Introduction to Data Science with Python

Chapter 2

Fundamentals

Primitive Data Types

How is data stored and processed ?

- Values are stored in **variables**
- The four most important data types in Python:

```
integer = 10
float = 2.8
string = "This is a string"
boolean = True
```

How is data stored and processed ?

- We can compute with these variables

```
a = 10
b = 5
c = a + b

print(c)
```

```
Output: 15
```

What kind of data type is this : `"27-03-2021"` ?

a) integer b) float c) string d) date

What kind of data type is this : `"27-03-2021"` ?

a) integer b) float c) string d) date

Fundamentals

Data Structures

Data Structures - Lists

We can combine values in lists

```
a = [5, 3, 9, 7, 4, 10, 3]
b = ["Justus", "Peter", "Bob"]
```

Data Structures - Lists

Value	5	3	9	7	4	10	3
Index	0	1	2	3	4	5	6

Data Structures - Lists

Access the data with an index

```
a = [5, 3, 9, 7, 4, 10, 3]
b = ["Justus", "Peter", "Bob"]

print(a[0])  # Output: 5
```

Data Structures - Lists

Access the data with an index

```
a = [5, 3, 9, 7, 4, 10, 3]
b = ["Justus", "Peter", "Bob"]

a[3]  # Output: 7
b[1]  # Output: Peter
```

Data Structures - Lists

```
a[start:stop:step_size]
```

Data Structures - Lists

Value	5	3	9	7	4	10	3
Index	0	1	2	3	4	5	6

```
a[1:4]
```

Data Structures - Lists

Value	5	3	9	7	4	10	3
Index	0	1	2	3	4	5	6

```
a[1:4:2]
```

Data Structures - Dictionaries

```
translate = {"Eins":"One",
             "Zwei":"Two",
               "Ja":"Yes"}
translate["Eins"]  # Output: "One"
```

Quick - Summary

Data types

integer 2

float 2.32

string "Text"

boolean True/False

Data structures

lists: a = [1,2,3]

dictionary: b={“a”:1}

Exercise 1

```
Data structures - Hints
lists:
    create:  a = [1,2,3]
    access:     a[0]
dictionary:
    create: b={“a”:1}
    access: b[“a”]
```

Relational operators

- Compare variables

  a == b → is a equal to b?

  returns **True / False**

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==	is equal
<	smaller than
>	greater than
<=	smaller or equal than
>=	greater or equal than
!=	not equal to

Relational operators

- Compare variables

  a == b → is a equal to b?

  returns **True / False**

- Combine operators with "**and**" / "**or**"

  "and": (a >= b) and (a<=c)

  "or": (a >= b) or (a<=c)

==	is equal
<	smaller than
>	greater than
<=	smaller or equal than
>=	greater or equal than
!=	not equal to

QUIZ

```
a = 1
b = 2
c = 2
(a>b) or (a<=c)
```

QUIZ

```
a = 1
b = 2
c = 2
(a>b) or (a<=c)
False or True
```

QUIZ

```
a = 1
b = 2
c = 2
```

```
(a>b) or (a<=c)
```

```
False or True →  True
```

Very important for filtering

Name	Gender	Age
“Tim”	“M”	20
“Nina”	“F”	24
“John”	“M”	26

Select all Names with following condition:

(Gender == “F”) **&** (Age > 20)

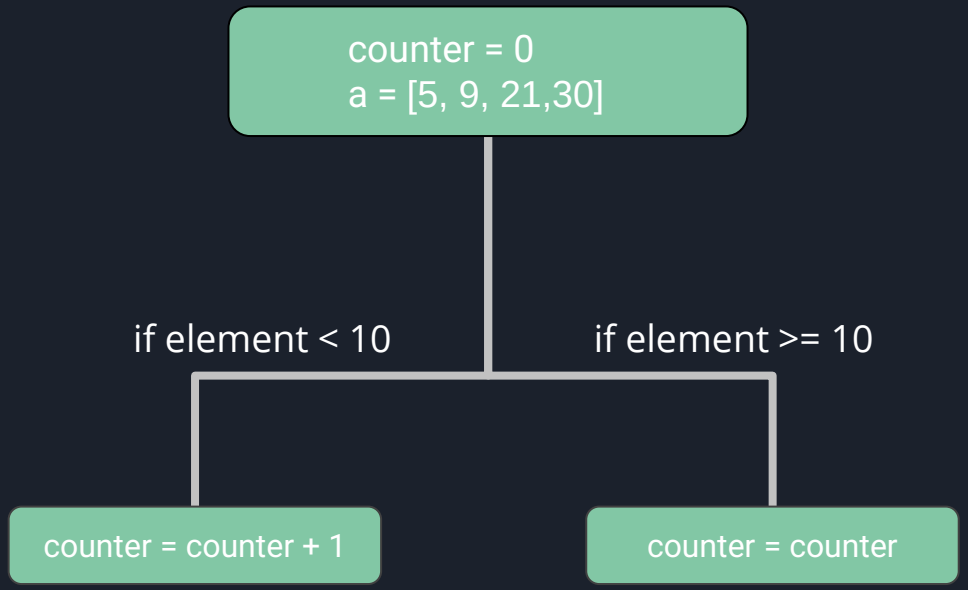
Fundamentals

Control Flow

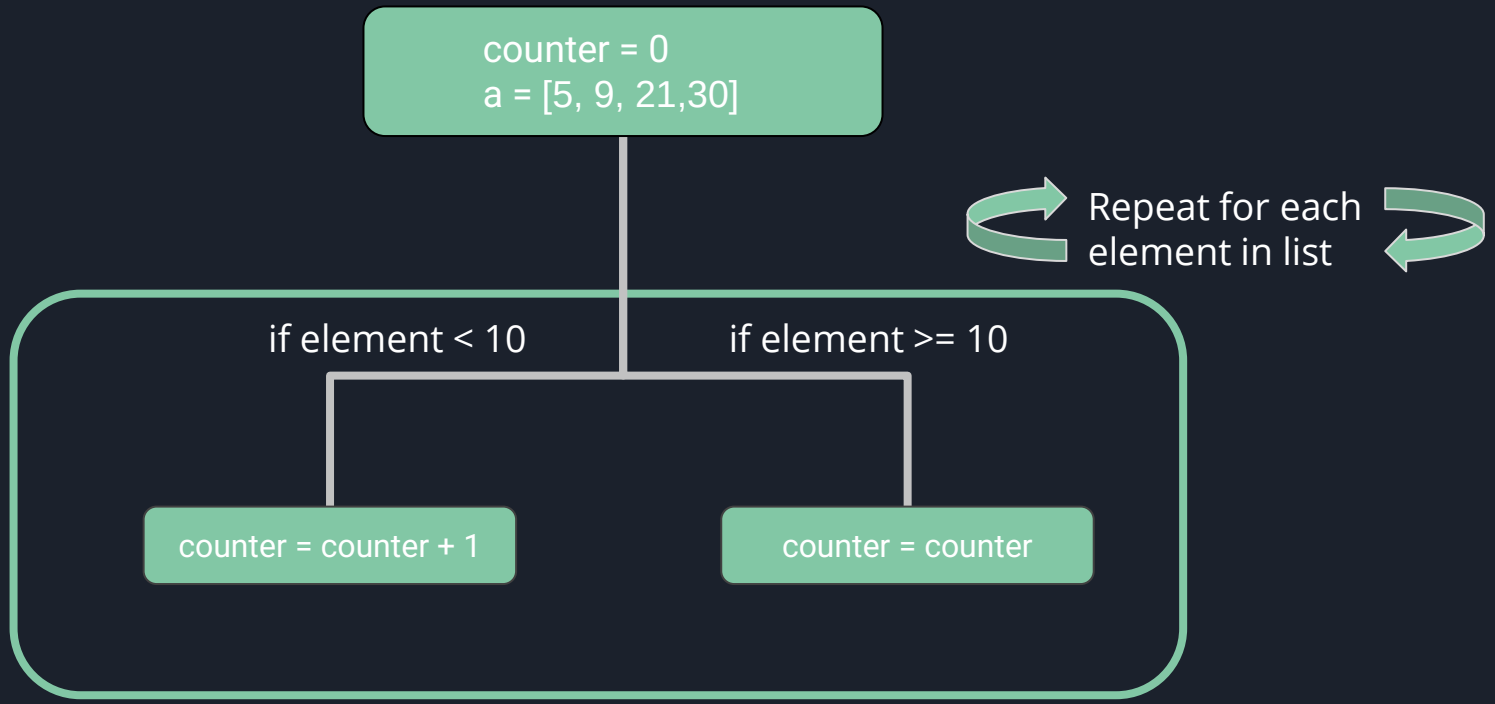
Count numbers smaller than 10 in a list

```
counter = 0
a = [5, 9, 21,30]
```

Count numbers smaller than 10 in a list



Count numbers smaller than 10 in a list



Control Flow - if / else

- Control which block of code will be executed
- Blocks defined by indentation

```
if BOOLEAN-CONDITION:
    print("A")
else:
    print("B")
```

Control Flow - if / else

- Control which block of code will be executed
- Blocks defined by indentation

```
if a>2:
    print("A")
else:
    print("B")
```

Control Flow - for-loop

- Repeat blocks of your code
- Use different values in each loop

```
for element in [1,2,3,4]:
    print(element)
```

Exercise 2

Count amount of numbers in a list which are smaller than 5

```
for element in [1,2,3,4]:
    print(element)
```

```
if a>2:
    print("A")
else:
    print("B")
```

Fundamentals

Functions & Libraries

functions

```
a = doSomething(b)
```

functions

```
a = doSomething(b)
```

Name of function

functions

Argument of function
(can be a value, variable, list, dict,...)

```
a = doSomething(b)
```

Name of function

functions

Argument of function
(can be a value, variable, list, dict,...)

Variable for
return value

```
a = doSomething(b)
```

Name of function

functions - round function

```
b = 5.2
a = round(b)
→ a = 5.0
```

Built-in Functions

```
print()     sum()
round()     abs()
min()       range()
max()       sorted()
```

QUIZ

```
round(2.34)   == ?
abs(-2)       == ?
a = [0,4,1,3,2]
max(a)        == ?
sum(a)        == ?
len(a)        == ?
sorted(a)     == ?
```

QUIZ

```
round(2.34)   == 2.0
abs(-2)       == 2
a = [0,4,1,3,2]
max(a)        == 4
sum(a)        == 10
len(a)        == 5
sorted(a)     == [0,1,2,3,4]
```

Create your own functions

- Define own functions for repeating tasks
- reduce amount of code lines

```
def my_function(a,b):
    c = ...
    return c
```

Create your own functions

- Define own functions for repeating tasks
- reduce amount of code lines

```
def my_function(a,b):
    return a + b
my_function(1,2) # 3
```

Exercise 3

Convert your code which counts amount of numbers smaller 5 into a function

```
def smaller_than(numbers, value):
    # your code here
    return counter
```