



SOFTWARE CARPENTRY

PYTHON PART 1

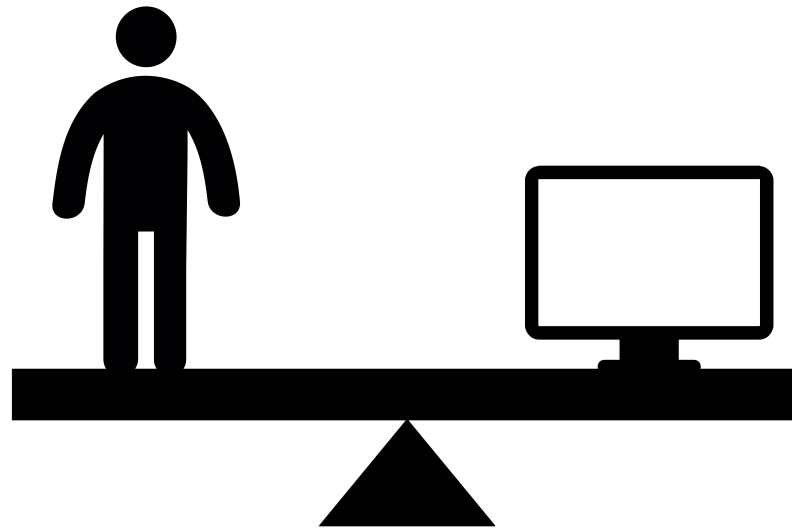
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lucydot.github.io/slides

THE TRADE-OFF

human time

computer time



Matlab
Python

Fortran
C

WHY PYTHON?

- readable
- free to use
- cross-platform
- well documented
- widely used

OUTLINE

1. running python code
2. variables
3. data types
4. functions, help and errors
5. lists
6. for loops
7. if statements

lunch @ 1

PLAIN TEXT VS. JUPYTER NOTEBOOK

- *Plain text approach:*
 - write code in a text editor
 - save with a `.py` extension
 - run code using a terminal
- *Jupyter notebook approach:*
 - write code in a `jupyter notebook`
 - run code in a `jupyter notebook`
 - save with a `.ipynb` extension

TASK

Use your Jupyter notebook to...

- link to the Imperial webpage
- calculate $3624357/325$
- make a bullet pointed shopping list with heading "shopping list"

[Green sticky when you're done please]

VARIABLES

a = 65



variable

value

- letters, digits and _
- cannot start with a digit
- _ start has special meaning
- case sensitive

TASK

Fill the table showing the values of the variables after each statement is executed.

Command	Value of x	Value of y	Value of swap
x = 1.0			
y = 3.0			
swap = x			
x = y			
y = swap			

DATA TYPES

Data type	Python name	Definition	Example
integer	int	positive or negative whole numbers	-256
float	float	real number	-3.16436
string	str	character string	"20 pence."
list	list	a sequence of values	['frog', 2, 8]

+ boolean, dict, tuple, complex, None, set

TASK

What do you think the following code will print?

```
first = 1
second = 5*first
first=2
print('first is', first, 'and second is', second)
```

OUTLINE

1. **running python code:** Jupyter Notebooks, markdown basics
2. **variables:** variable names, variable assignment, `print()`, execution order
3. **data types:** integer, float, string, list, `len()`, string operations/indexing/slicing, type conversion: `int()`, `str()`, `float()`
4. **functions, help and errors:** `min()`, `max()`, `round()`, `help()`, runtime errors (exceptions), syntax errors
5. **lists**
6. **for loops**
7. **if statements**

LISTS

Data type	Python name	Definition	Example
integer	int	positive or negative whole numbers	-256
float	float	real number	-3.16436
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FOR LOOPS

```
print(2)  
print(3)  
print(5)
```

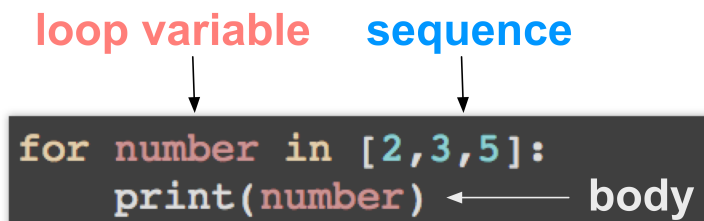
```
for number in [2,3,5]:  
    print(number)
```

FOR LOOPS

```
print(2)
print(3)
print(5)
```

loop variable sequence

```
for number in [2,3,5]:
    print(number) ← body
```



TASK

I want to sum the first 10 integers. What is wrong with this code? How can I fix it?

```
total = 0
for number in range(10):
    total = total + number
print(total)
```

CONDITIONALS

```
mass = 4.2

if mass > 3:
    print(mass, ' is large')

if mass < 2:
    print(mass, ' is small')

if 2 <= mass <= 3: (check this allowed!)
    print(mass, ' is just right')
```


TASK

What is wrong with the code? Fix the code so that it works as intended.

```
grade = 95

if grade >= 70:
    print("grade is C")
elif grade >= 80:
    print("grade is B")
elif grade >= 90:
    print("grade is A")
```

SUMMARY

1. **running python code:** Jupyter Notebooks, markdown basics
2. **variables:** variable names, variable assignment, `print()`, execution order
3. **data types:** integer, float, string, list, `len()`, string operations/indexing/slicing, type conversion: `int()`, `str()`, `float()`
4. **functions, help and errors:** `min()`, `max()`, `round()`, `help()`, runtime errors (exceptions), syntax errors
5. **lists:** sequence type, immutable vs mutable, list method `append`, `del`
6. **for loops:** dummy variable, loop syntax, index from 0
7. **if statements:** `if`, `elif`, `else`, ordering

Workshop materials are available at: imperialcollegelondon.github.io/python-novice-mix/

These slides available at: lucydot.github.io/slides

Back at 2pm for Python part two

CLOSING COMMENTS

- Comment your code
- Use version control
- Aim for reproducibility
- Keep going

====Thank-you====