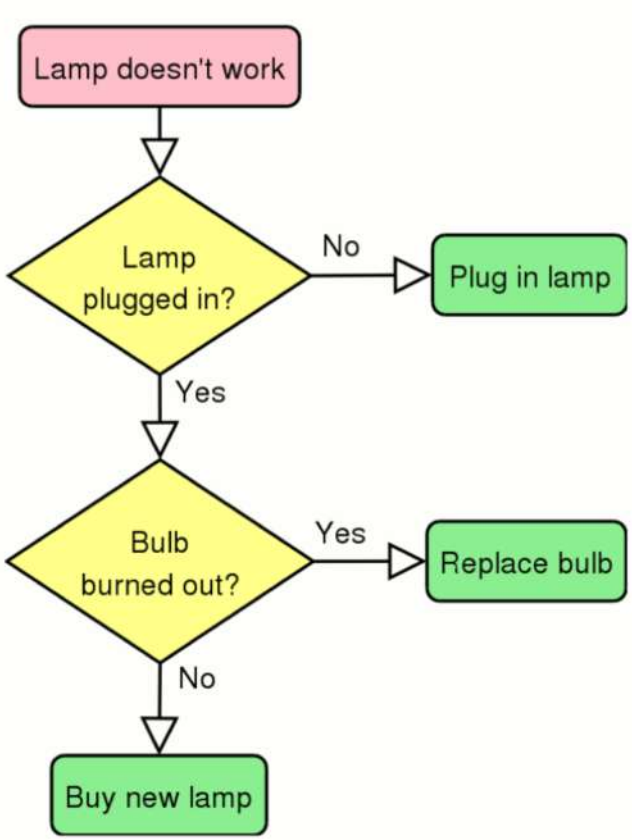
Branching logic

- Used to implement alternate paths for the logic flow.



https://upload.wikimedia.org/wikipedia/commons/4/44/LampFlowchart.png

If/elif/else statements

```
if test1:
    statement 1
elif test2:
    statement 2
else:
    statement 3
```

- Both the elif and else blocks are optional.

If/elif/else statements

```
>>> A = 0; B = 10; S1 = 'Hello'
>>> if (A < B ):
...     print 'true'
...
true
>>> if (A > B ):
...     print 'true'
... else:
...     print 'false'
...
false
```

```
>>> if A == 0 :
...     print A
... elif B ==10 :
...     print B
... else:
...     print "Neither match"
...
0
```

Lamp flowchart with if/else

```
#!/usr/bin/python

lamp = raw_input("Is the lamp on (yes/no): ")
plugged = raw_input("Is the lamp plugged in (yes/no) : ")
burnt = raw_input("Is the bulb burnt out (yes/no) : ")
if lamp != 'yes':
        if plugged == 'yes':
                if burnt == 'yes':
                        print 'replace bulb'
                else:
                        print 'replace lamp'
        else:
                print 'plug in lamp'
else: print 'Enjoy the light'
```

Accepts input from user, as a string

Truth and Boolean tests in Python

- All objects in python have an inherent true or false value.
- Any nonempty object is true.
  - For Integers : Any non-zero number is true
- Zero, empty objects and special object ‘None’ are false.
- Comparisons return the values True or False

Loops/Iterations

- A loop is syntax structure that repeats all the statements within the loop until the exit condition is met.
- Statements in a loop are defined by indenting them relative to the loop start.
- Loop ends when indentation ends.
- Python has two forms of loops: for loop and while loop.
- E.g. >>> for x in range(10)
- E.g. >>>while (A==10)

while loops

- while condition:
  statement 1
  statement 2
  .
  .

- Most generic form of loop, that checks whether the condition is true at the start of each iteration.
- Expects the condition to become false at some point during the iterations of the loop.
- If condition is never changed, this creates an ‘infinite’ loop. i.e., the program will get stuck in this loop for ever.

Example while loops

```
>>> while (A < B):
...     print A
...     A+=1
...
0
1
2
3
4
5
6
7
8
9
```

```
>>> while (B > A):
...     print B
...     B-=1
...
10
9
8
7
6
5
4
3
2
1
```

```
>>> while S1:
...     print S1
...     S1 = S1[1:]
...
Hello
ello
llo
lo
o
```

Altering while loops

- Normal loop control will execute all statements in block on every iteration. Loop ends only when exit condition is met.
- break statement forces the current loop to exit.
- continue statement skips the rest of the block and goes to the next iteration of the loop.
- pass statement is a placeholder for empty blocks.

Altering while loops

```
>>> A=0
>>> while True:
...       print A
...       if (A >= 5): break
...       A+=1
...
0
1
2
3
4
5
```

```
>>> A=0
>>> while A <= 5 :
...       A+=1
...       if (A == 3):continue
...       print A
...
1
2
4
5
6
```

for loops

- for item in sequence:
  statement 1
  statement 2
  .
  .

- Generic iterator for items in a ordered sequence such as lists, tuples etc.
- On each iteration retrieves one item from the list and assigns it to the variable specified.
- Automatically moves to the next item in the order.
- Value of variable may be altered within the for loop, but change is not made in the list.

for loops

```
>>> L=['Egg','Bacon','Ham']
>>> for item in L:
...     item+='s'
...     print item
...
Eggs
Bacons
Hams
>>> L
['Egg', 'Bacon', 'Ham']
```

```
>>> for x in range(0,100,10):
...     print x
...
0
10
20
30
40
50
60
70
80
90
```

Looping over Strings and Lists

- List is a general sequence object while String is a character sequence object.
- Both can be iterated over by a for loop:

```
>>> L
['Egg', 'Bacon', 'Ham']
>>> for x in L:
...     print x
...
Egg
Bacon
Ham
```

```
>>> S1="Hello"
>>> for x in S1:
...     print x
...
H
e
l
l
o
```

Looping over Tuples and Dictionaries

```
>>> T = (1,'a',45,23.45,'String')
>>> for x in T: print x
...
1
a
45
23.45
String
```

```
>>> myDict = {'a':'1','b':'2','c':'3'}
>>> for key in myDict:
...     print(key,' ==> ', myDict[key])
...
('a', ' ==> ', '1')
('c', ' ==> ', '3')
('b', ' ==> ', '2')
```

```
>>> for (key,value) in myDict.items():
...     print(key,' ==> ',value)
...
('a', ' ==> ', '1')
('c', ' ==> ', '3')
('b', ' ==> ', '2')
```

Nested Loops

- Loops can be nested just like the if/else statements.
- Indentation is again the key to creating nested loops.
- In a 2 level nested loop with x iterations on the outer loop and y iterations in the inner loop:
  - All statements in the outer loop will be executed x times
  - All statements in the inner loop will be executed x*y times

Summary: loops

- Loops allow repeated execution of the same set of statements on all the objects within a sequence.
- Using an index based for loop is best suited for making changes to items within a list.
- Always ensure that your exit condition will be met.