



# Язык Python

Евгений Борисов

# Python: реализации языка

**Cpython**

**Cythone**

**Jython (Java)**

**IronPython (.NET)**

**PyPy (compiler)**



**IronPython**



# Python: дистрибутивы



**CPython**

**Anaconda (Miniconda)**



# Python: IDE

**iPython / Jupyter**

**PyCharm**

**Visual Studio Code**

**Eclipse + PyDev**

**Vim**

**Apache Zeppelin**



**IP[y]:**

 **VS Code**



 **eclipse**



Apache Zeppelin

# Python: про версии

**CPython — стандарт де-факто**

**2.7 vs 3.8**

**PEP (Python Enhancement Proposals)  
предложения по улучшению Python**

**PEP 8: руководство по написанию кода**

# **Python: что почитать?**

**SoloLearn : Python**

**Python Help : Tutorial**

**Sebastian Raschka Python Machine Learning**

# Python: типы данных

**Логические**

**Списки**

**Числовые**

**Множества**

**Строки**

**Словари**

**None**

# Python: тип данных логический

**Boolean Type:**

**True**

**False**



# Python: типы данных числовые

## Numeric Type:

**int – целое число**

**7**

**float – число с плавающей точкой**

**7.5, 75e-1**

# Python: тип данных строки

## Text Sequence Type

`'привет'`

`"медвед"`

`'''превед  
Медвед'''`

# Python: типы данных списки

## Sequence Type:

**list – список**

**[ 1, 2, 'a', [ 4,'a', 5,] , ]**

**tuple – кортеж**

**( 1, 2, 'a', )**

# Python: типы данных множества

## Set Types:

**set – множество**

**set([1,2,2,3,4,2,3,4]) → {1,2,3,4}**

**frozenset – неизменяемое множество**

# Python: типы данных словарь

**Mapping Types:**

**dict – словарь**

**{'a':1, 'b':2, 'zzz':7,}**

# Python: изменяемые типы данных

**всё есть объекты**

**присваивание создаёт новый объект**

**immutable:**

int float bool string tuple frozenset

**mutable:**

list dict set

# Python: операции

**Операции с данными:  
арифметические, логические,  
строковые, битовые**

**управление**

**ЦИКЛЫ**

**ВВОД / ВЫВОД**

# Python: операции с данными

## присваивание, арифметика и сравнения

`a,b = 1,2`

`a,b = b,a`

`a = 10`

`a += 7`

`a / b`

`a // 3`

`a % 3`

`a - b`

`a + b`

`a * b`

`a**2`

`a<10`

`b<=7`

`a>2`

`a!=b`

`a==1`



# Python: операции с данными

## ЛОГИЧЕСКИЕ

```
a = True  
b = False
```

```
a or b  
a and b  
not b
```

# Python: операции с данными

## БИТОВЫЕ

`a = 255`

`b = 7`

`a^b`

`a&b`

`a|b`

`a>>3`

# Python: операции с данными

## строковые

`s = 'abc'`

`s*3 → 'abccabccabc'`

`s + 'dmr' → 'abccdmr'`

# Python: операции управления

```
if not x:  
    print('x')  
elif y:  
    print('y')  
else:  
    print('z')
```

# Python: цикл while

```
i=0
while i<5:
    print(i)
    i+=1
```

```
i=0
while i<5:
    i+=1
    if i<3:
        continue
    print(i)
```

```
i=0
while True:
    print(i)
    i+=1
    if i>5:
        break
```

## Python: цикл for

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

## Python: списки (list)

```
s=[1,7,3,4,['a','b']]
```

```
s.append(9)
```

```
s=[1,5,3,4,]
```

```
s.insert(5,'a')
```

```
len(s)    sorted(s)
```

```
s.index(2)
```

```
s[2]  s[2:]  s[2:4]
```

```
2 in s
```

```
s = list(range(10))
```

```
s = [ i/2 for i in range(10) if i!=3 ]
```

# Python: кортежи (tuple)

```
c = (1,2,3,5)
```



# Python: словари (dict)

```
d = { 'a':1, 'b':44, 'c':45, 'cvc':-1, }
```

```
d['c']→ 45
```

```
d.keys()    d.values()
```

# Python: множества (set)

```
s = set([1,2,3,1,3,4,5])
```

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

```
s[2] → error
```

операции: & | -

# Python: менеджер контекстов (with)

```
with open('temp.txt','r') as f:  
    x = f.read()
```

```
with open('temp.txt','r') as f:  
    x = [ s for s in f.read().split('\n') if s ]
```

# Python: функции

```
def myfunc(x,y=1):  
    print(x)  
    return x+1,y/2
```

```
a,b = myfunc(y=5,x=-1)
```

# Python: итераторы

объект перечислитель

реализует навигацию по элементам другого объекта

выдаёт следующий элемент `__next__()`

если элементов больше нет  
то бросает исключение

```
s='abcdef'
it_s = iter(s)
it_s.__next__()
for c in it_s:
    print(c)
```

```
s='abcdef'
for c in s:
    print(c)
```

# Python: генераторы

генерирует последовательность

```
def ones(n):  
    while n > 0:  
        n -= 1  
        yield 1
```

```
for o in ones(4):  
    print(o)
```

# Python: функциональное программирование

```
squares = map(lambda x: x * x, [0, 1, 2, 3, 4])
```

```
sum = reduce(lambda a, x: a + x, [0, 1, 2, 3, 4])
```

# Python: OOP

```
class Animal:
```

```
    def __init__(self, name, color):  
        self.name = name  
        self.color = color
```

```
class Dog(Wolf):
```

```
    def bark(self):  
        super().bark()  
        print("Woof!")  
    def __repr__(self):  
        return "Dog({})".format(self.name)
```

```
class Wolf(Animal):
```

```
    def bark(self):  
        print("Grr...!")
```



# Python: ООП декораторы

```
class Rectangle:
    def __init__(self, width, height):
        self.width = width
        self.height = height
        self._allowed = False
```

```
def calculate_area(self):
    return self.width * self.height
```

## **@classmethod**

```
def new_square(cls, side_length):
    return cls(side_length, side_length)
```

## **@staticmethod**

```
def square(a):
    return a**2
```

## **@property**

```
def allowed(self):
    return self._allowed
```

## **@allowed.setter**

```
def allowed(self, value):
    self._allowed = not(value)
```

```
sq = Rectangle.new_square(5)
```

```
print(sq.calculate_area())
```

```
# 25
```

```
sq.allowed=0
```

```
print(sq.allowed)
```

```
# True
```

```
print(Rectangle.square(4))
```

```
# 16
```

# Python: модули

```
import numpy as np
```

```
help(np)
```

```
np.__name__
```

```
np.__version__
```

```
from numpy.random import rand
```

# Python: менеджер пакетов pip

```
# pip search pep8
```

```
# pip install autopep8
```

```
# pip list
```

```
# pip uninstall autopep8
```

## Python: утилиты

# показывает места нарушения стиля  
**pep8** --first main.py

# определяет и исправляет нарушения стиля  
**autopep8** ./ --recursive --in-place -a

# форматирует комментарии  
**docformatter** --in-place example.py

# универсальная утилита приведения кода к PEP  
**pyformat**

# Python: Google Colab

<https://colab.research.google.com/>

The screenshot displays the Google Colaboratory (Colab) web interface. At the top, there's a navigation bar with the Colab logo, 'Welcome To Colaboratory', and a menu (File, Edit, View, Insert, Runtime, Tools, Help). On the right of the bar are icons for sharing, user profile, settings, and a green 'E' icon. Below the bar, a sidebar on the left contains a 'Table of contents' and a list of links: '<> Getting started', 'Data science', 'Machine learning', 'More Resources', 'Machine Learning Examples', and 'Section'. The main content area is titled 'What is Colaboratory?' and features the Colab logo. It explains that Colab allows writing and executing Python in a browser. A bulleted list highlights: 'Zero configuration required', 'Free access to GPUs', and 'Easy sharing'. A paragraph states that Colab can make work easier for students, data scientists, and AI researchers, with a link to 'Introduction to Colab'. A section titled 'Getting started' explains that the document is an interactive 'Colab notebook' and provides an example of a code cell. The code cell contains a Python script to calculate seconds in a day, showing the output '86400'. Below this, it explains how to execute code and edit cells. Another code cell shows calculating seconds in a week, with output '604800'. The page concludes by stating that Colab notebooks combine executable code, rich text, images, HTML, and LaTeX, and are stored in the user's Google Drive account. It provides a link to 'create a new Colab notebook'.

Welcome To Colaboratory  
File Edit View Insert Runtime Tools Help

Table of contents  
<> Getting started  
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+ Code + Text Copy to Drive

Connect Editing

## What is Colaboratory?

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. Watch [Introduction to Colab](#) to learn more, or just get started below!

### Getting started

The document you are reading is not a static web page, but an interactive environment called a **Colab notebook** that lets you write and execute code.

For example, here is a **code cell** with a short Python script that computes a value, stores it in a variable, and prints the result:

```
[ ] seconds_in_a_day = 24 * 60 * 60
seconds_in_a_day
```

86400

To execute the code in the above cell, select it with a click and then either press the play button to the left of the code, or use the keyboard shortcut "Command/Ctrl+Enter". To edit the code, just click the cell and start editing.

Variables that you define in one cell can later be used in other cells:

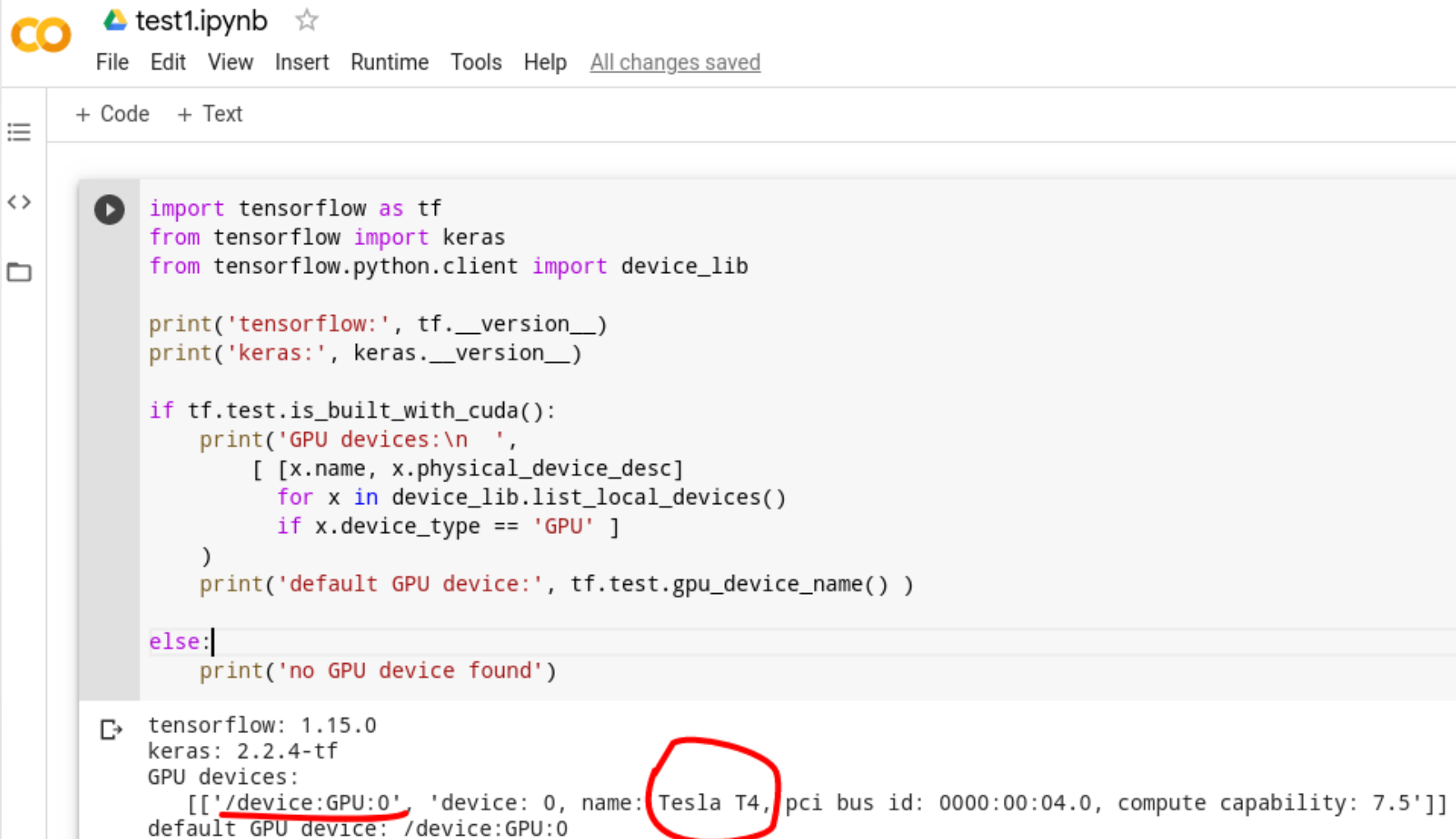
```
[ ] seconds_in_a_week = 7 * seconds_in_a_day
seconds_in_a_week
```

604800

Colab notebooks allow you to combine **executable code** and **rich text** in a single document, along with **images**, **HTML**, **LaTeX** and more. When you create your own Colab notebooks, they are stored in your Google Drive account. You can easily share your Colab notebooks with co-workers or friends, allowing them to comment on your notebooks or even edit them. To learn more, see [Overview of Colab](#). To create a new Colab notebook you can use the File menu above, or use the following link: [create a new Colab notebook](#).

# Python: Google Colab

<https://colab.research.google.com/>



The image shows a Google Colab notebook titled 'test1.ipynb'. The interface includes a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help', along with a status 'All changes saved'. Below the menu is a toolbar with '+ Code' and '+ Text' buttons. The main area contains a code cell with the following Python code:

```
import tensorflow as tf
from tensorflow import keras
from tensorflow.python.client import device_lib

print('tensorflow:', tf.__version__)
print('keras:', keras.__version__)

if tf.test.is_built_with_cuda():
    print('GPU devices:\n ',
          [ [x.name, x.physical_device_desc]
            for x in device_lib.list_local_devices()
            if x.device_type == 'GPU' ]
          )
    print('default GPU device:', tf.test.gpu_device_name() )
else:
    print('no GPU device found')
```

Below the code cell, the output is displayed:

```
tensorflow: 1.15.0
keras: 2.2.4-tf
GPU devices:
[['/device:GPU:0', 'device: 0, name: Tesla T4, pci bus id: 0000:00:04.0, compute capability: 7.5']]
default GPU device: /device:GPU:0
```

In the output, the string `['/device:GPU:0', 'device: 0, name: Tesla T4, pci bus id: 0000:00:04.0, compute capability: 7.5']` is enclosed in a red circle, highlighting the GPU information.

# Python: Yandex DataSphere

<https://cloud.yandex.ru/blog/posts/2020/05/datasphere>

The screenshot displays the Yandex DataSphere IDE interface. On the left, a file explorer shows a directory with files: `catboost_info`, `train_data.npy`, `train_labels.npy`, and `yadisk.token`. The main editor window, titled `test.ml`, contains a Python script for training a CatBoost classifier. The script includes imports for `CatBoostClassifier` and `numpy`, followed by loading the training data and labels, creating the classifier with `iterations=1000`, and fitting the model. The output shows the learning rate set to `0.003512` and a progress log for 30 iterations, displaying learning, total, and remaining times.

```
[1]: from catboost import CatBoostClassifier
import numpy as np

[3]: train_data = np.load('train_data.npy')
train_labels = np.load('train_labels.npy')

[5]: model = CatBoostClassifier(iterations=1000,
                                task_type="CPU",
                                devices='0:1')

[6]: model.fit(train_data, train_labels, verbose=True)

Learning rate set to 0.003512
0:   learn: 0.6906569   total: 49.8ms   remaining: 49.7s
1:   learn: 0.6881785   total: 50.1ms   remaining: 25s
2:   learn: 0.6871994   total: 50.2ms   remaining: 16.7s
3:   learn: 0.6864504   total: 50.3ms   remaining: 12.5s
4:   learn: 0.6839919   total: 50.4ms   remaining: 10s
5:   learn: 0.6815451   total: 50.5ms   remaining: 8.37s
6:   learn: 0.6791099   total: 50.6ms   remaining: 7.18s
7:   learn: 0.6783759   total: 50.7ms   remaining: 6.29s
8:   learn: 0.6776453   total: 50.8ms   remaining: 5.59s
9:   learn: 0.6757266   total: 50.9ms   remaining: 5.04s
10:  learn: 0.6733133   total: 51ms     remaining: 4.58s
11:  learn: 0.6723679   total: 51.1ms   remaining: 4.21s
12:  learn: 0.6704690   total: 51.2ms   remaining: 3.89s
13:  learn: 0.6685772   total: 51.3ms   remaining: 3.61s
14:  learn: 0.6661971   total: 51.4ms   remaining: 3.38s
15:  learn: 0.6633391   total: 51.5ms   remaining: 3.17s
16:  learn: 0.6609833   total: 51.6ms   remaining: 2.98s
17:  learn: 0.6586417   total: 51.7ms   remaining: 2.82s
18:  learn: 0.6567942   total: 51.8ms   remaining: 2.68s
19:  learn: 0.6549535   total: 51.9ms   remaining: 2.54s
20:  learn: 0.6521563   total: 52ms     remaining: 2.42s
21:  learn: 0.6503330   total: 52.1ms   remaining: 2.32s
22:  learn: 0.6494321   total: 52.2ms   remaining: 2.22s
23:  learn: 0.6471437   total: 52.3ms   remaining: 2.13s
24:  learn: 0.6464625   total: 52.4ms   remaining: 2.04s
25:  learn: 0.6446604   total: 52.5ms   remaining: 1.97s
26:  learn: 0.6428651   total: 52.6ms   remaining: 1.9s
27:  learn: 0.6410765   total: 52.7ms   remaining: 1.83s
28:  learn: 0.6404061   total: 52.8ms   remaining: 1.77s
29:  learn: 0.6381544   total: 52.9ms   remaining: 1.71s
30:  learn: 0.6359178   total: 53ms     remaining: 1.66s
```

<https://habr.com/ru/article/565086/>

# Python

**В сети появился курс по Python от Агентства нацбезопасности США**

<https://dev.by/news/v-seti-poyavilsya-kurs-po-python-ot-anb>

<https://nsa.sfo2.digitaloceanspaces.com/comp3321.pdf>

Doc ID: 6689691

(U)

## Instructor Notes

Updated about 2 years ago by [redacted] in [COMP 3321](#)

python fese

(U//FOUO) Instructor notes for COMP 3321.

Recommendations

### ~~UNCLASSIFIED//FOR OFFICIAL USE ONLY~~

(U) So, you're teaching the Python class. What have you gotten yourself into? You should probably take a few moments (or possibly a few days) to reconsider the life choices that have put you in this position.

### (U) Course Structure

(U) As mentioned in the [introduction](#), this course is designed for flexibility. When taught in a classroom setting, a single lesson or module can be covered in a session that lasts between 45 and 90 minutes, depending on the topics to be covered. The standard way to structure the course is as a full-time, two week block. During the first week, the ten lessons are covered with morning and afternoon lectures. During the second week, up to ten modules are covered in a similar manner, as needed or requested by the students in the class. (If the class needs are not known, take a vote). During the first few days of class, students should choose a project to work on. On the last day, students should report back on their progress and, if possible, demonstrate their work. Instructors should be available outside of lectures to assist students with exercises and projects.

(U) The two week block is not the only way of teaching the course. The material could be presented at a more leisurely pace, for instance during a weekly brown bag lunch that continues for several months. Alternatively, if students are already prepared (or willing to do some of the initial lessons in a self-study manner), a great deal can be accomplished in a two or three day workshop. For instance, if all students already have a basic knowledge of Python, they might well start with the lessons on [tooling](#) and [writing modules and packages](#), then move on to cover various modules of interest.

Approved for Release by NSA on 12-02-2019, FOIA Case # 108165



# Python: упражнения numpy

<https://github.com/rougier/numpy-100>

## 100 numpy exercises

This is a collection of exercises that have been collected in the numpy mailing list, on stack overflow and in the numpy documentation. The goal of this collection is to offer a quick reference for both old and new users but also to provide a set of exercises for those who teach.

If you find an error or think you've a better way to solve some of them, feel free to open an issue at <https://github.com/rougier/numpy-100>.

File automatically generated. See the documentation to update questions/answers/hints programmatically.

Run the `initialize.py` module, then for each question you can query the answer or an hint with `hint(n)` or `answer(n)` for `n` question number.

```
In [ ]: %run initialise.py
```

# Python: упражнения pandas

<https://github.com/ajcr/100-pandas-puzzles/>

## 100 pandas puzzles

Inspired by [100 Numpy exercises](#), here are 100\* short puzzles for testing your knowledge of [pandas](#)' power.

Since pandas is a large library with many different specialist features and functions, these exercises focus mainly on the fundamentals of manipulating data (indexing, grouping, aggregating, cleaning), making use of the core DataFrame and Series objects.

Many of the exercises here are stright-forward in that the solutions require no more than a few lines of code (in pandas or NumPy... don't go using pure Python or Cython!). Choosing the right methods and following best practices is the underlying goal.

The exercises are loosely divided in sections. Each section has a difficulty rating; these ratings are subjective, of course, but should be seen as a rough guide as to how inventive the required solution is.

If you're just starting out with pandas and you are looking for some other resources, the official documentation is very extensive. In particular, some good places get a broader overview of pandas are...

- [10 minutes to pandas](#)
- [pandas basics](#)
- [tutorials](#)
- [cookbook and idioms](#)

# Python: virtualenv

**проблема:** пакеты определённых версий могут быть несовместимы между собой

**решение:** виртуальные python-среды

позволяет работать с несколькими версиями python

держат одновременно несколько наборов пакетов разных версий

```
# pip install virtualenv
```

```
# mkdir /home/user/python3.8_env
```

```
# virtualenv -p python3.8 python3.8_env
```

```
# source /home/user/python3.8_env/bin/activate
```

# Python: что почитать?

<http://www.sololearn.com/Course/Python/>

[http://github.com/mechanoid5/ml\\_lectorium](http://github.com/mechanoid5/ml_lectorium)

Дейтел П., Дейтел Х. Python: Искусственный интеллект, большие данные и облачные вычисления (2020)