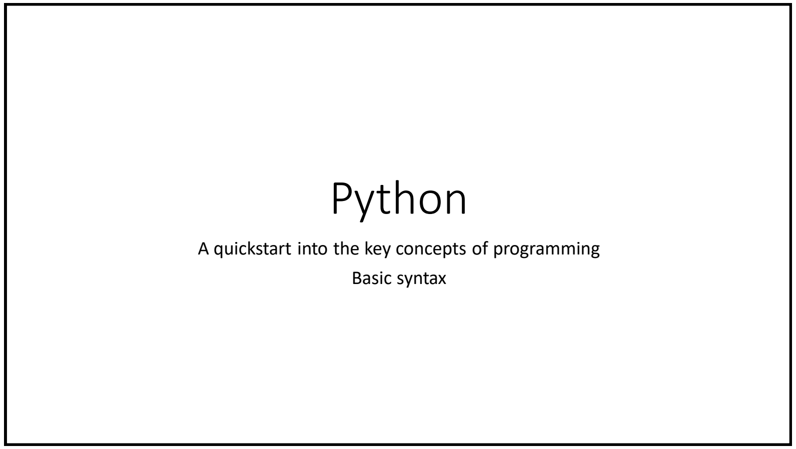
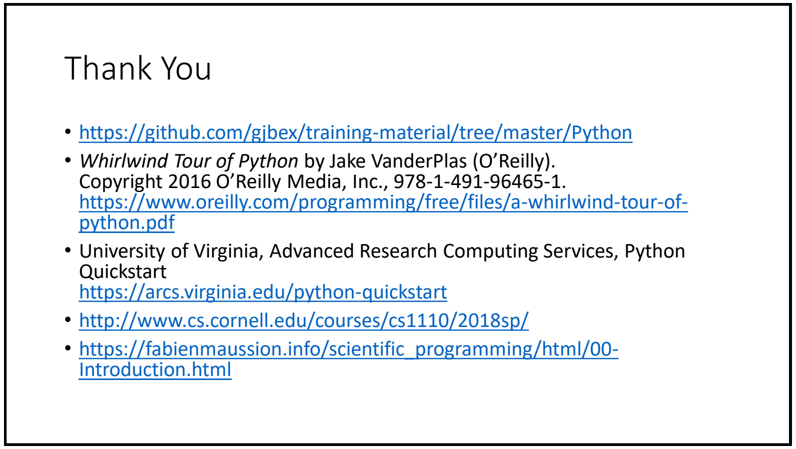


Python

A quickstart into the key concepts of programming

Basic syntax



Thank You

- https://github.com/gjbex/training-material/tree/master/Python
- *Whirlwind Tour of Python* by Jake VanderPlas (O'Reilly).
  Copyright 2016 O'Reilly Media, Inc., 978-1-491-96465-1.
  https://www.oreilly.com/programming/free/files/a-whirlwind-tour-of-python.pdf
- University of Virginia, Advanced Research Computing Services, Python Quickstart
  https://arcs.virginia.edu/python-quickstart
- http://www.cs.cornell.edu/courses/cs1110/2018sp/
- https://fabienmaussion.info/scientific_programming/html/00-Introduction.html

See also

- https://www.math.ubc.ca/~pwalls/math-python/
- http://troll.cs.ua.edu/ACP-PY/index.html
- https://data-flair.training/blogs/python-lambda-expressions/
- http://pages.physics.cornell.edu/~myers/teaching/ComputationalMethods/GettingStarted.html
- https://anh.cs.luc.edu/python/hands-on/3.1/handsonHtml/index.html
- https://www2.cs.duke.edu/courses/spring18/compsci101/index.php
- https://github.com/parrt/msan501
- https://docs.python-guide.org/intro/learning/

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Key concepts in programming

- Variables (*integers, strings, dates, etc.)*
- Flow control (*if then, loop, etc.*)
- Functions (*list of steps the code will follow*)

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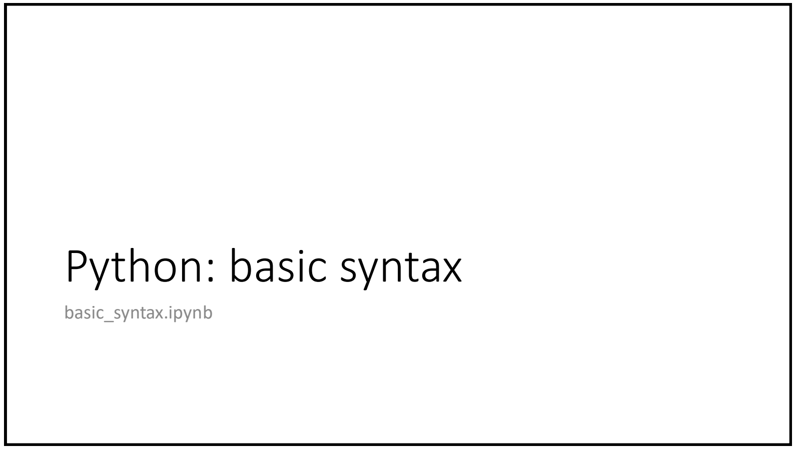

Python: basic syntax

basic_syntax.ipynb

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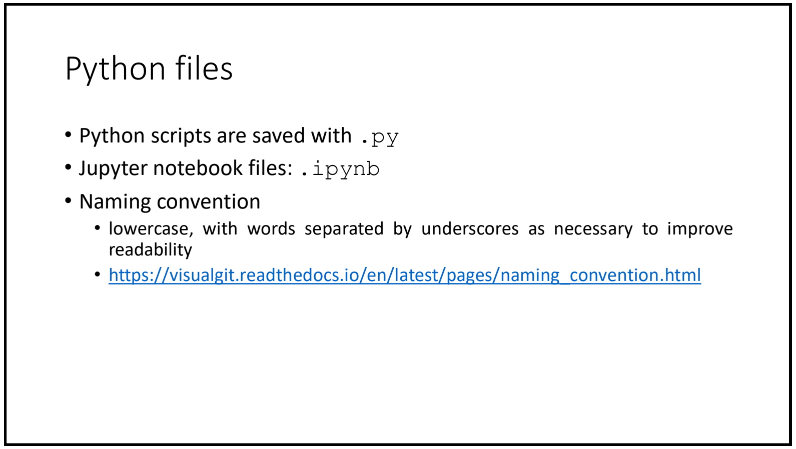

Python files

- Python scripts are saved with `.py`
- Jupyter notebook files: `.ipynb`
- Naming convention
  - lowercase, with words separated by underscores as necessary to improve readability
  - https://visualgit.readthedocs.io/en/latest/pages/naming_convention.html

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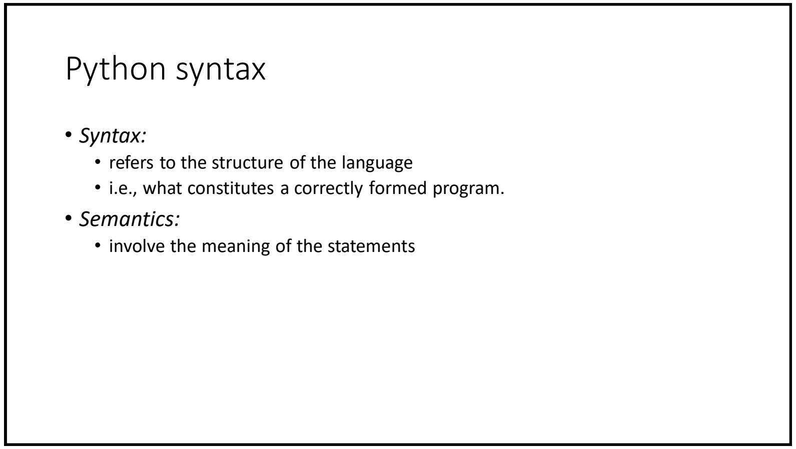

Python syntax

- *Syntax:*
  - refers to the structure of the language
  - i.e., what constitutes a correctly formed program.
- *Semantics:*
  - involve the meaning of the statements

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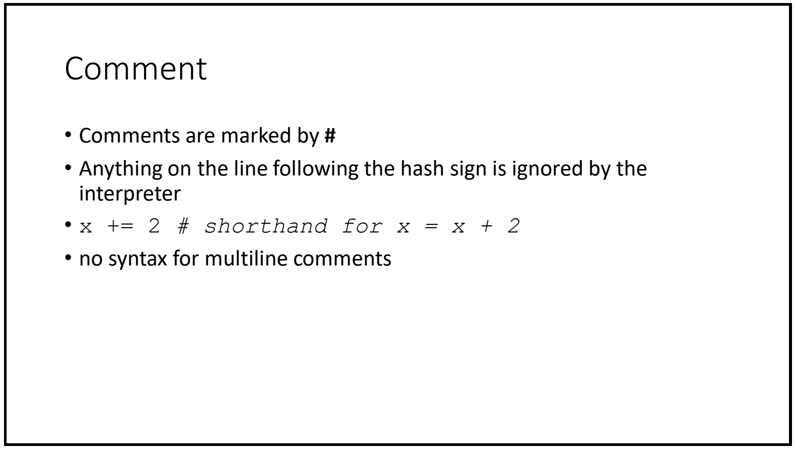

Comment

- Comments are marked by **#**
- Anything on the line following the hash sign is ignored by the interpreter
- `x += 2 # shorthand for x = x + 2`
- no syntax for multiline comments

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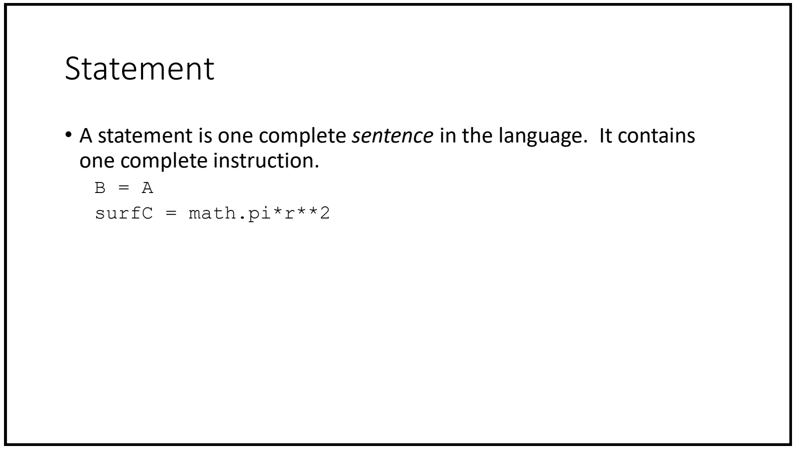
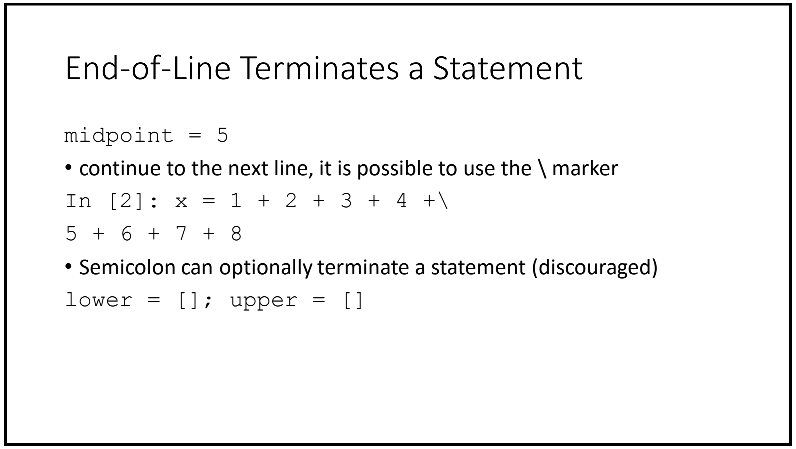


Statement

- A statement is one complete *sentence* in the language. It contains one complete instruction.

```
B = A
surfC = math.pi*r**2
```



End-of-Line Terminates a Statement

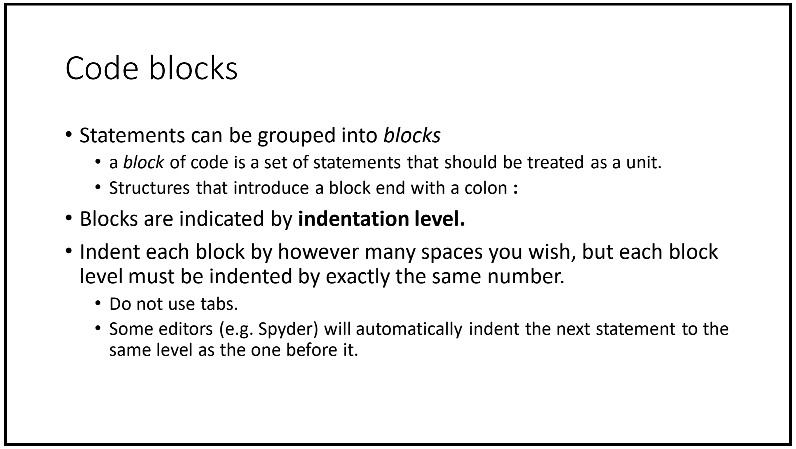
```
midpoint = 5
```

- continue to the next line, it is possible to use the \ marker

```
In [2]: x = 1 + 2 + 3 + 4 +\
5 + 6 + 7 + 8
```

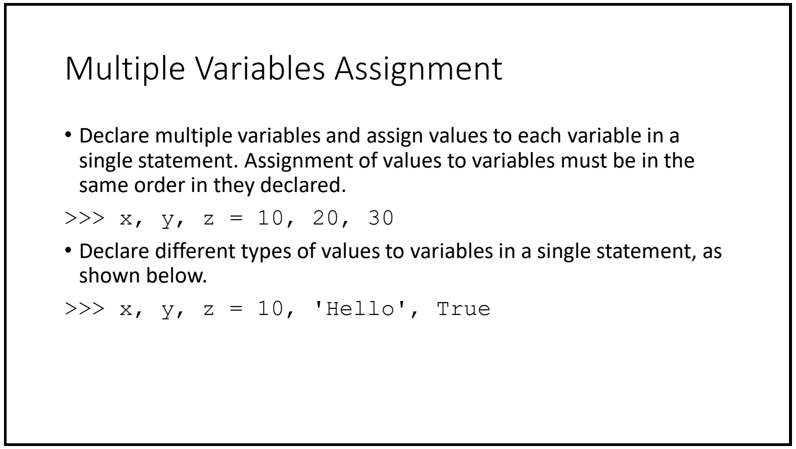
- Semicolon can optionally terminate a statement (discouraged)

```
lower = []; upper = []
```



Code blocks

- Statements can be grouped into *blocks*
  - a *block* of code is a set of statements that should be treated as a unit.
  - Structures that introduce a block end with a colon **:**
- Blocks are indicated by **indentation level.**
- Indent each block by however many spaces you wish, but each block level must be indented by exactly the same number.
  - Do not use tabs.
  - Some editors (e.g. Spyder) will automatically indent the next statement to the same level as the one before it.



Multiple Variables Assignment

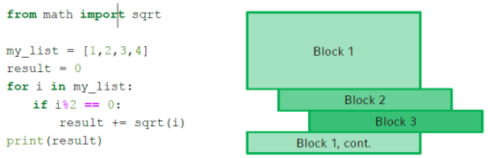
- Declare multiple variables and assign values to each variable in a single statement. Assignment of values to variables must be in the same order in they declared.

```
>>> x, y, z = 10, 20, 30
```

- Declare different types of values to variables in a single statement, as shown below.

```
>>> x, y, z = 10, 'Hello', True
```

Code blocks



```
from math import sqrt

my_list = [1,2,3,4]
result = 0
for i in my_list:
    if i%2 == 0:
        result += sqrt(i)
print(result)
```

http://www.dbs.ifi.lmu.de/Lehre/MaschLernen/SS2017/Orga/U01-Slides.pdf

Indentation: Whitespace Matters

- In C, code blocks are denoted by curly braces:

```
// C code
for(int i=0; i<100; i++)
{
total += i;
}
```

- In Python, code blocks are denoted by *indentation*:

```
for i in range(100):
    # indentation indicates code block
    total += i
```

- In Python, indented code blocks are always preceded by a colon (:) on the previous line.
- The Python standard is to use **four white spaces** to indent code.

Indentation

```
>>> if x < 4:
...     y = x * 2
...     print(x)
```

- print(x) is in the indented block, and will be executed only if x is less than 4.
- *File: check_whitespace.py*

```
>>> if x < 4:
...     y = x * 2
... print(x)
```

- print(x) is outside the block, and will be executed regardless of the value of x,

Whitespace

- *amount* of whitespace used for indenting code blocks is up to the user, as long as it is consistent throughout the script.
- Whitespace w*ithin l*ines does not matter

```
In [4]:  x=1+2
         x = 1 + 2
         x    =    1    +             2
```