Lists and dictionaries
Lists: ordered collections of things

In [1]: pets = ['fido', 'molly', 'tweety']
   pets[0]  # get 1st element of list
Out[1]: 'fido'  # result is a string

In [2]: pets[1:3]  # get 2nd and 3rd element
Out[2]: ['molly', 'tweety']  # result is a list
Dictionaries: unordered collections of key-value pairs

In [1]: pets = {'fido': 'dog', 'molly': 'cat'}  
    pets['fido']  # return the value for key 'fido'  
Out[1]: 'dog'

In [2]: 'molly' in pets  # does dict have key 'molly'?  
Out[2]: True  # yes

In [3]: 'tweety' in pets  # does dict have key 'tweety'?  
Out[3]: False  # no
Conditional code execution
if/else statements

if condition:
    statement
else:
    alternative statement
if/else statements

if condition:
  statement
else:  # optional, can be omitted
  alternative statement
if/else statements

if condition:
    statement
Simple if/else example

In [1]: if 2<3:
    print("yes")
else:
    print("no")

Out[1]: yes
Simple if/else example

In [1]: if 3<2:
    
    print("yes")
    
else:
    
    print("no")

Out[1]: no
Indentation defines code blocks

In [1]: if 3<2: # False
   print("1") # not run
   print("2") # not run
   print("3") # not run
   print("4") # run

Out[1]: 4
Indentation defines code blocks

In [1]: if 2<3: # True
   print("1") # run
   print("2") # run
   print("3") # run
   print("4")    # run

Out[1]: 1
    2
    3
    4
Doing things multiple times (loops)
for loops

for variable in list:
    statement
for-loop example

In [1]: for name in ["John", "Sara", "Bill"]: print(name)

Out[1]: John
       Sara
       Bill
Again, indentation defines code blocks

In [1]: for name in ["John", "Sara", "Bill"]:  
    print("----")  # run for every name  
    print(name)  # run for every name  
    print("----")  # run once

Out[1]: ----  
        John  
        ----  
        Sara  
        ----  
        Bill  
        ----
We use for loops when we want to do something a number of times

In [1]: for i in range(5):  # range(5) creates the
    print("Hello!")  # numbers from 0 to 4

Out[1]: Hello!
Hello!
Hello!
Hello!
Hello!
We use for loops when we want to do something a number of times

In [1]: for i in range(5):  # range(5) creates the numbers from 0 to 4
   print("Hello: ", i)  # numbers from 0 to 4

Out[1]: Hello: 0
Hello: 1
Hello: 2
Hello: 3
Hello: 4
One more example: Make a list of the numbers 1 through 5

In [1]: result = [] # start with empty list
   for i in range(1, 6): # count from 1 to 5
       result.append(i)
   print(result)

Out[1]: [1, 2, 3, 4, 5]
Combining loops and conditional execution
We often combine for loops and if statements

Typical example:

Loop over all elements in a list, and do an action if some condition is met.
Example:
Find names starting with 'S'

In [1]: for name in ["John", "Sara", "Bill"]:  
   if name[0] == 'S':  
       print(name, "starts with S")  
   else:  
       print(name, "doesn't start with S")

Out[1]: John doesn't start with S  
Sara starts with S  
Bill doesn't start with S
Example: Count names starting with 'S'

In [1]: count = 0       # start with count of 0
   for name in ["John", "Sara", "Bill"]:  
      if name[0]=='S':
         count += 1   # increase count by 1
   print(count)   # print final result

Out[1]: 1
Last example: Count how often letters occur in a string

In [1]: sentence = "Time flies like an arrow."
   # first we count, using a dict
counts = {} # empty dict
for c in sentence:
    if c in counts:  # have we seen this letter before?
        counts[c]+=1 # yes, increase count by 1
    else:
        counts[c]=1 # no, set count to 1

# now that we have the counts, we print them
for c in counts:  # loop over all letters in the dict
    print(c, "appears", counts[c], "times.")
Last example: Count how often letters occur in a string

Out[1]: i appears 3 times.
        k appears 1 times.
        o appears 1 times.
        r appears 2 times.
        l appears 2 times.
        appears 4 times.
        n appears 1 times.
        m appears 1 times.
        f appears 1 times.
        e appears 3 times.
        . appears 1 times.
        s appears 1 times.
        T appears 1 times.
        a appears 2 times.
        w appears 1 times.