Tuples, sets

More useful data structures
Tuples

Tuple is an immutable list.

tuple = (element1, element2, element3, ...

point = (2, -3)
point3d = (-2, 1, 3)
person = ("Jaap", "Dam", 1996, "Nijmegen")
Operations with tuples

• Accessing elements

```
t = ("red", "green", "blue")
print(t[2])
```

• Checking existence

```
if "green" in t:
    print("yes")
else:
    print("no")
```
Looping through a tuple

Loop over indices

```python
for i in range(len(tuple)):
    ...
```

Loop over elements

```python
for el in tuple:
    ...
```
Multiple return values

```python
def funcname(args):
    statements
    statements
    return (var1, var2)

def findmin(a):
    val = 1000
    for i in range(len(a)):
        if a[i] < val:
            val = a[i]
            ind = i
    return (val, ind)
```
Immutability

Immutable means that its value cannot be changed.

Tuple is immutable:

• Values of individual elements cannot be changed.
• Elements cannot be added or removed.
• Once created, the tuple remains as it is until the end of the program.
Example

Write a program that lets the user input a set of objects and their coordinates, and displays a map of these objects.
dict = {}
n = int(input("Enter number of objects: "))
for i in range(n):
    lat = int(input("Enter latitude: "))
    lon = int(input("Enter longitude: "))
    objname = input("Enter object name: ")
    dict[(lat, lon)] = objname

import matplotlib.pyplot as plt
for p in dict:
    if dict[p] == "bridge": color = "blue"
    elif dict[p] == "house": color = "red"
    elif dict[p] == "tree": color = "green"
    plt.scatter(p[0], p[1], c=color)
plt.show()
Sets

Set is an unordered collection of elements.

\[ set = \{ \text{element1, element2, element3, \ldots} \} \]

\[ towns = \{ "Tallinn", "Tartu", "Narva", "Pärnu", "Viljandi" \} \]

Empty set is created with \texttt{set()}
Adding and removing elements

```
set.add(element)  towns.add("Rakvere")
```

```
set.remove(element)  towns.remove("Pärnu")
```
Elements in set

if element in set: if "Tapa" in towns:
    ... print("yes, found")

for element in set: for t in towns:
    ... print(t)

len(set) print(len(towns))
Set operations

A & B  Intersection of sets A and B
A | B  Union of sets A and B
A - B  Difference of sets A and B
A ^ B  Symmetric difference of sets A and B
A <= B  A is subset of B
A >= B  A is superset of B
Example

Write a spell checker.

The program asks the user for a filename. Then it reads the content of the file and prints out all unknown words.
Solution

```python
f = open("words.txt")
wordset = set()
for word in f:
    word = word.strip()
    wordset.add(word)

g = open(filename)
for row in g:
    parts = row.replace(',',' ').replace('.',' ').replace('?',' ').replace('!',' ').split()
    for p in parts:
        if not p in wordset:
            print(p)
```

Create word set

Process input file
Exercises

• Worksheet for Session 12
• Further exercises for Session 12