

HKUST Future-Ready Scholars

Introduction to Game Programming using Python

Part 2

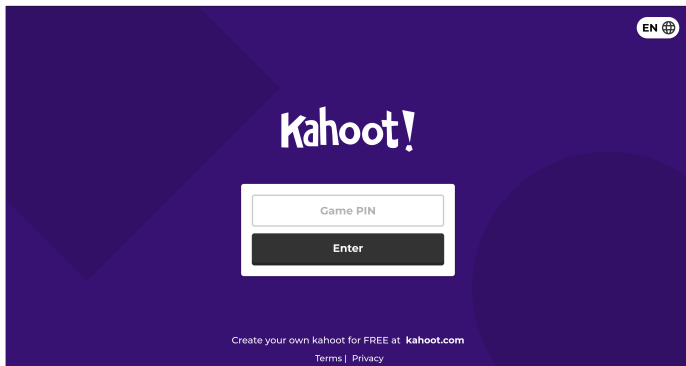
4 May 2024



Hangman

Let's start off with a simple game of Hangman.

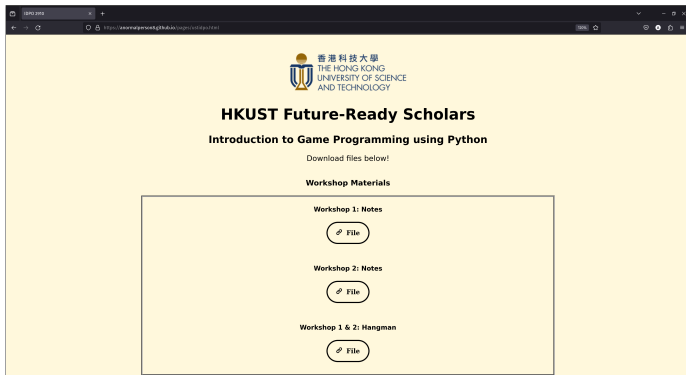
Open a tab on your browser, then go to
<https://www.kahoot.it/>



Login to your Gmail account.

Then head to
<https://colab.research.google.com/>

All materials today are at:
<https://bit.ly/ustidpo>



Download all files that belong to **Workshop 2** today.

Jupyter Notebook

Now upload your Jupyter Notebook file with **Files** → **Open Notebook**.



Upload the file **Hangman.ipynb**.

Using Jupyter Notebook

You can type your code in these blocks. We call these blocks code cells.



```
print("Mum I am in HKUST typing code in a code block")
```

You can run a code cell with the button on the left.



```
print("Hello World!") # Prints "Hello World!"
```

Summary from Last Workshop

Let's look at what we learnt last time.

Summary from Last Workshop

Examples of valid integers

```
a = 5  
b = 1000000  
c = -1984
```

Examples of valid strings

```
a = "5"  
b = "haha"  
c = 'some words'
```

Arithmetic Operators

Some basic and commonly-used operators:

+	add	-	minus,
*	multiply	/	divide

Summary from Last Workshop

The `print()` statement

```
print(*objects)
```

`*objects` - the things you want to print (put on the screen)

The `input()` statement

```
input(prompt)
```

where `prompt` is quite literally what it means. It prints the prompt, then returns the value inputted as a string.

`random.randint()`

```
random.randint(a, b)
```

`a` - the lower bound of your range

`b` - the upper bound of your range

This generates an integer `n` where $a \leq n \leq b$.

Summary from Last Workshop

if, elif and else

if, elif and else clauses are used to decide whether some code should be executed. Whenever one is fulfilled, all others are ignored.

```
if condition1: # if condition1 is true
    # Do something, ignore all elif and else below

elif condition2: # if condition2 is true
    # Do something, ignore all elif and else below

elif condition3: # if condition3 is true
    # Do something, ignore all elif and else below

else: # if all the conditions above are false
    # Do something
```

Summary from Last Workshop

The and logic operator

The and operator makes it so that both conditions have to be fulfilled in order for the code it is under to execute.

The or logic operator

The or operator makes it so that only 1 of the conditions have to be fulfilled in order for the code it is under to execute.

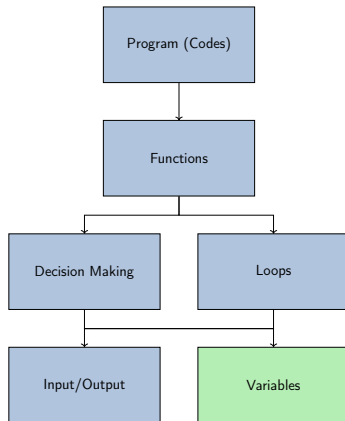
The not logic operator

The not operator reverses the condition it is attached to.

Multiple logic operators

One can chain multiple logic operators together, but to be safe add brackets () to make sure the condition works as intended.

Contents



Imagine you have a bunch of variables you want to store. For example, if you have a bunch of people's names.

```
name0 = "Chris Wong"  
name1 = "Desmond Tsoi"  
name2 = "Phoebe Mok"  
name3 = "Nancy Ip"
```

That is annoying to store and access.

Imagine you have a bunch of variables you want to store. For example, if you have a bunch of people's names.

```
name0 = "Chris Wong"  
name1 = "Desmond Tsoi"  
name2 = "Phoebe Mok"  
name3 = "Nancy Ip"
```

That is annoying to store and access.

What if instead, we store it in the same thing, as a...

Imagine you have a bunch of variables you want to store. For example, if you have a bunch of people's names.

```
name0 = "Chris Wong"  
name1 = "Desmond Tsoi"  
name2 = "Phoebe Mok"  
name3 = "Nancy Ip"
```

That is annoying to store and access.

What if instead, we store it in the same thing, as a... list?

Lists

```
names = ["Chris Wong", "Desmond Tsoi",  
         "Phoebe Mok", "Nancy Ip"]  
print(names[0]) # Chris Wong
```

Lists are declared by surrounding the items with [], and separating each item with a comma.

We can get the name from a list by getting the corresponding item.
How? With list[index].

The first item in the list is the 0th item, second is 1st item, etc...

We call this zero-indexing.

Note: Some programming languages use one-indexing instead.

If you approach another programming language, be careful.

Lists

```
names = ["Chris Wong", "Desmond Tsoi",  
         "Phoebe Mok", "Nancy Ip"]  
print(names[0], names[1], names[2], names[3])  
# Output:
```

```
names = ["Chris Wong", "Desmond Tsoi",  
         "Phoebe Mok", "Nancy Ip"]  
print(names[0], names[1], names[2], names[3])  
# Output: Chris Wong Desmond Tsoi Phoebe Mok Nancy Ip
```

Another example:

```
# Indices: 0  1  2  3  4  5
numbers = [0, 1, 1, 2, 3, 5]
print(numbers[0], numbers[1], numbers[2],
      numbers[3], numbers[4], numbers[5])
# Output: 0 1 1 2 3 5

print(numbers)
# Output: [0, 1, 1, 2, 3, 5]
```

Printing the whole list

To print the whole list, simply put it in the `print()` function.

To get the length of a list, we can use the `len()` function.

To get the length of a list, we can use the `len()` function.

```
numbers = [0, 1, 1, 2, 3, 5]  
print(len(numbers)) # 6
```

To edit an element of a list, assign the new value to the correct index.

To edit an element of a list, assign the new value to the correct index.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers) # [0, 1, 1, 2, 3, 5]
numbers[1] = 100 # Edit the second element (index 1)
print(numbers)
# Output:
```


To edit an element of a list, assign the new value to the correct index.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers) # [0, 1, 1, 2, 3, 5]
numbers[1] = 100 # Edit the second element (index 1)
print(numbers)
# Output: [0, 100, 1, 2, 3, 5]
```

To add an element to the end to a list, we use the `append(value)` list function.

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```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.append(100) # Add 100 to the end of the list
print(numbers, "length:", len(numbers))
# Output:
```

To add an element to the end to a list, we use the `append(value)` list function.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.append(100) # Add 100 to the end of the list
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5, 100] length: 7
```

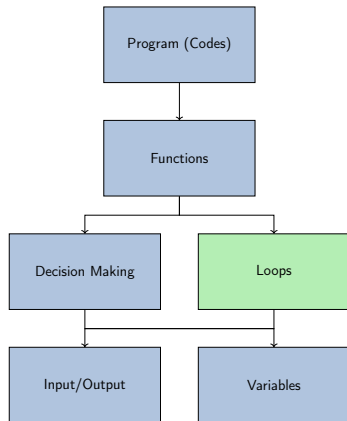
We can check if an element is in a list with the `in` operator.

Lists

We can check if an element is in a list with the `in` operator.

```
numbers = [0, 1, 1, 2, 3, 5]
if 0 in numbers:
    print("0 is in numbers.") # This line is run
else:
    print("0 is not in numbers.")
if 8 in numbers:
    print("8 is in numbers.")
else:
    print("8 is not in numbers.") # This line is run
```

Contents



Loops

What do you do if you want to do something repeatedly in code?

Loops

What do you do if you want to do something repeatedly in code?

```
print("Count:", 10)
print("Count:", 9)
print("Count:", 8)
print("Count:", 7)
print("Count:", 6)
print("Count:", 5)
print("Count:", 4)
print("Count:", 3)
print("Count:", 2)
print("Count:", 1)
print("Done.")
```

Loops

What do you do if you want to do something repeatedly in code?

```
print("Count:", 10)
print("Count:", 9)
print("Count:", 8)
print("Count:", 7)
print("Count:", 6)
print("Count:", 5)
print("Count:", 4)
print("Count:", 3)
print("Count:", 2)
print("Count:", 1)
print("Done.")
```

Let's turn this into a loop.

Loops - while

Example:

```
i = 10 # Initialising i as 10
while i > 0:
    print("Count:", i)
    i = i - 1
print("Done.")
```

Let's run through it together.

Loops - while

Example:

```
i = 10
```

```
while i > 0: # i is 10, which is larger than 0
```

```
    print("Count:", i)
```

```
    i = i - 1
```

```
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0:
    print("Count:", i) # Count: 10
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
```

```
while i > 0:
```

```
    print("Count:", i)
```

```
    i = i - 1 # i goes from 10 to 9, then we go back up
```

```
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0: # i is 9, which is larger than 0
    print("Count:", i)
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0:
    print("Count:", i) # Count: 9
    i = i - 1
print("Done.")
```


Loops - while

Example:

```
i = 10
```

```
while i > 0:
```

```
    print("Count:", i)
```

```
    i = i - 1 # i goes from 9 to 8, then we go back up
```

```
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0: # i is 8, which is larger than 0
    print("Count:", i)
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0:
    print("Count:", i) # Count: 8
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
```

```
while i > 0:
```

```
    print("Count:", i)
```

```
    i = i - 1 # i goes from 8 to 7, then we go back up
```

```
print("Done.")
```

Loops - while

Example:

```
i = 10
```

```
while i > 0: # i is 7, which is larger than 0
```

```
    print("Count:", i)
```

```
    i = i - 1
```

```
print("Done.")
```

This goes on and on...

Loops - while

Example:

```
i = 10
while i > 0: # i is 1, which is larger than 0
    print("Count:", i)
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0:
    print("Count:", i) # Count: 1
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
```

```
while i > 0:
```

```
    print("Count:", i)
```

```
    i = i - 1 # i goes from 1 to 0, then we go back up
```

```
print("Done.")
```


Loops - while

Example:

```
i = 10
while i > 0: # i is 0, which is NOT larger than 0, so we exit
    print("Count:", i)
    i = i - 1
print("Done.")
```

Loops - while

Example:

```
i = 10
while i > 0:
    print("Count:", i)
    i = i - 1
print("Done.") # "Done." is printed
```

Loops - while

Example:

```
i = 10
while i > 0:
    print("Count:", i)
    i = i - 1
print("Done.")
```

Indentation

Just like if-clauses, the indentation must be consistent for statements in the loop. This also applies to for loops, which we will get into very soon.

Loops - for

Example:

```
for i in range(10):  
    print("Count:", i)  
print("Done.")
```

Python range

Python range is a thing of mystery. When you do `range(n)`, where `n` is an integer, Python generates a *range* of integers from 0 to `n - 1`.

Loops - for

Not getting the loop?

```
for i in range(10):  
    print("Count:", i)  
print("Done.")
```

is equivalent to

```
i = 0  
while i < 10:  
    print("Count:", i)  
    i = i + 1  
print("Done.")
```

Both loops go from 0 to 9, and give identical output.

Loops - for

Another example:

```
for i in range(3):  
    print(i * i) # Print the square, end with a space  
# Output:
```

Loops - for

Another example:

```
for i in range(3):  
    print(i * i) # Print the square, end with a space  
# Output: 0  
#         1  
#         4
```

Loops - for

Let's combine lists with a for loop.

```
words = ["haha", "hehe", "hoho"]  
for i in range(len(words)):  
    print(words[i]) # Print num[i]
```

Output:

Loops - for

Let's combine lists with a for loop.

```
words = ["haha", "hehe", "hoho"]  
for i in range(len(words)):  
    print(words[i]) # Print num[i]
```

```
# Output: haha
```

```
#         hehe
```

```
#         hoho
```

Loops - for

Let's combine lists with a for loop.

```
words = ["haha", "hehe", "hoho"]  
for i in range(len(words)):  
    print(words[i]) # Print num[i]
```

```
# Output: haha
```

```
#         hehe
```

```
#         hoho
```

This is one way we go through a list.

Loops - for

Instead of using the index, there is another way to go through a list:

```
words = ["haha", "hehe", "hoho"]  
for i in words:  
    print(i) # Print the element
```

Output:

Loops - for

Instead of using the index, there is another way to go through a list:

```
words = ["haha", "hehe", "hoho"]  
for i in words:  
    print(i) # Print the element
```

```
# Output: haha
```

```
#         hehe
```

```
#         hoho
```

Loops - for

Instead of using the index, there is another way to go through a list:

```
words = ["haha", "hehe", "hoho"]  
for i in words:  
    print(i) # Print the element  
# Output: haha  
#         hehe  
#         hoho
```

The output is identical to the previous example.

Lists

Lists are represented with `[]` to hold multiple variables, where the i^{th} item is at index $i - 1$.

Lists with functions

If a list is called `l`, one can:

- print the list with `print(l)`.
- get the length of `l` with `len(l)`.
- get/edit the element at index `i` with `l[i]`.

List functions

If a list is called `l`, one can:

- append a value `v` to `l` with `l.append(v)`.
- use the `in` operator to check if a value `v` is in a list.

e.g.: `if v in l:`

while loops

```
while condition:  
    # Do code
```

Code in the `while` block are run while the condition is fulfilled.
Do make sure that the `while` loop can be exited.

Summary

for loops and range

```
n = 5 # Example
for i in range(n):
    # Do code with each number from 0 to n - 1
```

range(n) returns a range of integers that starts from 0 and ends at n - 1.

for loops and lists

```
l = [...] # A list with items
for i in l:
    # Do code with each item in the list
```

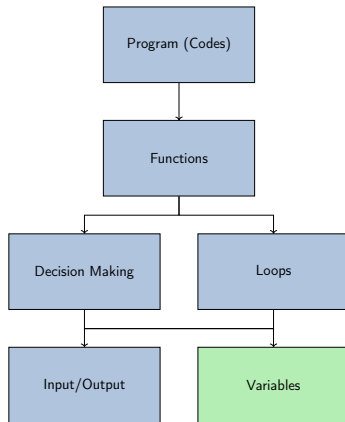
for loops can be directly applied onto lists.

The End
Thank you!

Additional content

Here are some additional content that we didn't think we would have time to mention in the workshop.

Contents



Lists

To insert an element to a particular position in a list, we use the `insert()` list function.

The `insert(i, value)` inserts the `value` at index `i`, and push everything after to the right.

Lists

To insert an element to a particular position in a list, we use the `insert()` list function.

The `insert(i, value)` inserts the value at index `i`, and push everything after to the right.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.insert(2, 100) # Add 100 to index 2 of the list
print(numbers, "length:", len(numbers))
# Output:
```

Lists

To insert an element to a particular position in a list, we use the `insert()` list function.

The `insert(i, value)` inserts the value at index `i`, and push everything after to the right.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.insert(2, 100) # Add 100 to index 2 of the list
print(numbers, "length:", len(numbers))
# Output: [0, 1, 100, 1, 2, 3, 5] length: 7
numbers.insert(7, 200)
```

Lists

To insert an element to a particular position in a list, we use the `insert()` list function.

The `insert(i, value)` inserts the value at index `i`, and push everything after to the right.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.insert(2, 100) # Add 100 to index 2 of the list
print(numbers, "length:", len(numbers))
# Output: [0, 1, 100, 1, 2, 3, 5] length: 7
numbers.insert(7, 200) # Same as numbers.append(200)
print(numbers, "length:", len(numbers))
# Output:
```


Lists

To insert an element to a particular position in a list, we use the `insert()` list function.

The `insert(i, value)` inserts the value at index `i`, and push everything after to the right.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.insert(2, 100) # Add 100 to index 2 of the list
print(numbers, "length:", len(numbers))
# Output: [0, 1, 100, 1, 2, 3, 5] length: 7
numbers.insert(7, 200) # Same as numbers.append(200)
print(numbers, "length:", len(numbers))
# Output: [0, 1, 100, 1, 2, 3, 5, 200] length: 8
```

To remove an element from a list, we use the `remove()` list function. The `remove(value)` function removes the **first** occurrence of `value`.

To remove an element from a list, we use the `remove()` list function. The `remove(value)` function removes the **first** occurrence of value.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.remove(1) # Remove the first occurrence of number 1
print(numbers, "length:", len(numbers))
# Output:
```

To remove an element from a list, we use the `remove()` list function. The `remove(value)` function removes the **first** occurrence of value.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.remove(1) # Remove the first occurrence of number 1
print(numbers, "length:", len(numbers))
# Output: [0, 1, 2, 3, 5] length: 5
```

The `reverse()` list function reverses a list's contents.

The `reverse()` list function reverses a list's contents.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.reverse() # Reverse the list
print(numbers, "length:", len(numbers))
# Output:
```

The `reverse()` list function reverses a list's contents.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.reverse() # Reverse the list
print(numbers, "length:", len(numbers))
# Output: [5, 3, 2, 1, 1, 0] length: 6
print(numbers[0])
# Output:
```

Lists

The `reverse()` list function reverses a list's contents.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers, "length:", len(numbers))
# Output: [0, 1, 1, 2, 3, 5] length: 6
numbers.reverse() # Reverse the list
print(numbers, "length:", len(numbers))
# Output: [5, 3, 2, 1, 1, 0] length: 6
print(numbers[0])
# Output: 5
```


The `count(item)` list function counts the number of occurrence of `item` in a list.

The `count(item)` list function counts the number of occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]
print(numbers.count(1))
```

Output:

The `count(item)` list function counts the number of occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
print(numbers.count(1))
```

```
# Output: 2
```

```
print(numbers.count(100))
```

```
# Output:
```

The `count(item)` list function counts the number of occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
print(numbers.count(1))
```

```
# Output: 2
```

```
print(numbers.count(100))
```

```
# Output: 0
```

The `index(item)` list function finds the index of the first occurrence of `item` in a list.

Lists

The `index(item)` list function finds the index of the first occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]  
print(numbers.index(1))
```

Output:

The `index(item)` list function finds the index of the first occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
print(numbers.index(1))
```

```
# Output: 1
```

```
print(numbers.index(5))
```

```
# Output:
```

The `index(item)` list function finds the index of the first occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
print(numbers.index(1))
```

```
# Output: 1
```

```
print(numbers.index(5))
```

```
# Output: 5
```

```
print(numbers.index(100))
```

```
# Output:
```


The `index(item)` list function finds the index of the first occurrence of `item` in a list.

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
print(numbers.index(1))
```

```
# Output: 1
```

```
print(numbers.index(5))
```

```
# Output: 5
```

```
print(numbers.index(100))
```

```
# Output: No output, error, 100 is not in the list
```

Combining `in` and `list.index()`:

Combining `in` and `list.index()`:

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
if 5 in numbers:
```

```
    print("The index of 5 in the list is", numbers.index(5))
```

```
# Output:
```

Combining `in` and `list.index()`:

```
numbers = [0, 1, 1, 2, 3, 5]
```

```
if 5 in numbers:
```

```
    print("The index of 5 in the list is", numbers.index(5))
```

```
# Output: The index of 5 in the list is 5
```

The `sort()` list function sorts a list's contents.

Lists

The `sort()` list function sorts a list's contents.

```
numbers = [6, 5, 1, 2, 3]
print(numbers, "length:", len(numbers))
# Output: [6, 5, 1, 2, 3] length: 5
print(numbers[0])
# Output: 6
numbers.sort() # Sort the list
print(numbers, "length:", len(numbers))
# Output:
```

Lists

The `sort()` list function sorts a list's contents.

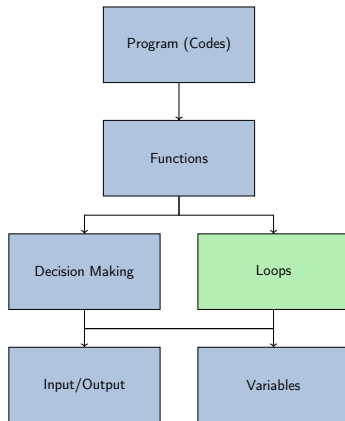
```
numbers = [6, 5, 1, 2, 3]
print(numbers, "length:", len(numbers))
# Output: [6, 5, 1, 2, 3] length: 5
print(numbers[0])
# Output: 6
numbers.sort() # Sort the list
print(numbers, "length:", len(numbers))
# Output: [1, 2, 3, 5, 6] length: 5
print(numbers[0])
# Output:
```

Lists

The `sort()` list function sorts a list's contents.

```
numbers = [6, 5, 1, 2, 3]
print(numbers, "length:", len(numbers))
# Output: [6, 5, 1, 2, 3] length: 5
print(numbers[0])
# Output: 6
numbers.sort() # Sort the list
print(numbers, "length:", len(numbers))
# Output: [1, 2, 3, 5, 6] length: 5
print(numbers[0])
# Output: 1
```


Contents



Loops - while

We can also apply boolean values to while loops.

```
equal_to_5 = False
count = 0
while not equal_to_5:
    if count == 5:
        equal_to_5 = True
    count = count + 1
print("Done.") # "Done." is printed
```

Summary

The range in Python does not always have to start at 0.

```
for i in range(2, 5):  
    print(i)
```

Output:

Summary

The range in Python does not always have to start at 0.

```
for i in range(2, 5):  
    print(i)
```

```
# Output: 2
```

```
#         3
```

```
#         4
```

Custom range

Given range(a, b), a for loop will iterate from a to b - 1.

List functions

If a list is called `l`, one can:

- insert a value `v` to `l` at index `i` with `l.insert(i, v)`.
- remove the first occurrence of a value `v` with `l.remove(v)`.
- reverse the list with `l.reverse()`.
- count the occurrence of value `v` with `l.count(v)`.
- get the index of the first occurrence of a value `v` with `l.index(v)`.
- sort the list with `l.sort()`.

Summary

Boolean conditions of while

You can apply boolean conditions to while loops.

```
status = True # Or False, or a condition with variables
while status: # Can also add "not"
    # Do something
```

Custom range

Given range(a, b), a for loop will iterate from a to b - 1.

```
sum = 0
for i in range(100, 102):
    sum = sum + i
print(sum) # Output: 201
```

End of Additional Contents
Made in L^AT_EX
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