ZAČETEK

Python je visoko-nivojski, interpretiran programski jezik.

Glavni razlogi za njegovo popularnost so, da je zelo preprost in lahko berljiv. Navklub temu, pa omogoča pisanje zelo kompleksne kode. Python je znan po tem, da je vsaka stvar objekt in, da ima dinamične spremenljivke - ista spremenljivka je lahko uporabljena za shranjevanje različnih data tipov.

Množična uporaba se je začela po letu 2000, z izdajo verzije 2.0 in z izdajo verzije 3.0 v letu 2008. Verziji med seboj nista popolnoma kompatibilni in omenit je treba, da se verzije 2.x ne vzdržuje več od leta 2020 naprej.

> A rough estimate of the complexity of a language can be gleaned from the number of keywords or reserved words in the language. These are words that are reserved for special meaning by the compiler or interpreter because they designate specific built-in functionality of the language. Python 3 has 33 keywords, and Python 2 has 31. By contrast, C++ has 62, Java has 53, and Visual Basic has more than 120, though these latter examples probably vary somewhat by implementation or dialect.

> What does it mean to be **intepreted lanugage**: Many languages are compiled, meaning the source code you create needs to be translated into machine code, the language of your computer’s processor, before it can be run. Programs written in an interpreted language are passed straight to an interpreter that runs them directly (line by line). This makes for a quicker development cycle because you just type in your code and run it, without the intermediate compilation step. One potential downside to interpreted languages is execution speed. Programs that are compiled into the native language of the computer processor tend to run more quickly than interpreted programs. For some applications that are particularly computationally intensive, like graphics processing or intense number crunching, this can be limiting. In practice, however, for most programs, the difference in execution speed is measured in milliseconds, or seconds at most, and not appreciably noticeable to a human user. The expediency of coding in an interpreted language is typically worth it for most applications.

> Python 2.0 was released in 2000, and the 2.x versions were the prevalent releases until December 2008. At that time, the development team made the decision to release version 3.0, which contained a few relatively small but significant changes that were not backward compatible with the 2.x versions. Python 2 and 3 are very similar, and some features of Python 3 have been backported to Python 2. But in general, they remain not quite compatible.

> Both Python 2 and 3 have continued to be maintained and developed, with periodic release updates for both. As of this writing, the most recent versions available are 2.7.15 and 3.6.5. However, an official End Of Life date of January 1, 2020 has been established for Python 2, after which time it will no longer be maintained. If you are a newcomer to Python, it is recommended that you focus on Python 3, as this tutorial will do.

Installing Python

Da se prične s programiranjem moramo imeti inštaliran Python Interpreter oziroma lahko uporabimo Online Python Interpreter.

Uporabljali bomo Python3.x verzijo.

Windows

Preverimo, če imamo že inštaliran Python:

- Odpremo CMD
- vpišemo `python --version`
  - Če piše "python is not recognized as an internal or external command…. Potem nimamo inštaliranega Python internpreterja

Inštalacija:

- python.org
- Najdemo za željeni operacijski sistem. Zdownloadamo najnovejšo različico 3.x verzije
  - Embedded zip file - to je, da ti extractaš v svojo datoteko in je to to
  - Executable - da ti inštalira in nrdi path itd..
- ADD Python to PATH!

Problemi:

- Če ma windows že inštalirano verzijo Python (primer: python2.7). Če probaš ukaz "python --version" uporabi verzijo 2.7, čeprov smo glihkr dodal verzijo 3.7. Lahko se proba z drugimi ukazi za Python3.7 (python3, python3.7, py3, py…). Lahko se zamenja "PATH VARIABLE" sam jst tega ne znam. Če ne druzga se lahko pomaknejo v mapo kjer je ta Python3.7 inštaliran in tm začenejo CMD in delajo normalno.

Linux

There is a very good chance your Linux distribution has Python installed already, but it probably won't be the latest version, and it may be Python 2 instead of Python 3.

To find out what version(s) you have, open a terminal window and try the following commands:

python --version

python2 --version

python3 --version

One or more of these commands should respond with a version, as below:

$ python3 --version Python 3.6.5 If the version shown is Python 2.x.x or a version of Python 3 that is not the latest (3.6.5 as of this writing), then you will want to install the latest version. The procedure for doing this will depend on the Linux distribution you are running.

MacOS

While current versions of macOS (previously known as "Mac OS X") include a version of Python 2, it is likely out of date by a few months. Also, this tutorial series uses Python 3, so let's get you upgraded to that.

The best way we found to install Python 3 on macOS is through the Homebrew package manager. This approach is also recommended by community guides like The Hitchhiker’s Guide to Python.

Step 1: Install Homebrew (Part 1) To get started, you first want to install Homebrew:

Open a browser and navigate to http://brew.sh/ (http://brew.sh/). After the page has finished loading, select the Homebrew bootstrap code under “Install Homebrew”. Then hit Cmd+C to copy it to the clipboard. Make sure you’ve captured the text of the complete command because otherwise the installation will fail. Now you need to open a Terminal.app window, paste the Homebrew bootstrap code, and then hit Enter. This will begin the Homebrew installation. If you’re doing this on a fresh install of macOS, you may get a pop up alert asking you to install Apple’s “command line developer tools”. You’ll need those to continue with the installation, so please confirm the dialog box by clicking on “Install”. At this point, you’re likely waiting for the command line developer tools to finish installing, and that’s going to take a few minutes. Time to grab a coffee or tea!

Step 2: Install Homebrew (Part 2) You can continue installing Homebrew and then Python after the command line developer tools installation is complete:

Confirm the “The software was installed” dialog from the developer tools installer. Back in the terminal, hit Enter to continue with the Homebrew installation. Homebrew asks you to enter your password so it can finalize the installation. Enter your user account password and hit Enter to continue. Depending on your internet connection, Homebrew will take a few minutes to download its required files. Once the installation is complete, you’ll end up back at the command prompt in your terminal window. Whew! Now that the Homebrew package manager is set up, let’s continue on with installing Python 3 on your system.

Step 3: Install Python Once Homebrew has finished installing, return to your terminal and run the following command:

$brewinstallpython3Note : Whenyoucopythiscommand, besureyoudon' tincludethe$ character at the beginning. That’s just an indicator that this is a console command.

This will download and install the latest version of Python. After the Homebrew brew install command finishes, Python 3 should be installed on your system.

You can make sure everything went correctly by testing if Python can be accessed from the terminal:

Open the terminal by launching Terminal.app. Type pip3 and hit Enter. You should see the help text from Python’s “Pip” package manager. If you get an error message running pip3, go through the Python install steps again to make sure you have a working Python installation. Assuming everything went well and you saw the output from Pip in your command prompt window…congratulations! You just installed Python on your system, and you’re all set to continue with the next section in this tutorial.

Text-Editor

Visual Studio Code https://code.visualstudio.com/download (https://code.visualstudio.com/download)

> zdownloadaš View -> Terminals - klikneš, da ti pokaže terminal Da zaženeš se morš s terminalom prestavt do kjer maš datoteko:
>
> - cd .. (da greš nazaj v mapi)
> - cd -ime- (da greš znotraj te mape)
> - ls da vidš kere vse mape so kle notr ko si znotraj mape k ma tvojo kodo: python -ime_datoteke.py-

Python extension

Debugger se dobi tako

Auto-complete kodo se dobi

Programiranje

Naloga: 5x zapored izpiši neko številko

Za izpis nečesa se uporablja beseda

```
print()
```

In [1]:

```
print(10)
```

```
10
```

Če je naprimer naša naloga 5x izpisati številko 1.

To bi lahko napisal na sledeč način:

In [2]:

```
print(1)
print(1)
print(1)
print(1)
print(1)
```

```
1
1
1
1
1
```

Tekom programiranja se odločmo, da hočmo namesto številke 1 izpisat številko 3.

In zdej gremo v vsako vrstico in zamenjamo 1 z 3.

In [3]:

```
print(3)
print(3)
print(3)
print(3)
print(3)
```

```
3
3
3
3
3
```

Če bi bil naš program, da moramo neko številko izpisat 1000x bi potem na roke moral popravljat vsako 1ko v 3ko. Kar pa je zamudno in lahko povzroči veliko število človeških napak (ponesreč izpustimo 1 vrstico, itd..)

Dosti lažje bi bilo, če bi mi lahko na začetku računalniko povedal, naj si shrani številko katero hočemo izpisat. Potem pa jo računalnik izpiše 100x.

To lahko dosežemo s pomočjo spremeljivk.

Spremenljivke

Spremenljivka je kot neka beseda v katero shranimo vrednost in do te vrednosti dostopamo kasneje v kodi.

```
x = 2
```

Beri: **Vrednost 2 shrani v spremenljivko z imenom x.**

Oziroma bolj natančno: **Ovrednoti kar je na desni strani enačaja in to shrani v levo stran enačaja**

Spremenljivke nam omogočajo shranjevanje vrednosti in lepšo kontrolo nad kodo.

Napišimo naš primer z uporabo spremenljivke.

In [5]:

```
x = 3 # definiramo našo spremenljivko in vanjo shranimo našo vrednost, katero želimo izpisa
print(x)
print(x)
print(x)
print(x)
print(x)
```

```
3
3
3
3
3
```

Če sedaj hočemo, da se namesto številke 3 izpiše številka 12 lahko enostavno popravimo 1 vrstico.

In [6]:

```
x = 12
print(x)
print(x)
print(x)
print(x)
print(x)
```

```
12
12
12
12
12
```

Da je koda lažje berljiva, tudi po tem, ko nekdo drug bere za tabo, obstaja nek skupek priporočil kako naj bo koda zapisana (PEP8 (https://www.python.org/dev/peps/pep-0008/)). Not recmo piše, da nej se spremenljivke poimenuje z uporabo snake_case (vse je z malimi začetnicai, besede ločimo z podčrtajem)

Pri imenu spremenljivk je tudi treba paziti, saj so case-sensitive.

In [7]:

```
x = 1
X = 2
print(x)
print(X)
```

```
1
2
```

Prav tako spremenljivk ne moremo poimenovati s posebnimi imeni ("keywords") katere Python že uporablja (False, None,...).

In [8]:

```
False = 1
```

```
  File "<ipython-input-8-1950c547d36b>", line 1
    False = 1
             ^
SyntaxError: can't assign to keyword
```

V Pythonu so spremenljivke **dinamične**. To pomeni, da nam ni potrebno izrecno povedati računalniku kakšnega tipa je spremenljivka.

Da vidimo kakšnega tipa je spremenljivka, uporabimo besedo:

```
type()
```

In [1]:

```
x = 1
print(x)
print(type(x)) # type(x) nam pove kakšnega tipa je spremenljivka x

print("------------")

x = 1.2
print(x)
print(type(x))
```

```
1
<class 'int'>
------------
1.2
<class 'float'>
```

Poznamo več različnih tipov spremenljivk, različnih vrednosti katere lahko shranimo:

Integer (celo število) - int

V Python3 ni maximalne velikosti integerja. Številka je lahko velika kolikor želimo. Omejeni smo samo z našim pomnilnikom.

In [3]:

```
x = 5
print(x)
print(type(x))
```

```
5
<class 'int'>
```

In [4]:

```
x = 1267650600228229401496703205376 # Tole je 2^100 , v Javi je omejitev men se zdi da 2^31
print(x)
print(type(x))
```

```
1267650600228229401496703205376
<class 'int'>
```

Floating-point (decimalno število) - float

Float predstavlja decimalno ševilo (število s plavajočo vecijo).

Treba je pazit saj te številke niso popolnoma natančne ampak le aproksimacije (te aproksimacije se vidjo šele pri n-ti decimalki).

> Almost all platforms represent Python float values as 64-bit “double-precision” values, according to the IEEE 754 standard. In that case, the maximum value a floating-point number can have is approximately 1.8 ⨉ 10^^308.

> The closest a nonzero number can be to zero is approximately 5.0 ⨉ 10-324. Anything closer to zero than that is effectively zero:

> Floating point numbers are represented internally as binary (base-2) fractions. Most decimal fractions cannot be represented exactly as binary fractions, so in most cases the internal representation of a floating-point number is an approximation of the actual value. In practice, the difference between the actual value and the represented value is very small and should not usually cause significant problems.

In [5]:

```
x = 5.43
print(x)
print(type(x))
```

```
5.43
<class 'float'>
```

Complex numbers (kompleksna števila) - complex

Nam predstavlja kompleksna števila. Števila, ki so sestavljena iz realnega in imaginarnega dela.

In [6]:

```
x = 2 + 3j
print(x)
print(type(x))
```

```
(2+3j)
<class 'complex'>
```

Boolean (True or False) - bool

Boolean spremenljivka lahko zavzeme samo 2 vrednosti. Ali True ali False.

In [8]:

```
x = True
print(x)
print(type(x))

print("-------")

x = False
print(x)
print(type(x))
```

```
True
<class 'bool'>
-------
False
<class 'bool'>
```

Tudi, če spremenljivka sama po sebi ni True ali False, se jo še vedno lahko pretvorivmo v tip bool. Tako lahko vidimo, da so naslednje vrednosti False:

- Boolean False
- numerična vrednost 0 (0, 0.0, 0+0j...)
- Empty string
- Keyword None
- Empty object (kot je prazen list, prazna terka...)

Vse ostalo je True.

Da pretvorivmo neko spremenljivko v boolean tip, uporabimo besedo:

```
bool(spemenljivka)
```

In [40]:

```
print(bool(False)) # bool(x) pretvor vrednost x v boolean (al true al false)
print(bool(0))
print(bool(""))
print(bool(None))
print(bool([]))
print("********")
print(bool(True))
print(bool(1))
print(bool("abc"))
print(bool([1,2]))
```

```
False
False
False
False
False
********
True
True
True
True
```

Na podoben način lahko spreminjamo spremenljivke v ostale tipe:

```
int(spremenljivka),
str(spremenljivka),
complex(spremenljivka)
```

String (stavek) - str

Stringi so zaporedja črk. Začnejo in končajo se z dvojnim (") ali enojnim (') narekovajem.

Vsebuje lahko neomejeno število črk. Edina omejitev je naš pomnilnik.

Lahko je tudi prazen stavek.

In [13]:

```
x = "Stavek" # navaden string z dvojnim narekovajem ""
print(x)
print(type(x))
```

```
Stavek
<class 'str'>
```

In [15]:

```
x = 'String' # navaden string z enojnim narekovajem ''
print(x)
print(type(x))
```

```
String
<class 'str'>
```

In [16]:

```
x = "" # prazen string
print(x)
print(type(x))
```

```

<class 'str'>
```

Če želimo v našem stringu uporabiti narekovaje naredimo to tako:

In [17]:

```
x = "String with (')"
y = 'String with (")'
print(x)
print(y)
```

```
String with (')
String with (")
```

Večina črk ima samo 1, primarni pomen. In to je dejanska črka. **A** pomeni **A**, **e** pomeni **e**, itd.

Določene črke pa imajo tudi sekundarni pomen. Če pred črko vstavimo *backslash* (\ ) s tem povemo Pythonu, naj uporabi njen sekundarni pomen.

- **n** primarni pomen je črka n. Njen sekundarni pomen (**\n**) pomeni "premik v novo vrstico".
- **t** primarni pomen je črka t. Njen sekundarni pomen (**\t**) pomeni "tabulator".
- \ primerni pomen je sporočilo Pythonu naj uporabi sekundarni pomen črke. Njen sekundarni pomen (\\) pomeni črka \ (backslash)

In [19]:

```
x = "String with (\")"
print(x) # ponavadi bi python prebral drugi " kot konec stringa

print("----------")

x = "String \nString"
print(x) # ponavadi bi python prebral n kot n. Ampak z \ ga ne prebere tko kot ponavadi amp
```

```
String with (")
----------
String
String
```

Obstaja tudi možnost večvrstičnega izpisa.

In [20]:

```
print('''
To je primer večvrstičnega izpisa.
Vrstica 1
Vrstica 2 ''')
```

```

To je primer večvrstičnega izpisa.
Vrstica 1
Vrstica 2
```

Vaje

Vaja 01

Naloga: Ustvarite 5 novih spremenljivk. Njihova imena naj bodo "a", "b", "c", "d", "e".

Spremenljivke naj bodo poljubne vrednosti naslednjih tipov:

- a naj bo tipa boolean
- b naj bo tipa integer
- c naj bo tipa float
- d naj bo tipa complex
- e naj bo tipa string

Vsako spremenljivko izpišite in izpišite njen tip.

In [ ]:

Vaja 02

Naloga: V neko spremenljivko shranite poljubno float vrednost. Izpišite spremenljivko in njen tip.

To spremenljivko pretvorite v boolan vrednost in to vrednost shranite v novo spremenljivko. Izpišite novo spremenljivko in njen tip.

In [ ]:

```

```

Input() funkcija

S pomočjo te funkcije lahko uporabnika vprašamo za nek input.

In [1]:

```
age = input('Enter your age: ')  # Enter 3
print('You have lived for', age, "years.")
```

```
Enter your age: 12
You have lived for 12 years.
```

Naša naloga je sedaj izpisat koliko mesecev je oseba stara.

In [3]:

```
age = input("Enter your age: ")
print("You have lived for", age*12, "monthts.")
```

```
Enter your age: 12
You have lived for 121212121212121212121212 monthts.
```

Koda ne deluje pravilno in nam 12x izpiše vrednost let. Potrebno je paziti, ker nam input vrne vrednost datatipa **string**. In množenje stringa s številko nam tolikokrat izpiše string.

Prvo moramo dobljena leta pretvoriti v integer in nato ga lahko normalno množimo.

In [6]:

```
age = input("Enter your age: ")
print(type(age))
print(age * 12)

age_int = int(age)
print(type(age_int))
print("You have lived for", age_int*12, "monthts.")
```

```
Enter your age: 12
<class 'str'>
121212121212121212121212
<class 'int'>
You have lived for 144 monthts.
```

Vaja 03

Naloga: Uporabnika zaprosite naj vnese neko celo število.

To vrednost shranite v spremenljivko z imenom **n** in jo izpišite in izpišite njen tip.

Nato to vrednost pretvorite v float vrednost. Dobljeno float vrednost shranite v spremenljivko **n**. Nato **n** izpišite in izpišite njen tip.

In [ ]:

```

```

Izpisovanje in formating

Da nekaj izpišemo uporabimo besedo

```
print()
```

In [60]:

```
print("Hello World")
```

```
Hello World
```

Zadeve lahko tudi izpišemo v lepših formatih (sredinsko centriranje, uporaba več decimalnih mest, itd..). S tem lahko izpisane zadeve napravimo bolj berljive za uporabnika.

S prihodom Python3.6 verzije se stringe izpisuje s pomočjo f-string

```
f'Besedilo {spremenljivka1:format1}, besedilo naprej{spremenljivka2:format2}, bese
dilo naprej....'
```

Dokumentacija f-string (https://docs.python.org/3.6/library/string.html#formatspec)

In [9]:

```
ime = input("Vnesi ime: ")
starost = 10
print(f'{ime} je {starost} let star')
```

```
Vnesi ime: leon
leon je 10 let star
```

Če želimo uporabiti lepši format za izpis naši spremenljivki dodamo " : " in definiramo način izpisa.

In [11]:

```
# Primer 1
# Starost bomo izpisali kot float vrednost, z 3 decimalnimi mesti.
ime = input("Vnesi ime: ")
starost = 10
print(f'{ime} je {starost:.3f} let star')
```

```
Vnesi ime: Gregor
Gregor je 10.000 let star
```

In [18]:

```
# Primer
# Starost bomo izpisali kot float vrednost, z 3 decimalnimi mesti.
# Za ime bomo porabili 10 mest
ime = input("Vnesi ime: ")
starost = 10
print(f'{ime:10} je {starost:.3f} let star')
```

```
Vnesi ime: Gregor
Gregor     je 10.000 let star
```

In [21]:

```
# Primer
# Starost bomo izpisali kot float vrednost, z 3 decimalnimi mesti.
# Za ime bomo porabili 10 mest, če je ime krajše od 10 mest bomo prosta mesta nadomestili z
ime = input("Vnesi ime: ")
starost = 10
print(f'{ime:*^10} je {starost:.3f} let star')
```

```
Vnesi ime: A
****A***** je 10.000 let star
```

Pred tem, s prihdom Python2.6, se je uporabljalo

```
str.format()
```

In [63]:

```
ime = "Anže"
starost = 10
print("Živjo {}. Star si {} let.".format(ime, starost))
```

```
Živjo Anže. Star si 10 let.
```

.format() je počasnejši od f' ' stavka

Še pred tem se je uporabljalo

```
%-formating
```

In [1]:

```
name = "Anže"
age = 10
print("Živjo %s. Star si %s let." % (name, age))
```

```
Živjo Anže. Star si 10 let.
```

Ta način je najpočasnejši. Pri veliki količini spremenljivk hitro postane nepregleden. Lahko vodi do napak, kot so nepravilno prikazovanje touples in dictionaries.

String operacije

Nad string-i lahko izvajamo tudi različne operacije.

Vse črke stringa lahko pretvorimo v male črke, oziroma velike črke.

In [2]:

```
my_str = "Živjo Anže. Star si 10 let."
print(my_str) # not modified

print(my_str.lower())
```

```
Živjo Anže. Star si 10 let.
živjo anže. star si 10 let.
```

In [3]:

```
my_str = "Živjo Anže. Star si 10 let."
print(my_str) # not modified

print(my_str.upper())
```

```
Živjo Anže. Star si 10 let.
ŽIVJO ANŽE. STAR SI 10 LET.
```

Preverimo lahko ali se naš string začne oziroma konča s poljubnim sub-string-om.

In [4]:

```
my_str = "Živjo Anže. Star si 10 let."
print(my_str) # not modified

print(my_str.startswith("Živjo"))
print(my_str.startswith("Zdravo"))
print(my_str.startswith("Živ"))
```

```
Živjo Anže. Star si 10 let.
True
False
True
```

In [5]:

```
my_str = "Živjo Anže. Star si 10 let."
print(my_str) # not modified

print(my_str.endswith("Živjo"))
print(my_str.endswith("let"))
print(my_str.endswith("let."))
```

```
Živjo Anže. Star si 10 let.
False
False
True
```

Iz začetka oziroma konca našega stringa lahko odstranimo znake.

In [6]:

```
my_string = "Živjo Anže. Star si 10 let."
print(my_str)

print(my_str.strip("."))
print(my_str.strip("Živjo"))
```

```
Živjo Anže. Star si 10 let.
Živjo Anže. Star si 10 let
 Anže. Star si 10 let.
```

Znake v stringu lahko nadomestimo s pooljubnimi znaki.

In [7]:

```
my_string = "Živjo Anže. Star si 10 let."
print(my_string)

print(my_string.replace(" ", "-"))
print(my_string.replace("Živjo", "Zdravo"))
```

```
Živjo Anže. Star si 10 let.
Živjo-Anže.-Star-si-10-let.
Zdravo Anže. Star si 10 let.
```

Različne stringe lahko med seboj združujemo (concate)

In [8]:

```
str1 = "Živjo"
str2 = "Anže"

print(str1 + str2)
print(str1 + " " + str2)
```

```
ŽivjoAnže
Živjo Anže
```

In [ ]:

```

```

Matematične operacije

- + seštevanje
- - odštevanje
- * množenje
- / deljenje
- // celoštevilsko deljenje
- ** eksponent
- % ostanek pri deljenju

In [24]:

```
x = 9
y = 4
```

In [25]:

```
x + y
```

Out[25]:

```
13
```

In [26]:

```
# še drugačen način seštevanja
# x += y
# x
```

In [27]:

```
x - y
```

Out[27]:

```
5
```

In [28]:

```
x * y
```

Out[28]:

```
36
```

In [29]:

```
x / y
```

Out[29]:

```
2.25
```

In [30]:

```
a = 6
b = 3
a / b # Pri navadnem deljenju je rezultat vedno float. Tud če je delenje brez ostanka.
```

Out[30]:

```
2.0
```

In [31]:

```
x // y # 9 / 4 = 2*4 + ostanek (ta dvojka se izpiše)
```

Out[31]:

```
2
```

In [32]:

```
x % y # ostanek pri deljenju
```

Out[32]:

```
1
```

In [33]:

```
x ** y # na potenco
```

Out[33]:

```
6561
```

In [ ]:

```
```

Vaja

Naloga: Napišite program seštevalnik.

Program naj od uporabnika zahteva dve števili. Te dve števili naj sešteje in vrednost izpiše.

In [ ]:

```
```

Potek operacij

> Operational precedence

In [75]:

```
x = 20 + 4 * 10
x # kaj se bo izpisal? 60 al 240
```

Out[75]:

```
60
```

Vsaka operacija ima določeno pomembnost.

V izrazu se prvo izvedejo operacije z najvišjo pomembnostjo. Ko pridobimo te rezultate, se nato izvedejo naslednje najpomembnejše operacije in tako do konca.

V primeru operacij z enako pomembnostjo se le te izvajajo od leve-proti-desni.

Tabela (od najpomembnejše do najmanj)

Operacije	Opis

Operacije	Opis
**	exponentiation
+x, -x, ~x	unary positive, unary negation, bitwise negation
*, /, //, %	multiplication, division, floor division, modulo
+, -	addition, subtraction
<<, >>	bit shifts
&	bitwise AND
^	bitwise XOR
|	bitwise OR
==, !=, <, <=, >, >=, is, is not	comparisons, identity
not	Boolean NOT
and	Boolean AND
or	Boolean OR

Potek operacij se lahko spremeni z uporabo oklepajev ().

Izrazi v okepajih se izvedejo pred izrazi, ki niso v oklepajih.

Nič ni narobe s pretirano uporabo oklepajev tudi, če niso potrebni. Uporaba oklepajev velja za dobro prakso, saj izboljša berljivost kode.

In [76]:

```
x = 20 + (4 * 10) # prvo se izvede oklepaj in dobimo 20 + 40 = 60
y = (20 + 4) * 10 # prvo se izvede oklepaj in dobimo 24 * 10 = 240
print(x)
print(y)
```

```
60
240
```

Primerjalne operacije

Za primerjanje različnih vrednosti in spremenljivk med seboj imamo primerjalne operacije. Te primerjajo dve vrednosti in nam vrnejo rezultat, ki je ali True ali False.

- < manjši
- > večji
- <= manjše ali enako
- >= večje ali enako
- == enako
- != neenako

In [23]:

```
5 < 10
```

Out[23]:

```
True
```

In [24]:

```
10 > 5
```

Out[24]:

```
True
```

In [25]:

```
3 <= 2
```

Out[25]:

```
False
```

In [26]:

```
5 >= 5
```

Out[26]:

```
True
```

Ko primerjamo dve spremenljivki z uporabo == , primerjamo njuni vrednosti.

In [27]:

```
5 == 4
```

Out[27]:

```
False
```

In [28]:

```

x = 1.1000 + 2.2000
y = 3.3000
print(x == y)
print(f' x: {x:.50} \n y: {y:.50}')
```

```
False
 x: 3.3000000000000002664535259100375697016716003417969
 y: 3.2999999999999998223643160599749535322189331054688
```

In [29]:

```
4 != 4
```

Out[29]:

```
False
```

Primer večih primerjav v eni vrstici:

In [30]:

```
1 < 4 > 6 < 10
# same as (1 < 4) and (4 > 6) and (6 < 10)
```

Out[30]:

```
False
```

Logične operacije

- not
- or
- and
- is > Primerja identiteto
- in > Preverja, če je vrednost znotraj primerjalne vrednosti

NOT

A	NOT
False	True
True	False

In [87]:

```
x = False
not x # obrne vrednost. Če je vrednost True jo obrne v False, če je False jo obrne v True
```

Out[87]:

```
True
```

OR

A	B	OR
False	False	False
False	True	True
True	False	True
True	True	True

In [88]:

```
x = True
y = False
x or y # če je ena izmed vrednosti True, bo izraz True
```

Out[88]:

```
True
```

AND

A	B	AND
False	False	False
False	True	False
True	False	Fasle
True	True	True

In [89]:

```
x = True
y = False
x and y # če je ena izmed vrednosti False, bo izraz False
```

Out[89]:

```
False
```

IS

In [40]:

```



a = [1,2,3]
b = [1,2,3]
c = a

print("a == b")
print(a == b)
print()
print("a is b")
print(a is b)

print(30*"*")

print("a == c")
print(a == c)
print()
print("a is c")
print(a is c)

print(30*"-")
print("a id: ", id(a))
print("b id: ", id(b))
print("c id: ", id(c)) # c in a imasta isto identiteto. To tud pomen, da če spremeniš vredn

print()
```

```
a == b
True

a is b
False
******************************
a == c
True

a is c
True
------------------------------
a id:  2684900183488
b id:  2684900126528
c id:  2684900183488
```

In [92]:

```python
# poseben primer so številke od -5 do 256
a = -7
b = -7

for _ in range(-7, 260):
    print(f'Vrednost a: {a}, identiteta: {id(a)}')
    print(f'Vrednost b: {b}, identiteta: {id(b)}')

    if a == b:
        print("a and b have the same value.")

    if a is b:
        print("a and b are the same.")

    print(30*"*")
    a += 1
    b += 1
```

```
Vrednost a: -7, identiteta: 2027528172656
Vrednost b: -7, identiteta: 2027528172144
a and b have the same value.
******************************
Vrednost a: -6, identiteta: 2027528171696
Vrednost b: -6, identiteta: 2027528172656
a and b have the same value.
******************************
Vrednost a: -5, identiteta: 140707435483776
Vrednost b: -5, identiteta: 140707435483776
a and b have the same value.
a and b are the same.
******************************
Vrednost a: -4, identiteta: 140707435483808
Vrednost b: -4, identiteta: 140707435483808
a and b have the same value.
a and b are the same.
******************************
Vrednost a: -3, identiteta: 140707435483840
```

In [93]:

```python
x = "b"
x in "abc" # primerja ali je x v stringu, listu, itd..
```

Out[93]:

```
True
```

Vaja 02

Naloga: Uporabnika vprašajte za dve decimalni vrednosti.

Preverite, če je prva vrednost večja ali enaka od druge.

In [ ]:

In [ ]:

Vaje 03

Naloga: Uporabnika vprašajte za 3 celoštevilske vrednosti in jih izpišite s pomočjo print() in type().

V eni vrstici preverite ali je druga vrednost enaka prvi in ali je tretja vrednost manjša ali enaka prvi.

In [ ]:

In [ ]:

List

List je zbirka elementov. (V drugih programskih jezikih je znan kot "array").

Uporablja se, da več različnih vrednosti ali spremenljivk shranimo znotraj ene spremenljivke. Tako lahko preko ene spremenljivke dostopamo do več različnih stringov, števil, itd...

V Pythonu je list definiran z oglatimi oklepaji [], elementi v listu pa so ločeni z vejico ,

In [9]:

```python
živali  = ["pingvin", "medved", "los", "volk"]
print(živali)
```

```
['pingvin', 'medved', 'los', 'volk']
```

Glavne karakteristike list-ov so:

- Lists are ordered
- Lists can contain any arbitrary objects.
- List elements can be accessed by index.
- Lists can be nested to arbitrary depth.
- Lists are mutable.
- Lists are dynamic.

Lists are ordered

To pomeni, da so podatki shranjenji v list v določenem zaporedju in ostanejo v tem zaporedju.

In [10]:

```
a  = ["pingvin", "medved", "los", "volk"]
b  = ["los", "medved", "pingvin", "volk"]
a == b # čeprov mata list a in v enake elemente, niso v istem zaporedju zato nista enaka
```

Out[10]:

```
False
```

Lists Can Contain Arbitrary Objects

Za podatke v list-u ni potrebno, da so istega tipa (data type).

In [11]:

```
a = [21.42, "medved", 3, 4, "volk", False, 3.14159]
a
```

Out[11]:

```
[21.42, 'medved', 3, 4, 'volk', False, 3.14159]
```

Podatki v list-u se lahko podvajajo.

In [12]:

```
a  = ["pingvin", "medved", "los", "volk", "medved"]
a
```

Out[12]:

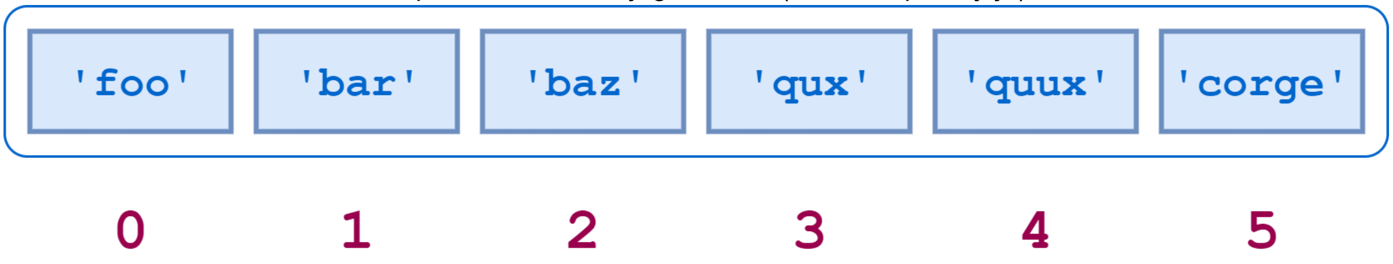
```
['pingvin', 'medved', 'los', 'volk', 'medved']
```

List Elements Can Be Accessed by Index

In [41]:

```
a = ['foo', 'bar', 'baz', 'qux', 'quux', 'corge']
```

Do elementov v list-u lahko dostopamo, če vemo njegov index (na kateri poziciji je).



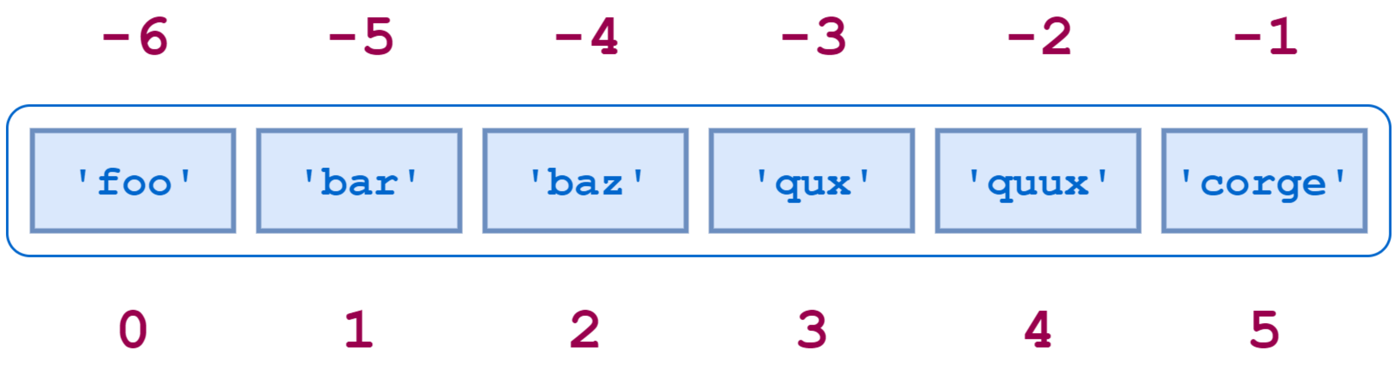
V Pythonu se indexiranje začne z 0.

In [42]:

```
print(a[0])
print(a[2])
print(a[3])
```

```
foo
baz
qux
```

Indexiramo lahko tudi z negativnimi vrednostmi:



In [43]:

```
print(a[-6])
print(a[-1])
```

```
foo
corge
```

Slicing

To nam pomaga pridobiti določene pod-liste iz že narejene list-e.

In [44]:

```
print(a[2:5])
# a[m:n] nam vrne list vrednosti, ki se nahajajo v a od vključno indexa m do izvzeto indexa
# a[2:5] nam vrne elemente v listu a od vključno 2 do ne vključno 5
```

```
['baz', 'qux', 'quux']
```

In [45]:

```
print(a[-5:-2]) # isto deluje z negativnimi indexi
```

```
['bar', 'baz', 'qux']
```

In [46]:

```
print(a[:4]) # če izvzamemo začetni index nam začne pri indexu 0
```

```
['foo', 'bar', 'baz', 'qux']
```

In [47]:

```
print(a[2:]) # če izvzamemo zadnji index se sprehodi do konca seznama
```

```
['baz', 'qux', 'quux', 'corge']
```

Specificeramo lahko tudi korak, za koliko naj se premakne.

In [48]:

```
print(a[::2]) # začne pri indexu 0, do konca, vsako drugo vrednost
```

```
['foo', 'baz', 'quux']
```

In [49]:

```
print(a[1:5:2])
print(a[6:0:-2]) # korak je lahko tudi negativen
print(a[::-1]) # sintaksa za sprehajanje po listu v obratnem vrstnem redu
```

```
['bar', 'qux']
['corge', 'qux', 'bar']
['corge', 'quux', 'qux', 'baz', 'bar', 'foo']
```

Use the * operator to represent the “rest” of a list

Often times, especially when dealing with the arguments to functions, it’s useful to extract a few elements at the beginning (or end) of a list while keeping the “rest” for use later. Python 2 has no easy way to accomplish this aside from using slices as shown below. Python 3 allows you to use the * operator on the left hand side of an assignment to represent the rest of a sequence.

In [56]:

```
some_list = ['a', 'b', 'c', 'd', 'e']
(first, second, *rest) = some_list
print(rest)
(first, *middle, last) = some_list
print(middle)
(*head, second_last, last) = some_list
print(head)
```

```
['c', 'd', 'e']
['b', 'c', 'd']
['a', 'b', 'c']
```

Lists can be nested to arbitrary depth

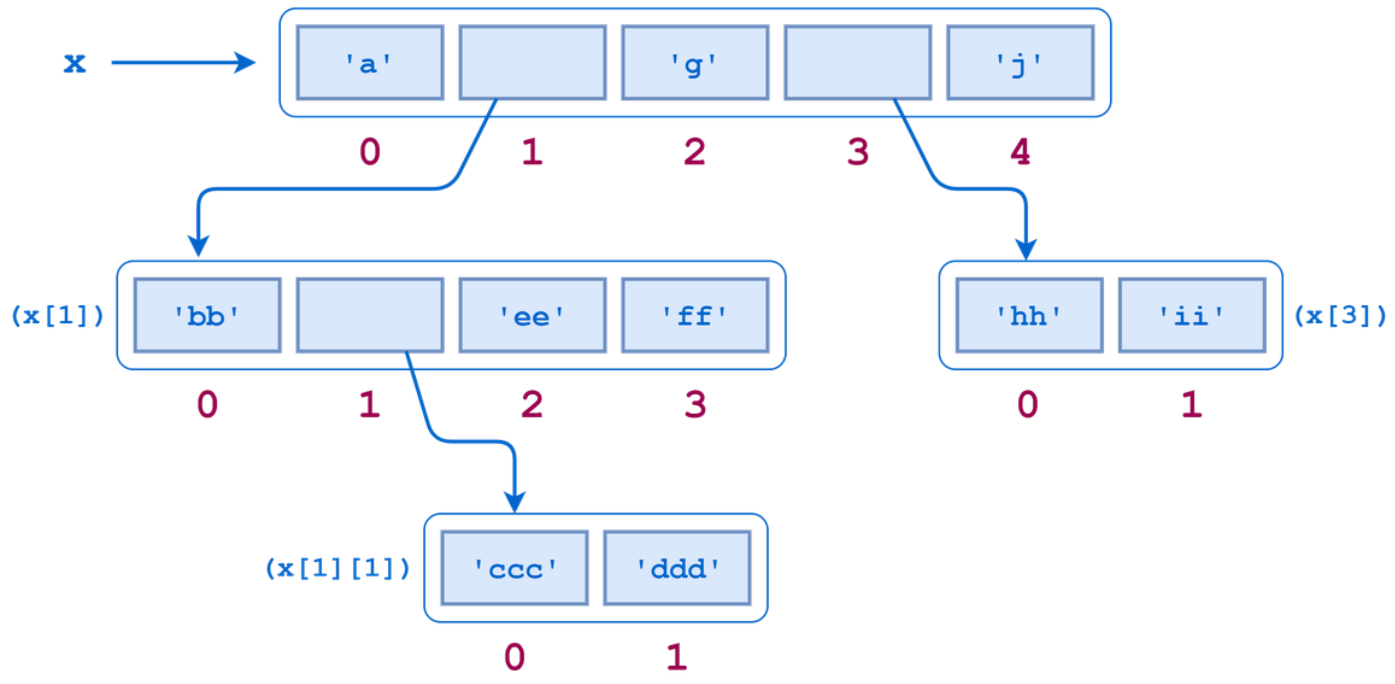
Elementi v listu so lahko poljubnega data type.

Lahko je tudi še en list. Tako lahko dodajamo dimenzije našemu list-u

In [120]:

```
x = ['a', ['bb', ['ccc', 'ddd'], 'ee', 'ff'], 'g', ['hh', 'ii'], 'j']
print(x)
```

```
['a', ['bb', ['ccc', 'ddd'], 'ee', 'ff'], 'g', ['hh', 'ii'], 'j']
```



In [121]:

```
print(x[2]) # element na indexu 2 je preprosti string dolžine 1 črke
```

```
g
```

In [122]:

```
print(x[1]) # 1 element je nov list z 4 elementi
```

```
['bb', ['ccc', 'ddd'], 'ee', 'ff']
```

In [123]:

```
print(x[1][0]) # da pridemo do njihovih elementov preprosto dodamo nov []
```

```
bb
```

In [124]:

```
print(x[1][1])
print(x[1][1][0])
```

```
['ccc', 'ddd']
ccc
```

Lists Are Mutable

To pomeni, da jih lahko spreminjamo. Lahko dodajamo elemente, jih brišemo, premikamo vrstni red, itd..

> Most of the data types you have encountered so far have been atomic types. Integer or float objects, for example, are primitive units that can't be further broken down. These types are immutable, meaning that they can't be changed once they have been assigned. It doesn't make much sense to think of changing the value of an integer. If you want a different integer, you just assign a different one.

> By contrast, the string type is a composite type. Strings are reducible to smaller parts—the component characters. It might make sense to think of changing the characters in a string. But you can't. In Python, strings are also immutable.

Spreminjanje vrednosti elementa.

In [125]:

```
a  = ["pingvin", "medved", "los", "volk"]
print(a)

a[2] = "koza"
print(a)
```

```
['pingvin', 'medved', 'los', 'volk']
['pingvin', 'medved', 'koza', 'volk']
```

Brisanje elementa.

In [126]:

```
a  = ["pingvin", "medved", "los", "volk"]
del a[3]
print(a)
```

```
['pingvin', 'medved', 'los']
```

Spreminjanje večih elementov naenkrat.

Velikost dodanih elementov ni potrebno, da je ista kot velikost zamenjanih elementov. Python bo povečal oziroma zmanjšal list po potrebi.

In [127]:

```
a  = ["pingvin", "medved", "los", "volk"]
print(a)

a  = ["pingvin", "medved", "los", "volk"]
a[1:3] = [1.1, 2.2, 3.3, 4.4, 5.5]
print(a)

a  = ["pingvin", "medved", "los", "volk"]
a[1:4] = ['krava']
print(a)

a  = ["pingvin", "medved", "los", "volk"]
a[1:3] = [] # slicane elemente zamenjamo z praznim listom -> jih izbrišemo
print(a)
```

```
['pingvin', 'medved', 'los', 'volk']
['pingvin', 1.1, 2.2, 3.3, 4.4, 5.5, 'volk']
['pingvin', 'krava']
['pingvin', 'volk']
```

List funkcije

Dodajanje elementov.

Lahko dodajamo vrednosti s pomočjo .append() funkcije

In [128]:

```
a  = ["pingvin", "medved", "los", "volk"]
a.append(123)
print(a)
```

```
['pingvin', 'medved', 'los', 'volk', 123]
```

.append() doda celotno vrednost na konec lista.

In [129]:

```
a  = ["pingvin", "medved", "los", "volk"]
a.append([1, 2, 3])
print(a)
```

```
['pingvin', 'medved', 'los', 'volk', [1, 2, 3]]
```

Če želimo dodati vsako vrednost posebej lahko uporabimo .extend()

In [130]:

```
a  = ["pingvin", "medved", "los", "volk"]
a.extend([1, 2, 3])
print(a)
```

```
['pingvin', 'medved', 'los', 'volk', 1, 2, 3]
```

Dodajanje elementa na specifično mesto

```
a.insert(<index>, <obj>)
```

Element na mestu index zamenjamo z object.

In [131]:

```
a  = ["pingvin", "medved", "los", "volk"]
a.insert(3, 3.14159)
print(a)
```

```
['pingvin', 'medved', 'los', 3.14159, 'volk']
```

```
a.remove(<obj>)
```

Odstranimo object iz liste.

In [132]:

```
a  = ["pingvin", "medved", "los", "volk"]
a.remove("los")
print(a)
```

```
['pingvin', 'medved', 'volk']
```

```
    a.pop(index=-1)
```

Odstranimo element z indexa. Metoda nam vrne izbrisani element. Default pop je zadnji element.

In [133]:

```
a  = ["pingvin", "medved", "los", "volk"]
default_pop = a.pop()
naslednji_pop = a.pop(1)

print(a)
print(default_pop)
print(naslednji_pop)
```

```
['pingvin', 'los']
volk
medved
```

Lists Are Dynamic

Dynamic pove, da ni treba na začetku definirat, da bo to list.

In [134]:

```
a  = ["pingvin", "medved", "los", "volk"]
print(a)
print(type(a))

a = 1
print(a)
print(type(a))
```

```
['pingvin', 'medved', 'los', 'volk']
<class 'list'>
1
<class 'int'>
```

In [ ]:

In [ ]:

Vaja 01

Naloga: Iz sledečega list-a pridobite vrednost **ffff**

```
our_list = ["a", ["bb", "cc"], "d", [["eee"], ["ffff"], "ggg"]]
```

In [ ]:

```

```

In [ ]:

```

```

Vaja 02

Naloga: Pri sledečem list-u začnite z vrednostjo 4 in vzemite vsako 3 vrednost.

```
our_list = [1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20]

Rešitev:
[4, 7, 10, 13, 16, 19]
```

In [ ]:

```

```

In [ ]:

```

```

In [ ]:

```

```

Tuples

Imajo enake lastnosti kot list, vendar so "immutable" - Njihovih vrednosti ne moremo spreminjati.

Definira se jih z navadnimi oklepaji ()

In [135]:

```
t  = ("pingvin", "medved", "los", "volk")
print(t)
```

```
('pingvin', 'medved', 'los', 'volk')
```

In [136]:

```
# Primer: Touples are ordered
t  = ("pingvin", "medved", "los", "volk")
t2  = ("pingvin", "volk", "medved", "los")

if t == t2:
    print("Touples are NOT ordered")
else:
    print("Touples ARE ordered")
```

```
Touples ARE ordered
```

In [137]:

```
# Primer: Touples can contain any arbitrary object
t  = ("pingvin", "medved", "los", "volk", 1.23, True)
print(t)
```

```
('pingvin', 'medved', 'los', 'volk', 1.23, True)
```

In [138]:

```
# Primer: Touples are indexed
t  = ("pingvin", "medved", "los", "volk")
print(t)

print(t[2]) # primer, da so elementi indexirani

print(t[1:3]) # slicing primer
```

```
('pingvin', 'medved', 'los', 'volk')
los
('medved', 'los')
```

In [139]:

```
# Primer: Touples can be nested
t  = ("pingvin", "medved", "los", "volk", ("lisica", "krava"))
print(t)
```

```
('pingvin', 'medved', 'los', 'volk', ('lisica', 'krava'))
```

In [140]:

```
# Primer: Touples are IMMUTABLE
t = ("pingvin", "medved", "los", "volk")
t[1] = "Bork!"
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
<ipython-input-140-1f7dd710d595> in <module>
      1 # Primer: Touples are IMMUTABLE
      2 t = ("pingvin", "medved", "los", "volk")
----> 3 t[1] = "Bork!"

TypeError: 'tuple' object does not support item assignment
```

In [141]:

```
# Primer: da je dinamična
t  = ("pingvin", "medved", "los", "volk")
print(t)
print(type(t))

t = 2
print(t)
print(type(t))
```

```
('pingvin', 'medved', 'los', 'volk')
<class 'tuple'>
2
<class 'int'>
```

Zakaj bi uporabljali touple namesto list?

- Program je hitrejši, če manipulira z touple kot pa z list
- Če ne želimo spreminjati elementov

TECHNICAL

Treba pazit kadar inicializiramo touple samo z eno vrednostjo.

In [142]:

```
t = (1,2,3,4) # nebi smel bit problem
print(t)
print(type(t))
print()

t = () # nebi smel bit problem. Prazen touple
print(t)
print(type(t))
print()

t = (2) # kle nastane problem
print(t)
print(type(t))
print()
'''
Since parentheses are also used to define operator precedence in expressions, Python evalua
the expression (2) as simply the integer 2 and creates an int object. To tell Python that y
to define a singleton tuple, include a trailing comma (,) just before the closing parenthes
'''

t = (2,)
print(t)
print(type(t))
```

```
(1, 2, 3, 4)
<class 'tuple'>

()
<class 'tuple'>

2
<class 'int'>

(2,)
<class 'tuple'>
```

In [ ]:

Vaja

Naloga: Iz sledečega tuple pridobite vrednost **cc**

```
our_tuple = ("a", ["bb", "cc"], "d", [("eee"), ["ffff"], "ggg"])
```

Vaja

Naloga: Pri sledečem tuple vzemite zadnjih 5 vrednosti.

```
our_tuple = (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20)

Rešitev:
(16, 17, 18, 19, 20)
```

In [ ]:

```

```

Dictionaries

Njihove lastnosti so sledeče:

- Are insertion ordered (vrstni red elementov je odvisen od vrstega reda dodajanja) (to velja od python 3.6+)
- Element accession (do elementov se dostopa preko ključev, ne preko indexov)
- Can be nested (kot element ima lahko še en dictionary, list, touple, ...)
- Are mutable (vrednosti elementov se lahko spreminjajo)
- Are dynamic (sej to velja za vse pr pythonu)

Dictionary je sestavljen iz parov ključa in vrednosti. Vsak Ključ ima svojo vrednost.

In [96]:

```
d = {
'macek' : 'Silvestre',
'pes'   : 'Fido',
'papagaj': 'Kakadu'
}
print(d)
print(type(d))
```

```
{'macek': 'Silvestre', 'pes': 'Fido', 'papagaj': 'Kakadu'}
<class 'dict'>
```

In [97]:

```
# Primer: Can contain any arbitrary objects
d = {
'macek' : 1,
'pes'   : 'Fido',
'papagaj': False
}
print(d)
```

```
{'macek': 1, 'pes': 'Fido', 'papagaj': False}
```

Accessing dictionary value

Vrednosti najdemo preko ključev.

In [145]:

```
d = {
'macek' : 'Silvestre',
'pes'   : 'Fido',
'papagaj': 'Kakadu'
}
print(d['papagaj'])
```

```
Kakadu
```

Če vpišemo ključ, ki ne obstaja python vrne napako.

In [146]:

```
d = {
'macek' : 'Silvestre',
'pes'   : 'Fido',
'papagaj': 'Kakadu'
}
d['koza'] # should give KeyError
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-146-91bc34ee01c4> in <module>
      4 'papagaj': 'Kakadu'
      5 }
----> 6 d['koza'] # should give KeyError

KeyError: 'koza'
```

Dodajanje novih vrednosti

In [149]:

```
d = {
'macek' : 'Silvestre',
'pes'   : 'Fido',
'papagaj': 'Kakadu'
}
d['koza'] = "Micka"
print(d)
```

```
{'macek': 'Silvestre', 'pes': 'Fido', 'papagaj': 'Kakadu', 'koza': 'Micka'}
```

Posodabljanje vrednosti.

In [150]:

```
d['koza'] = 'Helga'
print(d)
```

```
{'macek': 'Silvestre', 'pes': 'Fido', 'papagaj': 'Kakadu', 'koza': 'Helga'}
```

Brisanje elementa.

In [151]:

```
del d['koza']
print(d)
```

```
{'macek': 'Silvestre', 'pes': 'Fido', 'papagaj': 'Kakadu'}
```

Restrictions on dictionary keys

Kot Ključ lahko uporabimo poljubne vrednosti, dokler so "immutable". Sm spadajo integer, float, string, boolean, touple.

Touple je lahko ključ le, če so elementi znotraj njega tudi "immutable" (strings, integers, floats,...).

In [100]:

```
d = {1: 'a',
     2.3: 'b',
     "string": 'c',
     None: 'd',
     (1,"touple"):'e',
    }
print(d)
print(d[2.3])
print(d[None])
print(d[(1, "touple")])
# PAZI: Če daš True namest None bo narobe deloval. Pomojm tretira 1 kt True pa se mu zmeša
# Sej keywords dajat sm je nesmiselno
```

```
{1: 'a', 2.3: 'b', 'string': 'c', None: 'd', (1, 'touple'): 'e'}
b
d
e
```

In [103]:

```
# Primer: Vrže error, ker hočemo kot ključ uporabiti list, ki pa je mutable
d = {[1,1]: 'a', [1,2]: 'b'}
d = {(1,2,[1,2]): "f",}
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
<ipython-input-103-f98311767e81> in <module>
      1 # Primer: Vrže error, ker hočemo kot ključ uporabiti list, ki pa je
 mutable
----> 2 d = {[1,1]: 'a', [1,2]: 'b'}
      3 d = {(1,2,[1,2]): "f",}

TypeError: unhashable type: 'list'
```

Technical Note:

Why does the error message say “unhashable” rather than “mutable”? Python uses hash values internally to implement dictionary keys, so an object must be hashable to be used as a key.

[https://docs.python.org/3/glossary.html#term-hashable (https://docs.python.org/3/glossary.html#term-hashable)](https://docs.python.org/3/glossary.html#term-hashable)

> An object is hashable if it has a hash value which never changes during its lifetime (it needs a **hash**() method), and can be compared to other objects (it needs an **eq**() method). Hashable objects which compare equal must have the same hash value.

> Hashability makes an object usable as a dictionary key and a set member, because these data structures use the hash value internally.

> All of Python’s immutable built-in objects are hashable; mutable containers (such as lists or dictionaries) are not. Objects which are instances of user-defined classes are hashable by default. They all compare unequal (except with themselves), and their hash value is derived from their id().

AMPAK

Ključ more bit edinstven (se ne sme ponovit):

In [104]:

```
d = {
'macek' : 'Silvestre',
'pes'   : 'Fido',
'papagaj': 'Kakadu',
'macek' : 'Amadeus'
}
print(d)
```

```
{'macek': 'Amadeus', 'pes': 'Fido', 'papagaj': 'Kakadu'}
```

Built-in Dictionary Methods

Še nekaj ostalih metod.

```
d.clear()
```

d.clear() empties dictionary d of all key-value pairs:

In [155]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(d)

d.clear()
print(d)
```

```
{'a': 10, 'b': 20, 'c': 30}
{}
```

```
d.get(<key>[, <default>])
```

get() metoda nam nudi preprost način kako dobimo vrednost ključa brez, da preverimo, če ključ sploh obstaja.

Če ključ ne obstaja dobimo None

In [156]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(d.get('b'))
print(d.get('z'))
```

```
20
None
```

Če ključ ni najden in smo specificirali dodaten argument nam vrne le tega namesto None.

In [157]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(d.get('z', -5))
```

```
-5
```

```
    d.items()
```

Vrne nam list sestavljen iz touple, ki so sestavljeni iz ključ-vrednost parov. Prvi element toupla je ključ, drugi je vrednost.

In [158]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(list(d.items()))
print(list(d.items())[1])
print(list(d.items())[1][1])
```

```
[('a', 10), ('b', 20), ('c', 30)]
('b', 20)
20
```

```
    d.keys()
```

Vrne nam list ključev.

In [159]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(list(d.keys()))
```

```
['a', 'b', 'c']
```

```
    d.values()
```

Vrne nam list vrednosti.

In [160]:

```
d = {'a': 10, 'b': 10, 'c': 10}
print(list(d.values()))
```

```
[10, 10, 10]
```

```
d.pop(<key>[, <default>])
```

Če ključ obstaja v dictionary ga odstrani skupaj z njegovo vrednostjo.

In [161]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(d.pop('b'))
print(d)
```

```
20
{'a': 10, 'c': 30}
```

Če ne najde ključa nam vrne napako.

In [162]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(d.pop('z'))
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-162-f36d736a326b> in <module>
      1 d = {'a': 10, 'b': 20, 'c': 30}
----> 2 print(d.pop('z'))

KeyError: 'z'
```

Če ključ ni najden, smo pa dodatno specificirali default argument, potem nam vrne vrednost default argumenta in ne dvigne nobene napake.

In [163]:

```
d = {'a': 10, 'b': 20, 'c': 30}
print(d.pop('z', "Ni našlo ključa"))
```

```
Ni našlo ključa
```

```
d.popitem()
```

Odstrani random, arbitrarni ključ-vrednost par in nam ga vrne kot touple.

> popitem() is useful to destructively iterate over a dictionary, as often used in set algorithms

In [164]:

```
d = {'a': 10, 'b': 20, 'c': 30, 'd': 40, 'e': 50, 'f': 60, 'g': 70}
print(d.popitem())
print(d)
```

```
('g', 70)
{'a': 10, 'b': 20, 'c': 30, 'd': 40, 'e': 50, 'f': 60}
```

Če je dictionary prazen dobimo KeyError error.

In [165]:

```
d = {}
d.popitem()
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-165-3d5a99fd0340> in <module>
      1 d = {}
----> 2 d.popitem()

KeyError: 'popitem(): dictionary is empty'
```

In [166]:

```
# Primer: Da je dictionary dinamičen
d = {'a': 10, 'b': 20, 'c': 30, 'd': 40, 'e': 50, 'f': 60, 'g': 70}
print(d)
print(type(d))

d = 1.2
print(d)
print(type(d))
```

```
{'a': 10, 'b': 20, 'c': 30, 'd': 40, 'e': 50, 'f': 60, 'g': 70}
<class 'dict'>
1.2
<class 'float'>
```

In [ ]:

```

```

In [ ]:

```
dict_ = {
    "a": 1,
    "b": 2,
    "c": 3,
    "d": 4
}
```

Vaja 03

Naloga: Sledečemu dictionary zamenjanjte vrednost pod ključem **b** v vrednost 12 in odstranite vrednost pod ključem **d**.

```
our_dict = {
    "a": 10,
    "b": 9,
    "c": 8,
    "d": 7,
    "e": 3
}
```

In [ ]:

In [ ]:

Vaja 04

Naloga: Iz sledečega dictionary pridobite vrednost **fff**.

```
d = {
    "a": "a",
    "b": "b",
    "c": {
        1: 11,
        2: 22,
        3: 33,
        4: {
            5: "ccc",
            6: "ddd",
            "7": "fff"
        }
    }
}
```

In [ ]:

In [ ]:

Sets

(Množice)

Ta data-tip je prav tako kolekcija elementov, ampak nad set-i se da izvajati posebne operacije.

Lastnosti

- Sets are unordered
- Set elements are unique. Duplicate elements are not allowed
- A set itself may be modified, but the elements must be of type immutable.
- Sets do not support indexing, slicing, or other sequence-like behavior. (Če hočš pridt do specifičnega elementa lahko uporabiš for _ in set:)

In [113]:

```
s = {"medved", "zajec", "volk", "slon", "zajec"} # zajec se ne ponovi ampak je samo 1x izpi
print(s)
print(type(s))
```

```
{'volk', 'slon', 'zajec', 'medved'}
<class 'set'>
```

Set je lahko prazen ampak Python bo {} prebral kot prazen dictionary.

Edini način, da ustvarimo prazen set je z set().

In [168]:

```
s = {}
print(type(s))

s = set()
print(type(s))
```

```
<class 'dict'>
<class 'set'>
```

Elementi so lahko poljubni ampak morajo biti "immutable."

In [114]:

```
s = {42, 'eee', (1, 2, 3), 3.14159} # touple je lahko element, ker je immutable
print(s)
```

```
{3.14159, 42, 'eee', (1, 2, 3)}
```

In [115]:

```
s = {11, [1, 2, 3], 'eeee'} # list ne more bit element, ker je mutable
print(x)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
<ipython-input-115-d32f290234c5> in <module>
----> 1 s = {11, [1, 2, 3], 'eeee'} # list ne more bit element, ker je mutab
le
      2 print(x)

TypeError: unhashable type: 'list'
```

In [170]:

```
# Primer: Can be nested
s = {42, 'eee', (1, 2, (4, 5, 6)), 3.14159}
print(s)
```

```
{42, 3.14159, (1, 2, (4, 5, 6)), 'eee'}
```

Operating on a Set

Nad set-i je možno izvajanje posebnih operacij.

Večina jih je lahko zapisana na dva načina: z metodo ali z operatorjem.

Union

Vsebuje elemente iz obeh set-ov.

In [171]:

```
x1 = {1, 2, 3, 4}
x2 = {4, 5, 6, 7}
print(x1 | x2) # operator
print(x1.union(x2)) # metoda
# Element 4 je samo enkrat, ker se elementi v set-ih ne ponavljajo
```

```
{1, 2, 3, 4, 5, 6, 7}
{1, 2, 3, 4, 5, 6, 7}
```

Razlika med operatorjem in metodo je, da operator zahteva, da sta obe spremenljivki set, medtem ko metoda uzeme kot argument poljuben "iterable".

In [172]:

```
print(x1.union(list(x2)))
print(x1 | list(x2)) # this one should throw error
```

```
{1, 2, 3, 4, 5, 6, 7}

---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
<ipython-input-172-ea3a52617f77> in <module>
      1 print(x1.union(list(x2)))
----> 2 print(x1 | list(x2)) # this one should throw error

TypeError: unsupported operand type(s) for |: 'set' and 'list'
```

Ali z operatorjem ali z metodo lahko specificiramo večje število set-ov.

In [173]:

```
x1 = {1, 2, 3, 4}
x2 = {4, 5}
x3 = {5, 6}
x4 = {9, 10}

print(x1.union(x2, x3, x4))

print(x1 | x2 | x3 | x4)
```

```
{1, 2, 3, 4, 5, 6, 9, 10}
{1, 2, 3, 4, 5, 6, 9, 10}
```

Intersection

Vrne set z elementi skupni obema set-oma.

In [174]:

```
x1 = {1, 2, 3, 4}
x2 = {4, 5, 6, 7}

print(x1.intersection(x2))
print(x1 & x2)
```

```
{4}
{4}
```

Difference

Vrne set z elementi, ki so v x1 in ne v x2.

In [175]:

```
x1 = {1, 2, 3, 4}
x2 = {4, 5, 6, 7}

print(x1.difference(x2))
print(x1 - x2)
```

```
{1, 2, 3}
{1, 2, 3}
```

Symetric Difference

Vrne set z elementi, ki so ali v prvem ali v drugem set-u, vendar ne v obeh.

In [176]:

```
x1 = {1, 2, 3, 4}
x2 = {4, 5, 6, 7}

print(x1.symmetric_difference(x2))
print(x1 ^ x2)
```

```
{1, 2, 3, 5, 6, 7}
{1, 2, 3, 5, 6, 7}
```

Modifying Sets

Set-e lahko tudi spreminjamo.

```
    x.add(<elem>) adds <elem>, which must be a single immutable object, to x:
```

In [177]:

```
x = {1, 2, 3, 4}
x.add("string")
print(x)
```

```
{1, 2, 3, 4, 'string'}
```

```
    x.remove(<elem>) removes <elem> from x. Python raises an exception if <elem> is no
    t in x:
```

In [178]:

```
x = {1, 2, 3, 4}
print(x.remove(3))
print(x)
```

```
None
{1, 2, 4}
```

In [179]:

```
x = {1, 2, 3, 4}
x.remove(6) # gives error
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-179-4f450e54381b> in <module>
      1 x = {1, 2, 3, 4}
----> 2 x.remove(6) # gives error

KeyError: 6
```

    x.discard(<elem>) also removes <elem> from x. However, if <elem> is not in x, this
    method quietly does nothing instead of raising an exception:

In [180]:

```
x = {1, 2, 3, 4}
print(x.discard(2))
print(x)
```

```
None
{1, 3, 4}
```

In [181]:

```
x = {1, 2, 3, 4}
x.discard(6) # doesnt give error
print(x)
```

```
{1, 2, 3, 4}
```

 python
x.pop() removes and returns an arbitrarily chosen element from x. If x is empty, x.pop()
raises an exception:

In [182]:

```
x = {1, 2, 3, 4}
print("First pop: ", x.pop())
print(x)

print("Second pop: ",x.pop())
print(x)

print("Third pop: ", x.pop())
print(x)

print("Fourth pop: ",x.pop())
print(x)

print("Fourth pop: ",x.pop()) #this one should give error
print(x)
```

```
First pop:  1
{2, 3, 4}
Second pop:  2
{3, 4}
Third pop:  3
{4}
Fourth pop:  4
set()

---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-182-594f9b06ae7d> in <module>
     12 print(x)
     13 
---> 14 print("Fourth pop: ",x.pop()) #this one should give error
     15 print(x)

KeyError: 'pop from an empty set'
```

```
    x.clear() removes all elements from x
```

In [183]:

```
x = {1, 2, 3, 4}
print(x)
x.clear()
print(x)
```

```
{1, 2, 3, 4}
set()
```

Frozen sets

Python ima tudi frozenset, ki se obnaša isto kot set, le da je frozenset immutable.

In [184]:

```
x = frozenset([1, 2, 3, 4])
print(x | {9, 8, 7}) # you can perform non-modifying operations on frozensets
x.add(100) # should give error, because frozenset is immutable
```

```
frozenset({1, 2, 3, 4, 7, 8, 9})

---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-184-769f87059d2e> in <module>
      1 x = frozenset([1, 2, 3, 4])
      2 print(x | {9, 8, 7}) # you can perform non-modifying operations on f
rozensets
----> 3 x.add(100) # should give error, because frozenset is immutable

AttributeError: 'frozenset' object has no attribute 'add'
```

Vaja 05

Naloga: Iz sledečega lista odstranite vrednost, ki se nahaja na indexu 4. Vrednost dodajte v dictionary pod ključ **d**.

Nato iz dictionary pridobite vse vrednosti. Te vrednosti shranite v nov set in novonastali set primerjajte ali je enak podanemu set-u.

```
our_list = [1,2,3,4,5,6,7]
our_dict = {
    "a": 2,
    "b": 5,
    "c": 8,
    "d": 12,
    "e": 357,
    "f": 12
}
our_set = {357, 12, 12, 8, 5, 2, 2}
```

In [ ]:

```
```

In [ ]:

```
```

Vaja 06

Naloga: Izpišite vse skupne črke sledečih dveh stringov.

```
str1 = "Danes je lep dan"
str2 = "Jutri bo deževalo"

OUTPUT:
{' ', 'a', 'd', 'e', 'l'}
```

In [ ]:

```

```

In [ ]:

```

```

In [ ]:

```

```