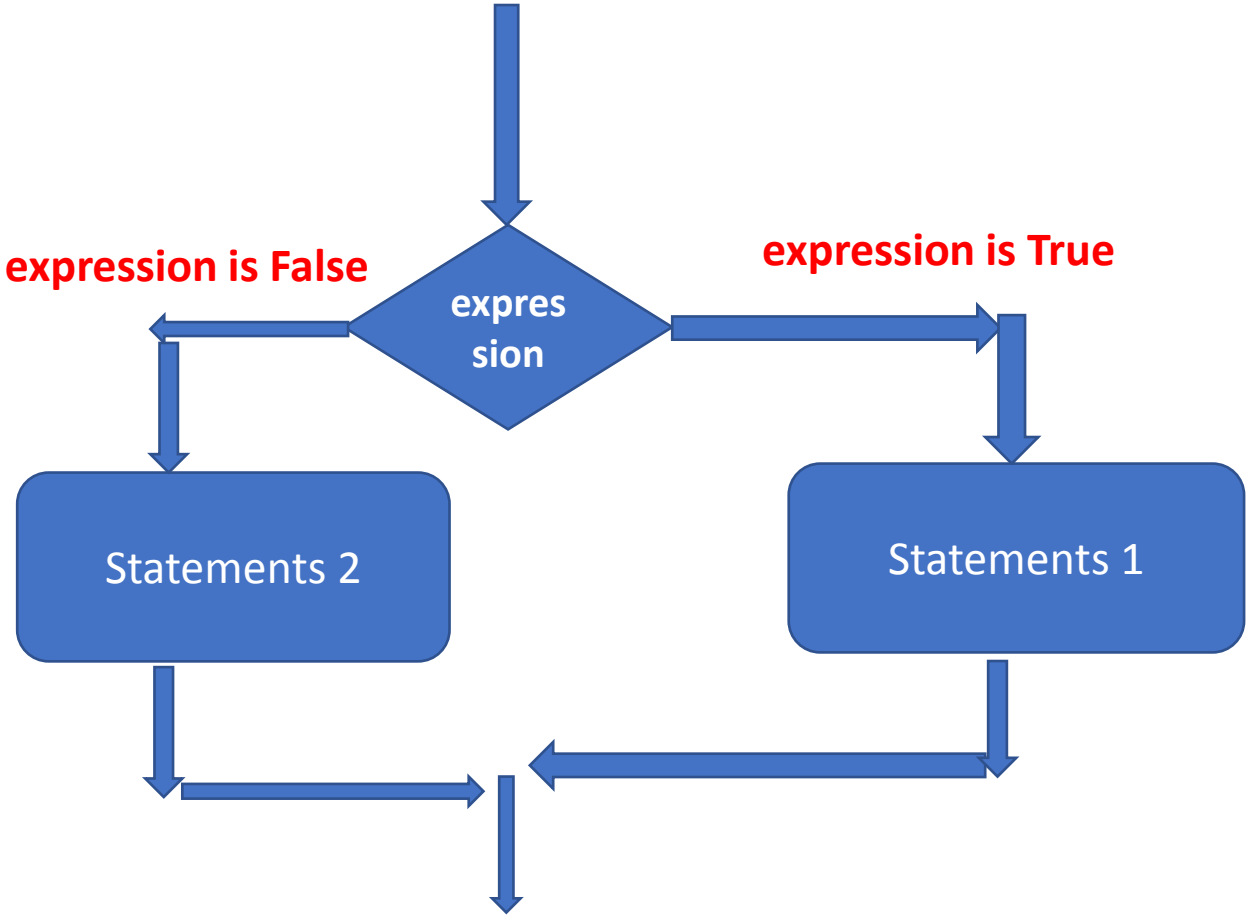
Note:

- There is no limit on the number of statements that can appear in the body, but there must be at least one.
- It is useful to have a body with no statements
- Use the **pass** statement, which does nothing.

if...else... statement

- **A second form of the if statement in which there are two possibilities and the condition determines which one gets executed.**





Programs on if...else...

- **Program to Find If a Given Number Is Odd or Even**

```
x = 10
if x%2 == 0 :
    print('x is even', x)
else :
    print('x is odd', x)
```

- **Program to Find the Greater of Two Numbers**

```
x, y=10,20
if (x > y):
    print("x is big",x)
else:
    print("y is big",y)
```

if…elif…else statement (multy-way control)

- **When you need to choose from several possible alternatives, then an *elif* statement is used along with an *if* statement.**

```
If expression 1:
   statement 1
elif expression 2:
   statement 2
        :
        :
        :
else:
   statement last
```

If expression 1 is *True*, then statement_1 is executed.

If expression 1 is *False* and expression 2 is *True*, then statement 2 is executed.

If none of the expression is *True*, then statement last is executed.

Program using if...elif...else statement

- **Program to find whether a given number is greater than / less than / equal to another.**

```
x = int(input("enter first number:"))
y = int(input("enter second number:"))


if (x > y):
    print("x > y")
elif (x < y):
    print("x < y")
else:
    print("x == y")
```

```
1  x = int(input("enter first number:"))
2  y = int(input("enter second number:"))
3
4  if (x > y):
5      print("x > y")
6  elif (x < y):
7      print("x < y")
8  else:
9      print("x == y")
```

```
enter first number:20
enter second number:10
x > y
```

Single line if else statements

```
if condition:
  value_when_true
else:
  value_when_false
```

```
value_when_true if condition else value_when_false
```

- If condition returns True then value_when_true is returned
- If condition returns False then value_when_false is returned

```
b = int(input("Enter value for b: "))

a = "positive" if b >= 0 else "negative"

print(a)
```

```
b = int(input("Enter value for b: "))

if b >= 0:
    a = "positive"
else:
    a = "negative"

print(a)
```

```
if condition1:
    expr1
elif condition2:
    expr2
else:
    expr
```

```
expr1 if condition1 else expr2 if condition2 else expr
```

- If the value of `b` is less than `0` then "`neg`" is returned
- If the value of `b` is greater than `0` then "`pos`" is returned.
- If both the condition return `False`, then "`zero`" is returned

```
b = int(input("Enter value for b: "))
a = "neg" if b < 0 else "pos" if b > 0 else "zero"

print(a)
```

for loop

- Probably the most popular looping instructi

```
for iteration_variable in sequence:
    statement(s)
```

- The *for* loop starts with *for* keyword and ends with a colon.
- The first item in the sequence gets assigned to the iteration variable iteration_variable. iteration_variable can be any valid variable name. Then the statement block is executed.
- This process of assigning items from the sequence to the iteration_variable and then executing the statement continues until all the items in the sequence are completed.
- Actually, the for loop is designed to do more complicated tasks - it can "browse" large collections of data item by item.

range()

- The range() type returns an immutable sequence of numbers between the given start integer to the stop integer.
- range() constructor has two forms of definition:
- range(stop)
- range(start, stop[, step])

  start - integer starting from which the sequence of integers is to be returned

  stop - integer before which the sequence of integers is to be returned. The range of integers end at stop - 1.

  step (Optional) - integer value which determines the increment between each integer in the sequence
- range() returns an immutable sequence object of numbers depending upon the definitions used:

Example for loop with range()

for a in range (5):

print (a)

```
for a in range (5):
    print  (a)
```

```
0
1
2
3
4
```

for a in range (6,10):

print (a)

```
for a in range (6,10):
    print  (a)
```

```
6
7
8
9
```

for a in range (11,20,2):

print (a)

```
for a in range (11,20,2):
    print  (a)
```

```
11
13
15
17
19
```

for loop with string

- Program to Iterate through Each Character in the String

```
for ch in "Conduira":
    print(ch)
```

```
1 for ch in "Conduira":
2     print(ch)
```

```
C
o
n
d
u
i
r
a
```

Example for loop

- Program : Sum of all first 10 Natural numbers

```
sum=0
for n in range(1,11):
    sum+=n
print (sum)
```

```
1  sum=0
2  for n in range(1,11):
3      sum+=n
4  print (sum)
```

```
55
```

Example for loop

- Program to Find the Sum of All Odd and Even Numbers

```
num = int(input("Enter a number: "))
even = 0
odd = 0
for i in range(num):
    if i % 2 == 0:
        even = even + i
    else:
        odd = odd + i
print(f"Sum of Even are {even} odd are {odd}")
```

```
1  num = int(input("Enter a number: "))
2  even = 0
3  odd = 0
4  for i in range(num):
5      if i % 2 == 0:
6          even = even + i
7      else:
8          odd = odd + i
9  print(f"Sum of Even are {even} odd are {odd}")
```

```
Enter a number: 10
Sum of Even are 20 odd are 25
```

while loop

- The while loop in Python is used to iterate over a block of code as long as the test expression (condition) is true.
- Condition: We generally use this loop when we don't know the number of times to iterate beforehand.

```
while test_expression:
    Body of while
```

```
# Program to add natural # numbers up to

n = 10
sum = 0
i = 1

while i <= n:
    sum = sum + i
    i = i+1

print("The sum is", sum)
```

break , continue statements

- In Python, break and continue statements can alter the flow of a normal loop.
- Loops iterate over a block of code until the test expression is false, but sometimes we wish to terminate the current iteration or even the whole loop without checking test expression.
- The break statement terminates the loop containing it.
- If the break statement is inside a nested loop (loop inside another loop), the break statement will terminate the innermost loop.
- The continue statement is used to skip the rest of the code inside a loop for the current iteration only.
- Loop does not terminate but continues with the next iteration.

Example with break , continue statements

```
for i in range(1, 6):
    if i == 3:
        break
    print("Inside the loop.", i)
print("Outside the loop.")
```

```
for i in range(1, 6):
    if i == 3:
        break
    print("Inside the loop.", i)
print("Outside the loop.")
```

```
Inside the loop. 1
Inside the loop. 2
Outside the loop.
```

```
for i in range(1, 6):
    if i == 3:
        continue
    print("Inside the loop.", i)
print("Outside the loop.")
```

```
Inside the loop. 1
Inside the loop. 2
Inside the loop. 4
Inside the loop. 5
Outside the loop.
```

In Python, a nested loop is a loop inside another loop

Syntax:

```
Outer loop:
        Inner loop:
                statements of inner loop
        statements of outer loop
```

```
for loop:
        for loop:
                statements of for loop
        statements of for loop
```

```
while loop:
        while loop:
                statements of while loop
        statements of while loop
```

```
for loop:
        while loop:
                statements of while loop
        statements of for loop
```

```
while loop:
        for loop:
                statements of for loop
        statements of while loop
```

else statement

- With the else statement we can run a block of code once when the condition no longer is true:

```
i = 1
while i < 6:
  print(i)
  i += 1
else:
  print("i is no longer less than 6")
```

```
for i in range(0, 10,2):
    print(i, end=" ")
else:
    print("\n No Break")
```