HKUST Future-Ready Scholars
Introduction to Game Programming using Python

Part 2: Hangman

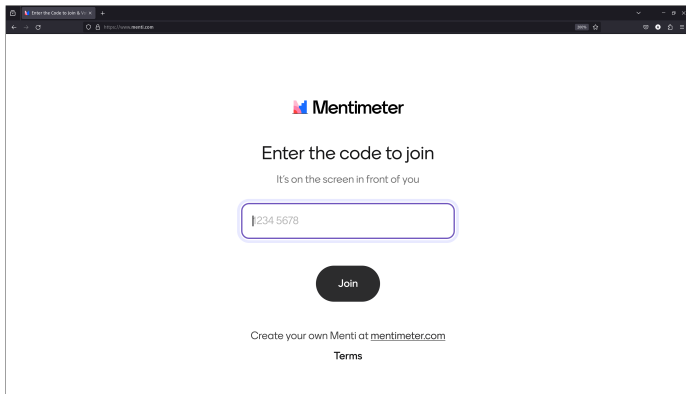4 May 2024

THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY

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

Revision

Open a tab on your browser, then go to
https://www.menti.com/

Login to your Gmail account.

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

All materials today are at:
https://bit.ly/ustidpo
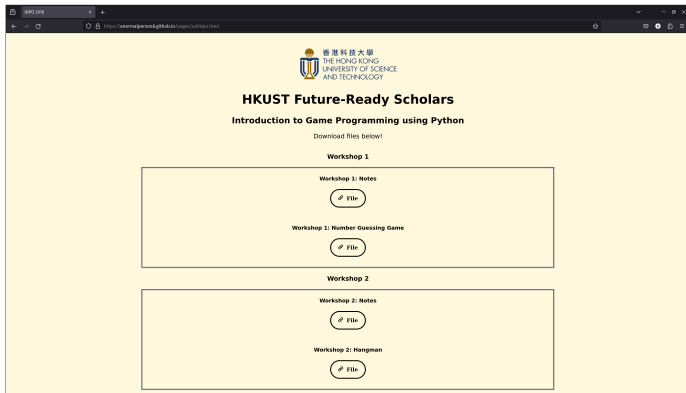
Download all files that belong to **Workshop 2** today.

Now upload your Jupyter Notebook file with **Files** $\rightarrow$ **Open Notebook**.

Upload the file **Hangman.ipynb**.

Using Jupyter Notebook

You can type your code in these blocks. We call these blocks code cells.
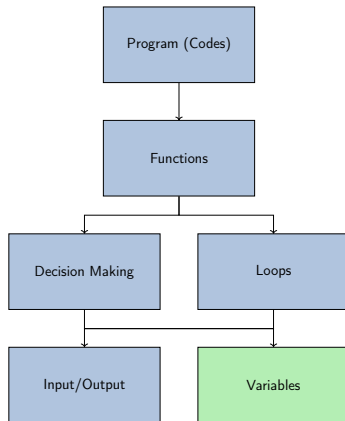
```
print("Mum I am in HKUST typing code in a code block")
```

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

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

Contents

Lists

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.

Lists

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"
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```

That is annoying to store and access.
What if instead, we store it in the same thing, as a...

Lists

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

```python
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:
```

Lists

```python
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
```

Lists

Another example:

```python
# 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.

Lists

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

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

Lists

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

Lists

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

```python
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:
```

Lists

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

```python
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]
```

Lists

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

Lists

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

```python
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:
```

Lists

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

```python
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
```

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

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

```python
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.

```python
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.

```python
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.

```python
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
```

Lists

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

Lists

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

```python
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 occurence 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** occurence 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 occurence of number 1
print(numbers, "length:", len(numbers))
# Output: [0, 1, 2, 3, 5] length: 5
```

Lists

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

Lists

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

```python
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:
```

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:
```

Lists

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

```python
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 occurence of item in a list.

Lists

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

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

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

```python
numbers = [0, 1, 1, 2, 3, 5]
print(numbers.count(1))
# Output: 2
print(numbers.count(100))
# Output:
```

Lists

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

```python
numbers = [0, 1, 1, 2, 3, 5]
print(numbers.count(1))
# Output: 2
print(numbers.count(100))
# Output: 0
```

Lists

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.

```python
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
```

Lists

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

Lists

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

Lists

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

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

Lists

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

```python
numbers = [0, 1, 1, 2, 3, 5]
print(numbers.index(1))
# Output: 1
print(numbers.index(5))
# Output: 5
print(numbers.index(100))
# Output:
```

Lists

The index(item) list function finds the index of the first occurence 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()`:

Lists

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

```python
numbers = [0, 1, 1, 2, 3, 5]
if 5 in numbers:
    print("The index of 5 in the list is", numbers.index(5))
# Output:
```

Lists

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

```python
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.

```python
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.

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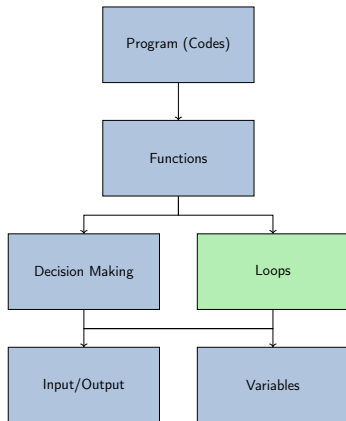
What do you do if you want to do something repeatedly in code?

Loops

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

```python
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?

```python
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:

```python
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:

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

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

Example:

```python
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:

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

Loops - while

Example:

```python
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:

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

Example:

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

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.")
```

Example:

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

We can also apply boolean values to `while` loops.

```python
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
```

Loops - `for`

Example:

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

is equivalent to

```python
i = 0
while i < 10:
    print("Count:", i)
    i = i + 1
print("Done.")
```
Both loops go from 0 to 10, and give identical output.

Loops - for

Another example:
```python
for i in range(5):
    print(i*i, end=" ") # Print the square, end with a space
print() # Add new line at the end
# Output:
```

Loops - `for`

Another example:

```python
for i in range(5):
    print(i*i, end=" ") # Print the square, end with a space
print() # Add new line at the end
# Output: 0 1 4 9 16
```

Let's combine lists with a for loop.

```python
num = [1, 5, 9, 12, 4, 800]
for i in range(len(num)):
    print(num[i], end=" ") # Print num[i], end with a space
print() # Add new line at the end
# Output:
```

Let's combine lists with a for loop.

```python
num = [1, 5, 9, 12, 4, 800]
for i in range(len(num)):
    print(num[i], end=" ") # Print num[i], end with a space
print() # Add new line at the end
# Output: 1 5 9 12 4 800
```

Let's combine lists with a for loop.

```python
num = [1, 5, 9, 12, 4, 800]
for i in range(len(num)):
    print(num[i], end=" ") # Print num[i], end with a space
print() # Add new line at the end
# Output: 1 5 9 12 4 800
```

This is how we go through a list.

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

```python
num = [1, 5, 9, 12, 4, 800]
for i in num:
    print(i, end=" ")
print() # Add new line at the end
# Output:
```

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

```python
num = [1, 5, 9, 12, 4, 800]
for i in num:
    print(i, end=" ")
print() # Add new line at the end
# Output: 1 5 9 12 4 800
```

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

```python
num = [1, 5, 9, 12, 4, 800]
for i in num:
    print(i, end=" ")
print() # Add new line at the end
# Output: 1 5 9 12 4 800
```

The output is identical to the previous example.

Loops - `for`

It also works for lists of other types.

```python
word = ["h", "k", "u", "s", "t"]
for w in word:
    print(w, end="")
print() # Add new line at the end
# Output:
```

It also works for lists of other types.

```python
word = ["h", "k", "u", "s", "t"]
for w in word:
    print(w, end="")
print() # Add new line at the end
# Output: hkust
```

Summary

Lists

Lists are represented with [ ] to hold multiple variables, where the ith 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]`.

Summary

Lists functions

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

- append a value `v` to `l` with `l.append(v)`.
- insert a value `v` to `l` at index `i` with `l.insert(i, v)`.
- remove the first occurence of a value `v` with `l.remove(v)`.
- reverse the list with `l.reverse()`.
- count the occurence of value `v` with `l.count(v)`.
- use the `in` operator to check if a value `v` is in a list.

  e.g.: `if v in l:`
- get the index of the first occurence of a value `v` with `l.index(v)`.
- sort the list with `l.sort()`.

Summary

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`

```python
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

```python
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!

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

End of Additional Contents
Made in LaTeX
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