

Computing GC Content using functions and conditionals

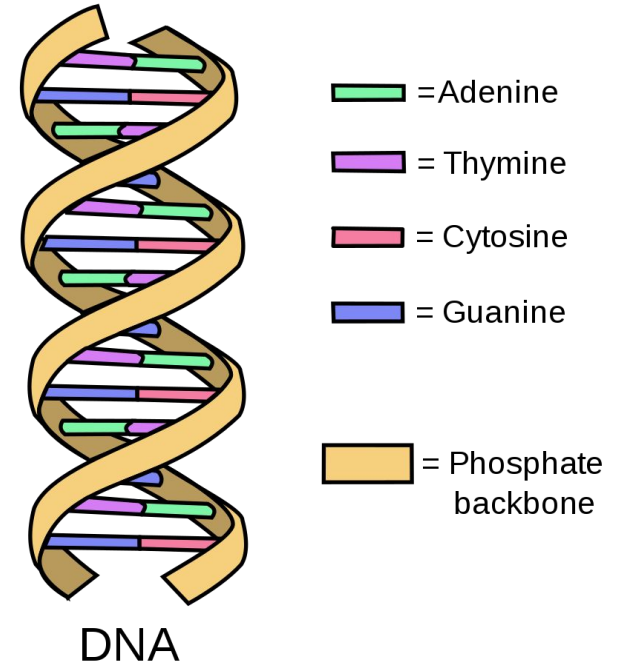
BILD 62

By the end of
this lecture you
will be able to:

- Recognize function syntax & write a simple function
 - Recognize Booleans & write conditional logic statements
 - Test conditional statements in Python
-

DNA Refresher

- Nucleic acids contain all of the information to build our cells!
- In deoxyribonucleic acid (DNA) there are four different: **adenine (A)**, **cytosine (C)**, **guanine (G)**, and **thymine (T)**.
- The sequence of a nucleic acid polymer is defined by the order of these bases, which we can represent with a string of A's, C's, G's, and T's.
- **Base pairs:** A bonds to T, and C bonds to G



Representing DNA on a computer

5' - ATTCGTCA - 3'

Forward strand

3' - TAAGCAGT - 5'

Reverse strand

} **same # of G or C,**
so we can work
with either strand

One way to characterize & distinguish different sequences of DNA is by their **GC content**. Can we write a **program** that does this?

function syntax

function
name

```
def function(value):
```

colon

```
    print(value)
```

function
body

indented
by 4 spaces
(or tab)

function syntax

input arguments (these can be variables or default arguments)

```
def function(b):
```

```
    a = b**2
```

```
    return a
```

return to retrieve a variable outside of a function (*what happens in the function stays in the function*)
ALSO ENDS THE FUNCTION!

call to function giving it the argument and saving the returned variable as a

```
a = function(6)
```

function syntax

```
def function(b):
```

```
    c = b**2
```

```
    a = c * 2
```


```
    return a
```

```
a = function(6)
```

```
print(c)
```

```
????
```

return to retrieve a variable outside
of a function (*what happens in the
function stays in the function*)



Let's get into
notebook 05!

Operators in Python

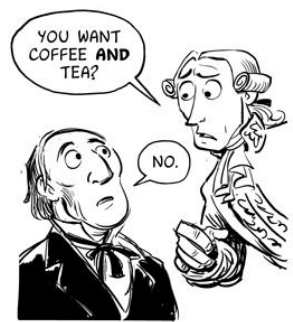
Operators are special symbols that carry out arithmetic or logical computation.

	Type of operator	Examples
Notebook #1	assignment	<code>a = 6</code>
	arithmetic (math)	<code>2 * 3</code>
Notebook #5	logic (boolean)	<code>True and False</code>
	comparison	<code>a != 6</code>
	identity	<code>a is 6</code>
Notebook #4	membership	<code>'a' in 'cat'</code>

Basic conditional operators in Python

Symbol	Operation	Usage	Outcome
<code>==</code>	Is equal to	<code>10==5*2</code>	True
<code>!=</code>	Is not equal to	<code>10 != 5*2</code>	False
<code>></code>	Is greater than	<code>10 > 2</code>	True
<code><</code>	Is less than	<code>10 < 2</code>	False
<code>>=</code>	Greater than <i>or</i> equal to	<code>10 >= 10</code>	True
<code><=</code>	Less than <i>or</i> equal to	<code>10 <= 10</code>	True

**Boolean variables
store True (1) or
False (0) and are
the basis of all
computer
operations.**



Sydney Padua:



<https://sydneypadua.com/2dgoggles/happy-200th-birthday-george-boole/>

if statements syntax

`if` condition:  you need a colon here!

indented
by 4 spaces
(or tab)

```
    print('condition met')  
    print('nice work.')  
print('not in the block')
```

 block

`if/else` statement syntax

`if` condition:

```
print('condition met')
```

```
print('nice work.')
```

`else:`

```
print('condition not met')
```



you need a
colon here!

One more function: **elif**

- Short for “else if”
- Enables you to check for additional conditions.

```
condition_1 = False  
condition_2 = True
```

```
if condition_1:  
    print('Condition 1 is true.')
```

```
elif condition_2:  
    print('Condition 2 is true.')
```

```
else:  
    print('Both Condition 1 and 2 are false.')
```

Pseudocoding

```
e_neuron = Neuron(10nm, 'Excitatory')
e_neuron.n_type = 'excitatory'

class Neuron():
    random = " "
    def __init__(diameter, n_type):
        self.diameter = diameter
        self.n_type = n_type
        self.firing_rate = []
    def spike(firing_input):
        self.firing_rate.append(firing_input)
```

```
class Neuron():
```

```
    def __init__(self, diameter, n_type, firing_rate):
        self.diameter = diameter
        self.n_type = n_type
```

```
    def spike(self):
        self.firing_rate = []
```

Final challenge: guessing game

Ask the user: “What’s my favorite food?” If it’s the same as yours, respond, “Yep, delicious!” If not, say “Nope, you’re wrong.” Regardless, tell the user “Thanks for playing.”

Hint: You can use the `input` function to ask the user for a string input. For example,

```
response = input("What's my name?")
```

Working with a team, pseudocode this on the whiteboard (write out your general idea for the code), and then write this code in Python (either in a Jupyter Notebook or a `.py` script).

Resources

[Stepik Introduction to Python book, Chapter 2](#)

[Software Carpentries Conditionals](#)

[Whirlwind Tour of Python: Control Flow](#)

[Merely Useful Functions](#)

[Python Tutorial: Functions](#)