List

Lists are used to store multiple items in a single variable.

Lists are one of 4 built-in data types in Python used to store collections of data, the other 3 are Tuple, Set, and Dictionary, all with different qualities and usage.

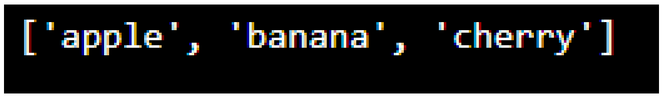
```
mylist = ["apple", "banana", "cherry"]
```

Lists are created using square brackets:

Example

Create a List:

```
thislist = ["apple", "banana", "cherry"]
print(thislist)
```



```
['apple', 'banana', 'cherry']
```

List Items

List items are ordered, changeable, and allow duplicate values.

List items are indexed, the first item has index `[0]`, the second item has index `[1]` etc.

Ordered

When we say that lists are ordered, it means that the items have a defined order, and that order will not change.

If you add new items to a list, the new items will be placed at the end of the list.

Changeable

The list is changeable, meaning that we can change, add, and remove items in a list after it has been created.

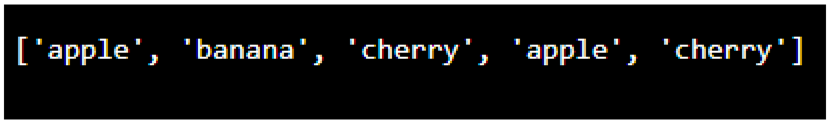
Allow Duplicates

Since lists are indexed, lists can have items with the same value:

Example

Lists allow duplicate values:

```
thislist = ["apple", "banana", "cherry", "apple", "cherry"]
print(thislist)
```



```
['apple', 'banana', 'cherry', 'apple', 'cherry']
```

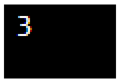
List Length

To determine how many items a list has, use the `len()` function:

Example

Print the number of items in the list:

```
thislist = ["apple", "banana", "cherry"]
print(len(thislist))
```



```
3
```

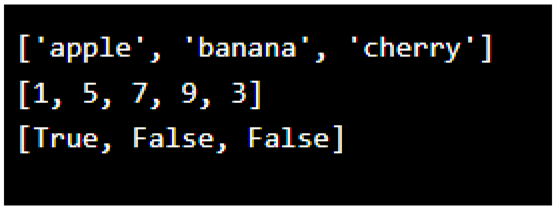
List Items - Data Types

List items can be of any data type:

Example

String, int and boolean data types:

```
list1 = ["apple", "banana", "cherry"]
list2 = [1, 5, 7, 9, 3]
list3 = [True, False, False]
```



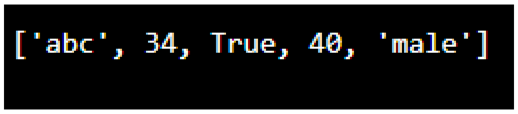
```
['apple', 'banana', 'cherry']
[1, 5, 7, 9, 3]
[True, False, False]
```

A list can contain different data types:

Example

A list with strings, integers and boolean values:

```
list1 = ["abc", 34, True, 40, "male"]
```



```
['abc', 34, True, 40, 'male']
```

type()

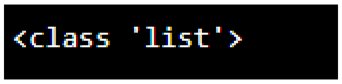
From Python's perspective, lists are defined as objects with the data type 'list':

```
<class 'list'>
```

Example

What is the data type of a list?

```
mylist = ["apple", "banana", "cherry"]
print(type(mylist))
```



```
<class 'list'>
```

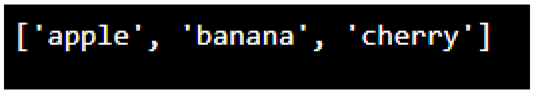
The list() Constructor

It is also possible to use the `list()` constructor when creating a new list.

Example

Using the `list()` constructor to make a List:

```
thislist = list(("apple", "banana", "cherry")) # note the
double round-brackets
print(thislist)
```



```
['apple', 'banana', 'cherry']
```

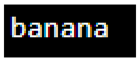
Access Items

List items are indexed and you can access them by referring to the index number:

Example

Print the second item of the list:

```
thislist = ["apple", "banana", "cherry"]
print(thislist[1])
```



```
banana
```

Note: The first item has index 0.

Negative Indexing

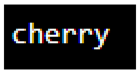
Negative indexing means start from the end

`-1` refers to the last item, `-2` refers to the second last item etc.

Example

Print the last item of the list:

```
thislist = ["apple", "banana", "cherry"]
print(thislist[-1])
```



```
cherry
```

Range of Indexes

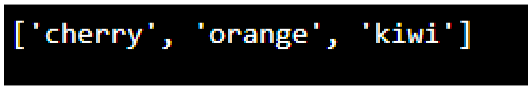
You can specify a range of indexes by specifying where to start and where to end the range.

When specifying a range, the return value will be a new list with the specified items.

Example

Return the third, fourth, and fifth item:

```
thislist =
["apple", "banana", "cherry", "orange", "kiwi", "melon", "mango"]
print(thislist[2:5])
```



```
['cherry', 'orange', 'kiwi']
```

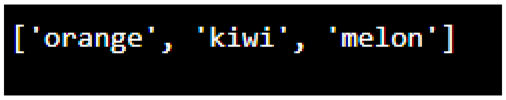
Range of Negative Indexes

Specify negative indexes if you want to start the search from the end of the list:

Example

This example returns the items from "orange" (-4) to, but NOT including "mango" (-1):

```
thislist =
["apple", "banana", "cherry", "orange", "kiwi", "melon", "mango"]
print(thislist[-4:-1])
```



```
['orange', 'kiwi', 'melon']
```

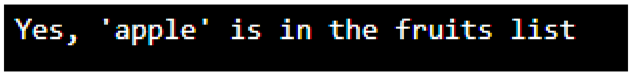
Check if Item Exists

To determine if a specified item is present in a list use the `in` keyword:

Example

Check if "apple" is present in the list:

```
thislist = ["apple", "banana", "cherry"]
if "apple" in thislist:
  print("Yes, 'apple' is in the fruits list")
```



```
Yes, 'apple' is in the fruits list
```

Change Item Value

To change the value of a specific item, refer to the index number:

Example

Change the second item:

```
thislist = ["apple", "banana", "cherry"]
thislist[1] = "blackcurrant"
print(thislist)
```

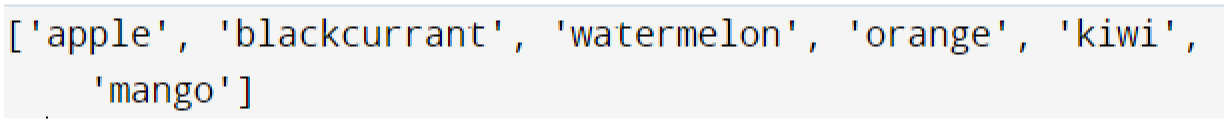
Change a Range of Item Values

To change the value of items within a specific range, define a list with the new values, and refer to the range of index numbers where you want to insert the new values:

Example

Change the values "banana" and "cherry" with the values "blackcurrant" and "watermelon":

```
thislist =
["apple", "banana", "cherry", "orange", "kiwi", "mango"]
thislist[1:3] = ["blackcurrant", "watermelon"]
print(thislist)
```



```
['apple', 'blackcurrant', 'watermelon', 'orange', 'kiwi',
    'mango']
```

Insert Items

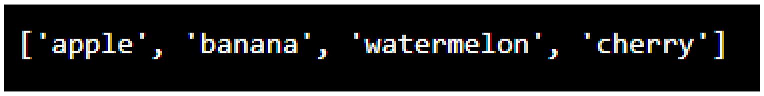
To insert a new list item, without replacing any of the existing values, we can use the `insert()` method.

The `insert()` method inserts an item at the specified index:

Example

Insert "watermelon" as the third item:

```
thislist = ["apple", "banana", "cherry"]
thislist.insert(2, "watermelon")
print(thislist)
```



```
['apple', 'banana', 'watermelon', 'cherry']
```

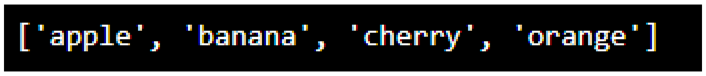
Append Items

To add an item to the end of the list, use the `append()` method:

Example

Using the `append()` method to append an item:

```
thislist = ["apple", "banana", "cherry"]
thislist.append("orange")
print(thislist)
```



```
['apple', 'banana', 'cherry', 'orange']
```

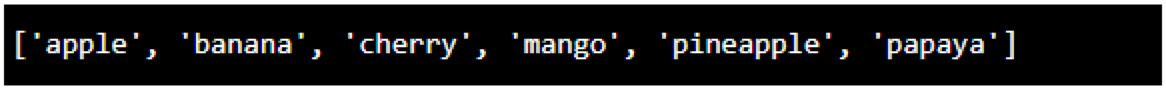
Extend List

To append elements from *another list* to the current list, use the `extend()` method.

Example

Add the elements of `tropical` to `thislist`:

```
thislist = ["apple", "banana", "cherry"]
tropical = ["mango", "pineapple", "papaya"]
thislist.extend(tropical)
print(thislist)
```



```
['apple', 'banana', 'cherry', 'mango', 'pineapple', 'papaya']
```

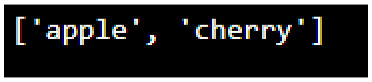
Remove Specified Item

The `remove()` method removes the specified item.

Example

Remove "banana":

```
thislist = ["apple", "banana", "cherry"]
thislist.remove("banana")
print(thislist)
```



```
['apple', 'cherry']
```

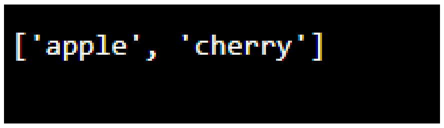
Remove Specified Index

The `pop()` method removes the specified index.

Example

Remove the second item:

```
thislist = ["apple", "banana", "cherry"]
thislist.pop(1)
print(thislist)
```



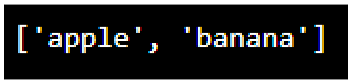
```
['apple', 'cherry']
```

If you do not specify the index, the `pop()` method removes the last item.

Example

Remove the last item:

```
thislist = ["apple", "banana", "cherry"]
thislist.pop()
print(thislist)
```



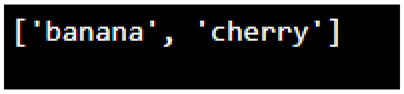
```
['apple', 'banana']
```

The `del` keyword also removes the specified index:

Example

Remove the first item:

```
thislist = ["apple", "banana", "cherry"]
del thislist[0]
print(thislist)
```



```
['banana', 'cherry']
```

The `del` keyword can also delete the list completely.

Example

Delete the entire list:

```
thislist = ["apple", "banana", "cherry"]
del thislist
```

thislist = ["apple", "banana", "cherry"]

del thislist

print(thislist) #this will cause an error because you have succsesfully deleted "thislist".

Clear the List

The `clear()` method empties the list.

The list still remains, but it has no content.

Example

Clear the list content:

```
thislist = ["apple", "banana", "cherry"]
thislist.clear()
print(thislist)
```

```
[]
```

Sort List Alphanumerically

List objects have a `sort()` method that will sort the list alphanumerically, ascending, by default:

Example

Sort the list alphabetically:

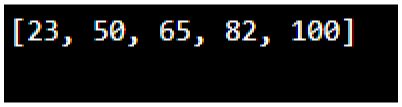
```
thislist =
["orange", "mango", "kiwi", "pineapple", "banana"]
thislist.sort()
print(thislist)
```

```
['banana', 'kiwi', 'mango', 'orange', 'pineapple']
```

Example

Sort the list numerically:

```
thislist = [100, 50, 65, 82, 23]
thislist.sort()
print(thislist)
```



```
[23, 50, 65, 82, 100]
```

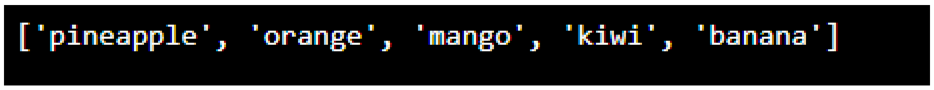
Sort Descending

To sort descending, use the keyword argument `reverse = True`:

Example

Sort the list descending:

```
thislist =
["orange", "mango", "kiwi", "pineapple", "banana"]
thislist.sort(reverse = True)
print(thislist)
```

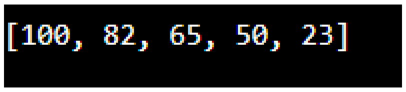


```
['pineapple', 'orange', 'mango', 'kiwi', 'banana']
```

Example

Sort the list descending:

```
thislist = [100, 50, 65, 82, 23]
thislist.sort(reverse = True)
print(thislist)
```



```
[100, 82, 65, 50, 23]
```

Copy a List

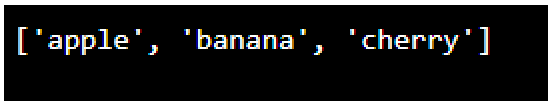
You cannot copy a list simply by typing `list2 = list1`, because: `list2` will only be a *reference* to `list1`, and changes made in `list1` will automatically also be made in `list2`.

There are ways to make a copy, one way is to use the built-in List method `copy()`.

Example

Make a copy of a list with the `copy()` method:

```
thislist = ["apple", "banana", "cherry"]
mylist = thislist.copy()
print(mylist)
```



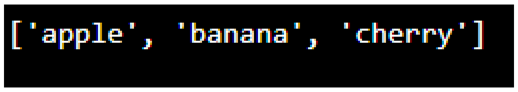
```
['apple', 'banana', 'cherry']
```

Another way to make a copy is to use the built-in method `list()`.

Example

Make a copy of a list with the `list()` method:

```
thislist = ["apple", "banana", "cherry"]
mylist = list(thislist)
print(mylist)
```



```
['apple', 'banana', 'cherry']
```

Join Two Lists

There are several ways to join, or concatenate, two or more lists in Python.

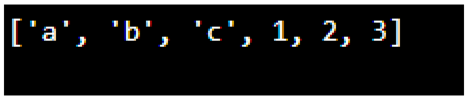
One of the easiest ways are by using the `+` operator.

Example

Join two list:

```
list1 = ["a", "b", "c"]
list2 = [1, 2, 3]

list3 = list1 + list2
print(list3)
```



```
['a', 'b', 'c', 1, 2, 3]
```

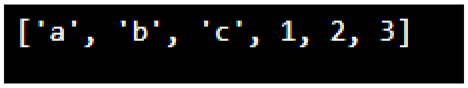
Or you can use the `extend()` method, which purpose is to add elements from one list to another list:

Example

Use the `extend()` method to add list2 at the end of list1:

```
list1 = ["a", "b" , "c"]
list2 = [1, 2, 3]

list1.extend(list2)
print(list1)
```



```
['a', 'b', 'c', 1, 2, 3]
```

Tuple

Tuples are used to store multiple items in a single variable.

Tuple is one of 4 built-in data types in Python used to store collections of data, the other 3 are List, Set, and Dictionary, all with different qualities and usage.

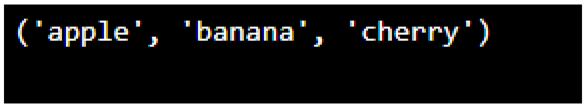
A tuple is a collection which is ordered and **unchangeable**.

Tuples are written with round brackets.

Example

Create a Tuple:

```
thistuple = ("apple", "banana", "cherry")
print(thistuple)
```



```
('apple', 'banana', 'cherry')
```

Tuple Items

Tuple items are ordered, unchangeable, and allow duplicate values.

Tuple items are indexed, the first item has index `[0]`, the second item has index `[1]` etc.

Ordered

When we say that tuples are ordered, it means that the items have a defined order, and that order will not change.

Unchangeable

Tuples are unchangeable, meaning that we cannot change, add or remove items after the tuple has been created.

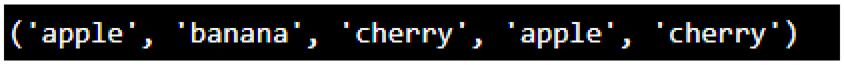
Allow Duplicates

Since tuples are indexed, they can have items with the same value:

Example

Tuples allow duplicate values:

```python
thistuple = ("apple", "banana", "cherry", "apple", "cherry")
print(thistuple)
```



```
('apple', 'banana', 'cherry', 'apple', 'cherry')
```

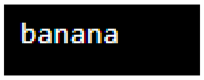
Access Tuple Items

You can access tuple items by referring to the index number, inside square brackets:

Example

Print the second item in the tuple:

```
thistuple = ("apple", "banana", "cherry")
print(thistuple[1])
```



```
banana
```

Negative Indexing

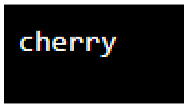
Negative indexing means start from the end.

`-1` refers to the last item, `-2` refers to the second last item etc.

Example

Print the last item of the tuple:

```
thistuple = ("apple", "banana", "cherry")
print(thistuple[-1])
```



```
cherry
```

Range of Indexes

You can specify a range of indexes by specifying where to start and where to end the range.

When specifying a range, the return value will be a new tuple with the specified items.

Example

Return the third, fourth, and fifth item:

```
thistuple =
("apple", "banana", "cherry", "orange", "kiwi", "melon", "ma
ngo")
print(thistuple[2:5])
```

```
('cherry', 'orange', 'kiwi')
```

Tuples are unchangeable, meaning that you cannot change, add, or remove items once the tuple is created.

But there are some workarounds.

Change Tuple Values

Once a tuple is created, you cannot change its values. Tuples are **unchangeable**, or **immutable** as it also is called.

But there is a workaround. You can convert the tuple into a list, change the list, and convert the list back into a tuple.

Example

Convert the tuple into a list to be able to change it:

```
x = ("apple", "banana", "cherry")
y = list(x)
y[1] = "kiwi"
x = tuple(y)

print(x)
```

```
("apple", "kiwi", "cherry")
```

Join Two Tuples

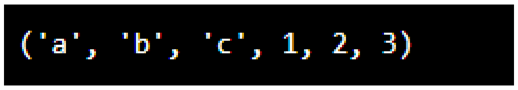
To join two or more tuples you can use the + operator:

Example

Join two tuples:

```
tuple1 = ("a", "b" , "c")
tuple2 = (1, 2, 3)

tuple3 = tuple1 + tuple2
print(tuple3)
```



```
('a', 'b', 'c', 1, 2, 3)
```

Remove Items

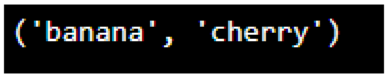
Note: You cannot remove items in a tuple.

Tuples are **unchangeable**, so you cannot remove items from it, but you can use the same workaround as we used for changing and adding tuple items:

Example

Convert the tuple into a list, remove "apple", and convert it back into a tuple:

```
thistuple = ("apple", "banana", "cherry")
y = list(thistuple)
y.remove("apple")
thistuple = tuple(y)
```



```
('banana', 'cherry')
```

Example

The `del` keyword can delete the tuple completely:

```
thistuple = ("apple", "banana", "cherry")
del thistuple
print(thistuple) #this will raise an error because the tuple
no longer exists
```