

2. Standart tools

April 22, 2020

1

1.1 ,,

2:

1. - , .

2. -, ' .

```
[1]: class MyList
      pass
```

```
File "<ipython-input-1-58ebc4a76c75>", line 1
class MyList
      ^
```

SyntaxError: invalid syntax

```
[3]: print('test')
      class MyList
      pass
```

```
File "<ipython-input-3-44e051ec0c14>", line 2
class MyList
      ^
```

SyntaxError: invalid syntax

```
:
```

TypeError - , .

```
[4]: class EvenLengthMixin:
      def even_length(self):
          return len(self) % 2 == 0

      class MyList(list, EvenLengthMixin):
          pass

      ml = MyList([1, 'abc', 3, 77, 2, 11])
      ml.sort()
      print(ml)
```

```

      □
      -----
      ↪
      TypeError                                Traceback (most recent call
      ↪last)

      <ipython-input-4-be88a2ce0409> in <module>
          7
          8 ml = MyList([1, 'abc', 3, 77, 2, 11])
      ----> 9 ml.sort()
          10 print(ml)

      TypeError: '<' not supported between instances of 'str' and 'int'
```

```

      3 :1. - , . :NameError- ..2. .3. , .
[6]: def f():
      x = [1, 2, 3]
      print(x[4])

      f()
```

```

      □
      -----
      ↪
      IndexError                                Traceback (most recent call
      ↪last)

      <ipython-input-6-3d82fd8305b1> in <module>
          3      print(x[4])
          4
      ----> 5 f()
```

```

<ipython-input-6-3d82fd8305b1> in f()
      1 def f():
      2     x = [1, 2, 3]
----> 3     print(x[4])
      4
      5 f()

```

IndexError: list index out of range

- :- f() - print -

1.2 try/except

1.2.1

```

[7]: x = [1, 2, 'hello', 7]
      x.sort()
      print(x)

      print('I can catch')

```

```

↳ -----
      TypeError                                Traceback (most recent call↳
↳ last)

```

```

<ipython-input-7-0edda37264eb> in <module>
      1 x = [1, 2, 'hello', 7]
----> 2 x.sort()
      3 print(x)
      4
      5 print('I can catch')

```

TypeError: '<' not supported between instances of 'str' and 'int'

- , :

```

[8]: try:
      x = [1, 2, 'hello', 7]
      x.sort()
      print(x)
      except TypeError:

```

```

    print('TypeError')

print('I can catch')

```

TypeError
I can catch

```

[11]: def f(x, y):
        try:
            return x / y
        except TypeError:
            print('TypeError')

f(5, [])

```

TypeError

```

[12]: f(5, 0)

```

```

↳ -----

ZeroDivisionError                                Traceback (most recent call↳
↳last)

  <ipython-input-12-b5ffca9c0a4f> in <module>
----> 1 f(5, 0)

  <ipython-input-11-6855f7936f49> in f(x, y)
      1 def f(x, y):
      2     try:
----> 3         return x / y
      4     except TypeError:
      5         print('TypeError')

ZeroDivisionError: division by zero

try , except , try .
except - ZeroDivisionError
except , ( ) , .

```

1.2.2

```
:- -
[13]: def f(x, y):
      try:
          return x / y
      except TypeError:
          print('TypeError')

      try:
          f(5, 0)
      except ZeroDivisionError:
          print('ZeroDivisionError')
```

ZeroDivisionError

1.2.3

```
:
[15]: def f(x, y):
      try:
          return x / y
      except (TypeError, ZeroDivisionError):
          print('Error')

      f(5, 0)
      f(5, 'aa')
```

Error

Error

1.2.4

```
:
[18]: def f(x, y):
      try:
          return x / y
      except (TypeError, ZeroDivisionError) as e:
          print('type: ', type(e))
          print('e: ', e)
          print('args: ', e.args, '\n')

      f(5, 0)
      f(5, 'aa')
```

type: <class 'ZeroDivisionError'>

e: division by zero

```
args: ('division by zero',)

type: <class 'TypeError'>
e: unsupported operand type(s) for /: 'int' and 'str'
args: ("unsupported operand type(s) for /: 'int' and 'str'",)
```

```
e.args -, . , .
```

1.2.5

```
try/except , :
```

```
[19]: def f(x, y):
      try:
          return x / y
      except:
          print('Error')

      f(5, 0)
      f(5, 'aa')
```

Error

Error

1.2.6 , isinstance(e, ...Error)

```
, , , , except:
```

```
[20]: try:
      15 / 0
      # e
  except ZeroDivisionError: # isinstance(e, ZeroDivisionError) == True
      print('ZeroDivisionError')
```

ZeroDivisionError

```
try .
except, .
. ZeroDivisionError ArithmeticError.
```

```
[21]: print(ZeroDivisionError.mro())
```

```
[<class 'ZeroDivisionError'>, <class 'ArithmeticError'>, <class 'Exception'>,
<class 'BaseException'>, <class 'object'>]
```

```

    , except , isinstance.
    except except , .

```

1.2.7 : else, finally

```

else- try , -.
finally- , , , .

```

```

[23]: def divide(x, y):
      try:
          result = x / y
      except ZeroDivisionError:
          print('ZeroDivisionError')
      else:
          print('Result = ', result)
      finally:
          print('finally\n')

divide(2, 1)
divide(2, 0)
divide(2, [])

```

```

Result = 2.0
finally

```

```

ZeroDivisionError
finally

```

```

finally

```

```

↳ -----

```

```

↳ last)      TypeError      Traceback (most recent call↳

```

```

<ipython-input-23-17d087ee666e> in <module>
    11 divide(2, 1)
    12 divide(2, 0)
--> 13 divide(2, [])

```

```

<ipython-input-23-17d087ee666e> in divide(x, y)

```

```

1 def divide(x, y):
2     try:
----> 3         result = x / y
4         except ZeroDivisionError:
5             print('ZeroDivisionError')

```

TypeError: unsupported operand type(s) for /: 'int' and 'list'

1.3 1

```

foo, .
, , ArithmeticError, AssertionError, ZeroDivisionError .
, .

try:
    foo()
except Exception:
    print("Exception")
except BaseException:
    print("BaseException")

```

```

[2]: def foo():
      pass

      try:
          foo()

      except ZeroDivisionError:
          print('ZeroDivisionError')

      except ArithmeticError:
          print('ArithmeticError')

      except AssertionError:
          print('AssertionError')

```

1.4 2

```

.
< 1> : < 2> < 3> ... < k>
, 1 2, 3, ..
:

class Error1(Error2, Error3 ... ErrorK):
    pass

```



```

, .
try:
    foo()
except < 1>:
    print("< 1>")
except < 2>:
    print("< 2>")
...

, / . . , .
:
    n- .
n . i- i-., ., ( ), .
m- . m , ., .
:
, / . , .

```

```

[6]: base = {}
already_checked = set()

def test(child):
    try:
        if base[child] == None:
            return 'Not to delete'
    except KeyError:
        return 'Not to delete'

    for cl in base[child]:
        if cl in already_checked or child in already_checked:
            return 'Delete'

    for cl in base[child]:
        if test(cl) == 'Delete':
            return 'Delete'

    return 'Not to delete'

for com in [input().split() for i in range(int(input()))]:
    base[com[0]] = None if len(com) == 1 else com[2:len(com)]

trig = 0
for com in [input() for i in range(int(input()))]:
    if test(com) == 'Delete':
        trig += 1
        if trig == 1:
            print('-----')
        print(com)
    already_checked.add(com)

```

```

4
ArithmeticError
ZeroDivisionError : ArithmeticError
OSError
FileNotFoundError : OSError
4
ZeroDivisionError
OSError
ArithmeticError
FileNotFoundError
-----
FileNotFoundError

```

1.5 raise,

```

[7]: def greet(name):
      if name[0].isupper():
          return "Hello, " + name
      else:
          raise ValueError(name + ' is inappropriate name')

print(greet('Anton'))
print(greet('anton'))

```

Hello, Anton

```

      □
↳ -----

ValueError                                Traceback (most recent call↳
↳last)

<ipython-input-7-e2d62ac5b9ca> in <module>
      6
      7 print(greet('Anton'))
----> 8 print(greet('anton'))

<ipython-input-7-e2d62ac5b9ca> in greet(name)
      3         return "Hello, " + name
      4     else:
----> 5         raise ValueError(name + ' is inappropriate name')
      6
      7 print(greet('Anton'))

```

ValueError: anton is inappropriate name

ValueError, , , , -.

```
[1]: def greet(name):
    if name[0].isupper():
        return "Hello, " + name
    else:
        raise ValueError(name + ' is inappropriate name')

while True:
    try:
        name = input('Please, enter ur name: ')
        greeting = greet(name)
        print(greeting)
    except ValueError:
        print('Please, try again \n')
    else:
        break
```

Please, enter ur name: beatorice

Please, try again

Please, enter ur name: Beatorice

Hello, Beatorice

, raise except - BaseException - .

, . :

```
[11]: class BadName(Exception):
    pass

def greet(name):
    if name[0].isupper():
        return "Hello, " + name
    else:
        raise BadName(name + ' is inappropriate name')

print(greet('anton'))
```

↳ -----

BadName Traceback (most recent call↳

↳last)

```

<ipython-input-11-ec452699dd26> in <module>
      8         raise BadName(name + ' is inappropriate name')
      9
----> 10 print(greet('anton'))

```

```

<ipython-input-11-ec452699dd26> in greet(name)
      6         return "Hello, " + name
      7     else:
----> 8         raise BadName(name + ' is inappropriate name')
      9
     10 print(greet('anton'))

```

BadName: anton is inappropriate name

1.6 3

```

PositiveList, list, .
    NonPositiveError.
    PositiveList append(self, x) ,    NonPositiveError ,    ,    list.
    ,    x append .
: , .

```

```

[12]: class NonPositiveError(Exception):
      pass

      class PositiveList(list):
          def append(self, x):
              if x > 0:
                  super(PositiveList, self).append(x)
              else:
                  raise NonPositiveError()

```

```

[13]: obj = PositiveList()
      obj.append(1)

```

```

[14]: obj.append(-12)

```

```

↳ -----
NonPositiveError                                Traceback (most recent call↳
↳ last)

```

```

<ipython-input-14-50f5f4fca1b5> in <module>

```

```
----> 1 obj.append(-12)
```

```
      <ipython-input-12-cee172f7d03c> in append(self, x)
          7         super(PositiveList, self).append(x)
          8         else:
----> 9         raise NonPositiveError()
```

```
NonPositiveError:
```

2 :

2.1 , ,

```
//, . .
- , .
:
```

```
import filename
```

```
    . , , .
    .
```

2.2 __name__

```
' . .
: /, .
, , , .
name
```

```
[15]: print(__name__)
```

```
def fib(k):
    if k == 0 or k == 1:
        return 1
    else:
        return fib(k - 1) + fib(k - 2)

print(fib(31))
```

```
__main__
```

```
2178309
```

```
    , print(__name__) filename
    , , ( ), :
```

```
if __name__ == "__main__":
```

```
    ...
```

```
[1]: def fib(k):
    if k == 0 or k == 1:
        return 1
    else:
        return fib(k - 1) + fib(k - 2)

if __name__ == "__main__":
    print(__name__)
    print(fib(31))
```

```
__main__
2178309
```

```
, if, , filename.
```

2.3 sys.modules, import,

import Python:

```
, . - .
import, .
sys.modules - : - - ; - - .
```

image.png

```
, exceptions, . - , module object, .
.
, id .
```

```
[5]: import sys

print(type(sys.modules), '\n')
sys.modules
```

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

```
[5]: {'builtins': <module 'builtins' (built-in)>,
'sys': <module 'sys' (built-in)>,
'_frozen_importlib': <module 'importlib._bootstrap' (frozen)>,
'_imp': <module '_imp' (built-in)>,
'_warnings': <module '_warnings' (built-in)>,
'_thread': <module '_thread' (built-in)>,
'_weakref': <module '_weakref' (built-in)>,
'_frozen_importlib_external': <module 'importlib._bootstrap_external'
(frozen)>,
'_io': <module 'io' (built-in)>,
'marshal': <module 'marshal' (built-in)>,
```

```

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'codecs': <module 'codecs' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\codecs.py'>,
'_codecs': <module '_codecs' (built-in)>,
'encodings.aliases': <module 'encodings.aliases' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\encodings\\aliases.py'>,
'encodings.utf_8': <module 'encodings.utf_8' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\encodings\\utf_8.py'>,
'_signal': <module '_signal' (built-in)>,
'__main__': <module '__main__'>,
'encodings.latin_1': <module 'encodings.latin_1' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\encodings\\latin_1.py'>,
'io': <module 'io' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\io.py'>,
'abc': <module 'abc' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\abc.py'>,
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'_locale': <module '_locale' (built-in)>,
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'C:\\Users\\bruenor\\Anaconda3\\lib\\encodings\\cp1251.py'>,
'site': <module 'site' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\site.py'>,
'os': <module 'os' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\os.py'>,
'errno': <module 'errno' (built-in)>,
'stat': <module 'stat' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\stat.py'>,
'_stat': <module '_stat' (built-in)>,
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'genericpath': <module 'genericpath' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\genericpath.py'>,
'os.path': <module 'ntpath' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\ntpath.py'>,
'_collections_abc': <module '_collections_abc' from
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'_sitebuiltins': <module '_sitebuiltins' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\_sitebuiltins.py'>,
'sysconfig': <module 'sysconfig' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\sysconfig.py'>,
'types': <module 'types' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\types.py'>,
'functools': <module 'functools' from
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'_functools': <module '_functools' (built-in)>,
'collections': <module 'collections' from

```

```

'C:\\Users\\bruenor\\Anaconda3\\lib\\collections\\__init__.py'>,
'operator': <module 'operator' from
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'C:\\Users\\bruenor\\Anaconda3\\lib\\reprlib.py'>,
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'weakref': <module 'weakref' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\weakref.py'>,
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'C:\\Users\\bruenor\\Anaconda3\\lib\\collections\\abc.py'>,
'importlib': <module 'importlib' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\importlib\\__init__.py'>,
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'importlib._bootstrap_external': <module 'importlib._bootstrap_external'
(frozen)>,
'warnings': <module 'warnings' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\warnings.py'>,
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packages\\sphinxcontrib\\__init__.py'>,
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'ipykernel.connect': <module 'ipykernel.connect' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\site-packages\\ipykernel\\connect.py'>,
'__future__': <module '__future__' from

```



```

'C:\\Users\\bruenor\\Anaconda3\\lib\\__future__.py'>,
'json': <module 'json' from
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packages\\IPython\\__init__.py'>,
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packages\\IPython\\core\\getipython.py'>,
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```

```

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'C:\\Users\\bruenor\\Anaconda3\\lib\\logging\\__init__.py'>,
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'bz2': <module 'bz2' from 'C:\\Users\\bruenor\\Anaconda3\\lib\\bz2.py'>,
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'ipykernel.ipkernel': <module 'ipykernel.ipkernel' from
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```

```

'IPython.utils.tokenutil': <module 'IPython.utils.tokenutil' from
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'tornado.locks': <module 'tornado.locks' from
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'ipykernel.jsonutil': <module 'ipykernel.jsonutil' from
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'ipykernel.zmqshell': <module 'ipykernel.zmqshell' from
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'IPython.core.payloadpage': <module 'IPython.core.payloadpage' from
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'ipykernel.datapub': <module 'ipykernel.datapub' from
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'ipykernel.serialize': <module 'ipykernel.serialize' from
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'ipykernel.codeutil': <module 'ipykernel.codeutil' from
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packages\\IPython\\extensions\\storemagic.py'>,
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'C:\\Users\\bruenor\\Anaconda3\\lib\\site-packages\\ipywidgets\\__init__.py'>,
'ipywidgets._version': <module 'ipywidgets._version' from

```

```

'C:\\Users\\bruenor\\Anaconda3\\lib\\site-packages\\ipywidgets\\_version.py'>,
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'C:\\Users\\bruenor\\Anaconda3\\lib\\site-
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'ipywidgets.widgets.trait_types': <module 'ipywidgets.widgets.trait_types' from
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packages\\ipywidgets\\widgets\\widget_core.py'>,
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packages\\ipywidgets\\widgets\\widget_description.py'>,
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packages\\ipywidgets\\widgets\\widget_box.py'>,
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packages\\ipywidgets\\widgets\\docutils.py'>,
'ipywidgets.widgets.widget_float': <module 'ipywidgets.widgets.widget_float'
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packages\\ipywidgets\\widgets\\widget_float.py'>,
'ipywidgets.widgets.widget_int': <module 'ipywidgets.widgets.widget_int' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\site-
packages\\ipywidgets\\widgets\\widget_int.py'>,

```

```

'ipywidgets.widgets.widget_color': <module 'ipywidgets.widgets.widget_color'
from 'C:\\Users\\bruenor\\Anaconda3\\lib\\site-
packages\\ipywidgets\\widgets\\widget_color.py'>,
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from 'C:\\Users\\bruenor\\Anaconda3\\lib\\site-
packages\\ipywidgets\\widgets\\widget_media.py'>,
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from 'C:\\Users\\bruenor\\Anaconda3\\lib\\site-
packages\\jedi\\evaluate\\context\\namespace.py'>,
'pygments.styles.default': <module 'pygments.styles.default' from
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packages\\pygments\\styles\\default.py'>,
'zmq.utils.garbage': <module 'zmq.utils.garbage' from
'C:\\Users\\bruenor\\Anaconda3\\lib\\site-packages\\zmq\\utils\\garbage.py'>}

, sys.modules?
.py . - .

```

```

[6]: import sys

for path in sys.path:

```

```
print(path)
```

```
C:\Users\bruenor\Anaconda3\python36.zip
C:\Users\bruenor\Anaconda3\DLLs
C:\Users\bruenor\Anaconda3\lib
C:\Users\bruenor\Anaconda3

C:\Users\bruenor\Anaconda3\lib\site-packages
C:\Users\bruenor\Anaconda3\lib\site-packages\pytesseract-0.1.7-py3.6.egg
C:\Users\bruenor\Anaconda3\lib\site-packages\win32
C:\Users\bruenor\Anaconda3\lib\site-packages\win32\lib
C:\Users\bruenor\Anaconda3\lib\site-packages\Pythonwin
C:\Users\bruenor\Anaconda3\lib\site-packages\IPython\extensions
C:\Users\bruenor\ipython
```

```
. .
- .
, , __init__.py.
, .
```

2.4 1

```
, date -- , .
    days -- .
, , , date , days.
:   datetime.   datetime.date   datetime.timedelta .
Sample Input 1:
```

```
2016 4 20
14
```

Sample Output 1:

```
2016 5 4
```

```
[26]: import datetime

year, month, day = map(int, input().split())

date = datetime.date(year, month, day)
delta = datetime.timedelta(int(input()))

new_date = date + delta

print(new_date.year, new_date.month, new_date.day)
```

```
2016 4 20
14
```

```
[27]: from numpy import asarray as ar
```

```
[ ]: from module import *b
```

```

    *, ..., _
    * . all, .
    all, , _
[30]: __all__ = ['name1', 'name2']
#
#
_GREETING = 'Hello'
#

```

```
, .  
, .  
, .  
    , . .  
simple-crypt.      simplecrypt.encrypt.  
simple-crypt,   simplecrypt.decrypt, .
```

```
[ ]: import simplecrypt
from datetime import datetime

start_time = datetime.now()

path_encrypted = "2.2/task-1/encrypted.bin"
path_passwords = "2.2/task-1/passwords.txt"

with open(path_encrypted, "rb") as data_file:
    encrypted = data_file.read()

pw_file = open(path_passwords, 'r')
passwords = [line.strip() for line in pw_file]

for password in passwords:
    try:
        decrypted = simplecrypt.decrypt(password, encrypted)
        break
```

```

    except simplecrypt.DecryptionException:
        pass

answer_file = open('2.2/task-1/answer.txt', 'w')
answer_file.write(decrypted.decode('utf8'))

print(datetime.now() - start_time)

```

3

3.1 for

```

for, :
[2]: lst = [1, 2, 3, 4, 5, 6]

book = {
    'title': 'The Langoliers',
    'author': 'Stephen King',
    'year_published': 1990
}

string = 'Hello, World!'

```

```

:
[3]: for i in lst:
    print(i)

```

```

1
2
3
4
5
6

```

```

:
[4]: for i in book:
    print(i)

```

```

title
author
year_published

```

```

:
[5]: for i in string:
    print(i)

```

H
e
l
l
o
,

W
o
r
l
d
!

```
- for .  
  , ? , ..  
  .  
  - for, , .  
-- , .  
  , StopIteration.
```

image.png

```
[8]: iterator = iter(book)  
     print(next(iterator))  
     print(next(iterator))  
     print(next(iterator))  
     next(iterator)
```

title
author
year_published

↳ -----

↳ StopIteration Traceback (most recent call↳
last)

```
<ipython-input-8-0f524d0c9826> in <module>  
    3 print(next(iterator))  
    4 print(next(iterator))  
----> 5 next(iterator)
```


StopIteration:

```
for -:
[9]: it = iter(book)
while True:
    try:
        i = next(it)
        # for
        print(i)
    except StopIteration:
        break
```

title
author
year_published

3.2 ,

, [0, 1]

```
[10]: class RandomIterator:
        pass

x = RandomIterator()
print(next(x))
```

```
↳
-----
TypeError                                Traceback (most recent call↳
↳last)
```

```
<ipython-input-10-0703b2605cd6> in <module>
      3
      4 x = RandomIterator()
----> 5 print(next(x))
```

TypeError: 'RandomIterator' object is not an iterator

```
, __next__
[11]: class RandomIterator:
        def __next__(self):
```

```

        return 0

x = RandomIterator()
print(next(x))

```

0

```

    next(x) == x.__next__()
    x -, __next__

```

[17]: `from random import random`

```

class RandomIterator:
    def __next__(self):
        return random()

```

```

x = RandomIterator()
print(next(x))

```

0.706609390969508

```

, .. StopIteration

```

[18]: `from random import random`

```

class RandomIterator:
    def __init__(self, k):
        # - ,
        self.k = k
        # -
        self.i = 0

    def __next__(self):
        if self.i < self.k:
            self.i += 1
            return random()
        else:
            raise StopIteration

```

```

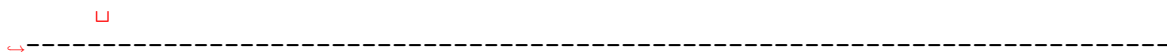
x = RandomIterator(3)
for i in range(4):
    print(next(x))

```

0.5797770309316919

0.17188895667399007

0.3033865347909781



StopIteration Traceback (most recent call
↳last)

```
<ipython-input-18-d6215cd1d389> in <module>
    17 x = RandomIterator(3)
    18 for i in range(4):
---> 19     print(next(x))

<ipython-input-18-d6215cd1d389> in __next__(self)
    13         return random()
    14     else:
---> 15         raise StopIteration
    16
    17 x = RandomIterator(3)
```

StopIteration:

for?
- __iter__ , .

[19]: `iter(x)`

↳-----

TypeError Traceback (most recent call
↳last)

```
<ipython-input-19-fc8878cfdbdd> in <module>
----> 1 iter(x)
```

TypeError: 'RandomIterator' object is not iterable

- __iter__ self. , . - __next__, - __iter__
- , , .

[21]: `from random import random`

```
class RandomIterator:
    def __init__(self, k):
        # - ,
        self.k = k
```

```

        # -
        self.i = 0

    def __iter__(self):
        return self

    def __next__(self):
        if self.i < self.k:
            self.i += 1
            return random()
        else:
            raise StopIteration

for x in RandomIterator(5):
    print(x)

```

```

0.3307875763562399
0.05941761164712778
0.38583029893282306
0.11299555188811128
0.8490904312008064

```

1. , (), __iter__, .
2. , , __next__

```

[22]: class DoubleElementListIterator:
        def __init__(self, lst):
            self.lst = lst
            self.i = 0

        def __next__(self):
            if self.i < len(self.lst):
                self.i += 2
                return self.lst[self.i - 2], self.lst[self.i - 1]
            else:
                raise StopIteration

    class MyList(list):
        def __iter__(self):
            return DoubleElementListIterator(self)

```

, MyList, .

```

[23]: for pair in MyList([1, 2, 3, 4]):
        print(pair)

```

```

(1, 2)
(3, 4)

```

```

    , .
    for.

```

```
[25]: for pair in MyList([1, 2, 3, 4, 5]):
      print(pair)
```

```

(1, 2)
(3, 4)

```

```

      □
↳ -----

      IndexError                                Traceback (most recent call↳
↳ last)

      <ipython-input-25-4d0b66c7da53> in <module>
      ----> 1 for pair in MyList([1, 2, 3, 4, 5]):
            2     print(pair)

      <ipython-input-22-481d6717797f> in __next__(self)
            7         if self.i < len(self.lst):
            8             self.i += 2
      ----> 9             return self.lst[self.i - 2], self.lst[self.i - 1]
            10         else:
            11             raise StopIteration

      IndexError: list index out of range

      __iter__()    MyList,      ""( , ).
      , ( __next__ ), . __iter__ , .
      !!! !!!
      (__iter__) (__next__), .

```

3.3 , yield, return

```

    , .
    ?
    -, return yield.

```

```
[26]: from random import random

class RandomIterator:
    def __init__(self, k):
        # - ,
        self.k = k
```

```

        # -
        self.i = 0

    def __iter__(self):
        return self

    def __next__(self):
        if self.i < self.k:
            self.i += 1
            return random()
        else:
            raise StopIteration

def random_generator(k):
    for i in range(k):
        yield random()

```

```

- yield , , , next
.
yield , -.
, .

```

```
[27]: gen = random_generator(3)
print(type(gen))
```

```

<class 'generator'>

yield -.
, , .
, , yield.
-, next.
, , next , , .
- yield, StopIteration.

```

```
[28]: def simple_gen():
    print('Checkpoint 1')
    yield 1
    print('Checkpoint 2')
    yield 2
    print('Checkpoint 3')

gen = simple_gen()
x = next(gen)
print(x)
y = next(gen)
print(y)
z = next(gen)
```

Checkpoint 1

1

Checkpoint 2

2

Checkpoint 3

```

    □
↳ -----
StopIteration                                Traceback (most recent call↳
↳last)
```

```

    <ipython-input-28-f443284aaa3a> in <module>
      11 y = next(gen)
      12 print(y)
----> 13 z = next(gen)
```

StopIteration:

```
[29]: from random import random

class RandomIterator:
    def __init__(self, k):
        # - ,
        self.k = k
        # -
        self.i = 0

    def __iter__(self):
        return self

    def __next__(self):
        if self.i < self.k:
            self.i += 1
            return random()
        else:
            raise StopIteration

def random_generator(k):
    for i in range(k):
        yield random()
```

```

    random_generator(k) k .
    , RandomIterator
```

```
[30]: gen = random_generator(3)
```

```
for i in gen:
    print(i)
```

```
0.3480898722350839
0.3183538008491692
0.7910409713698039
```

```
- .
, iter next, .
yield , , .
```

```

    return :
[33]: def simple_gen():
        print('Checkpoint 1')
        yield 1
        print('Checkpoint 2')
        return
        yield 2
        print('Checkpoint 3')
```

```
gen = simple_gen()
x = next(gen)
print(x)
y = next(gen)
print(y)
z = next(gen)
```

```
Checkpoint 1
1
Checkpoint 2
```

```

      □
↳ -----
```

```

      StopIteration                                Traceback (most recent call↳
↳last)
```

```

    <ipython-input-33-5439cb718541> in <module>
        10 x = next(gen)
        11 print(x)
    ---> 12 y = next(gen)
        13 print(y)
        14 z = next(gen)
```


StopIteration:

```
- , (return), , yield, StopIteration.  
- return, StopIteration.
```

```
[34]: def simple_gen():  
    print('Checkpoint 1')  
    yield 1  
    print('Checkpoint 2')  
    return 'No more elements'  
    yield 2  
    print('Checkpoint 3')  
  
gen = simple_gen()  
x = next(gen)  
print(x)  
y = next(gen)  
print(y)  
z = next(gen)
```

Checkpoint 1

1

Checkpoint 2

StopIteration Traceback (most recent call
last)

```
<ipython-input-34-dd60eb9634bd> in <module>  
    10 x = next(gen)  
    11 print(x)  
----> 12 y = next(gen)  
    13 print(y)  
    14 z = next(gen)
```

StopIteration: No more elements

```
, - .  
, next - yield .
```

3.4 1

Python filter. $a \rightarrow [x \in a, f(x) == \text{True}]$, $f(x)$, x .

```

        multifilter, , filter, , .
        , , . pos neg.
        - , - pos neg, True, , False.
        .
a = [1, 2, 3]
f2(x) = x % 2 == 0 # True, x 2 f3(x) = x % 3 == 0 judge_any(pos, neg) =
pos >= 1 # True,
, [2, 3].
:

class multifilter:
    def judge_half(pos, neg):
        # , (pos >= neg)

    def judge_any(pos, neg):
        # , (pos >= 1)

    def judge_all(pos, neg):
        # , (neg == 0)

    def __init__(self, iterable, *funcs, judge=judge_any):
        # iterable -
        # funcs -
        # judge -

    def __iter__(self):
        #

```

```

[35]: class multifilter:
    def judge_half(pos, neg):
        return pos >= neg

    def judge_any(pos, neg):
        return pos >= 1

    def judge_all(pos, neg):
        return neg == 0

    def __init__(self, iterable, *funcs, judge=judge_any):
        self.iterable = iterable
        self.funcs = funcs
        self.judge = judge

    def __iter__(self):
        for element in self.iterable:
            pos, neg = 0, 0
            for func in self.funcs:
                if func(element):

```

```

        pos += 1
    else:
        neg += 1
    if self.judge(pos, neg):
        yield element

```

3.5 1 - `__iter__` `__next__`

```

[36]: #
class MyIterator:
    def __init__(self, iterable):
        self.iterable = iterable
        self.index = 0

    def __next__(self):
        if self.index < len(self.iterable):
            self.index += 1
            return self.iterable[self.index - 1]
        raise StopIteration

class MyList:
    def __init__(self, list):
        self.list = list

    def __iter__(self):
        return MyIterator(self.list)

l = MyList([1, 2, 3, 4, 5])
print(type(l))
for i in l:
    print(i)

```

```

<class '__main__.MyList'>
1
2
3
4
5

```

```

[:]: # ,
# , , None
class multifilter:
    def judge_half(self, pos, neg):
        return pos >= neg

    def judge_any(self, pos, neg):
        return pos > 0

```

```

def judge_all(self, pos, neg):
    return neg == 0

def __init__(self, iterable, *funcs, judge=judge_any):
    self.iterable = iterable
    self.funcs = funcs
    self.judge = judge
    self.index = 0

def __next__(self):
    if self.index < len(self.iterable):
        pos, neg = 0, 0
        self.index += 1
        element = self.iterable[self.index - 1]
        for func in self.funcs:
            if func(element):
                pos += 1
            else:
                neg += 1
        if self.judge(self, pos, neg):
            return element
        else:
            raise StopIteration

def __iter__(self):
    return self

```

```

[ ]: # ,
# None
class multifilter:
    def judge_half(self, pos, neg):
        return pos >= neg

    def judge_any(self, pos, neg):
        return pos > 0

    def judge_all(self, pos, neg):
        return neg == 0

    def __init__(self, iterable, *funcs, judge=judge_any):
        self.iterator = iter(iterable)
        self.funcs = funcs
        self.judge = judge

    def __next__(self):
        while True:

```

```

        elem = next(self.iterator)
        pos, neg = 0, 0
        for func in self.funcs:
            if func(elem):
                pos += 1
            else:
                neg += 1
        if self.judge(self, pos, neg):
            return elem

    def __iter__(self):
        return self

```

3.6 2

```

', 2', 1 2. ,, 3,5,31, .
4,, , -1,2,4. 1, -1.
-primes, , 2.

```

```

[50]: import itertools
from math import sqrt, ceil

def primes():
    a = 1
    while True:
        a += 1
        prime_check = True
        for i in range(2, ceil(sqrt(a))):
            if a % i == 0:
                prime_check = False
                break
        if prime_check:
            yield a

print(list(itertools.takewhile(lambda x : x <= 31, primes())))
# [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31]

```

[2, 3, 4, 5, 7, 9, 11, 13, 17, 19, 23, 25, 29, 31]

3.7 List comprehensions

List Comprehension - .

```

[51]: x = [-2, -1, 0, 1, 2]
y = []

for i in x:

```

```
y.append(i*i)
print(y)
```

[4, 1, 0, 1, 4]

```
[52]:
:
y = [i * i for i in x]
y
```

[52]: [4, 1, 0, 1, 4]

```
if:
[54]: y = [i * i for i in x if i > 0]
y
```

[54]: [1, 4]

```
[55]: z = [(x, y) for x in range(3) for y in range(3) if y >= x]
z
```

[55]: [(0, 0), (0, 1), (0, 2), (1, 1), (1, 2), (2, 2)]

```
[56]: z = []
for x in range(3):
    for y in range(3):
        if y >= x:
            z.append((x, y))
z
```

[56]: [(0, 0), (0, 1), (0, 2), (1, 1), (1, 2), (2, 2)]

```
[57]: z = ((x, y) for x in range(3) for y in range(3) if y >= x)
print(z)
print(z.__next__())
```

<generator object <genexpr> at 0x000001D9F75D1FC0>
(0, 0)

```
[58]: print(next(z))
```

(0, 1)

4

4.1 ,

2 : 1. - . (, .txt, .html) 2. / - . (.mp3, .jpg, .gif,...)

.

```
[10]: path = '2.4 File system and files/2.4.1/'
```

```
f = open(path + 'test.txt', 'r')
x = f.read(5)
y = f.read()
print(x, '\n')
print(y)
f.close()
```

First

Line
Second Line
Third Line

`- r (read) - () - w (write) - , - a (append) - , - b (binary) - - t (text) - () - r+ - - w+ -`
,
open file object, .
File object ,.. .
- :

```
[12]: f = open(path + 'test.txt', 'r')
x = f.read()
print(repr(x))
f.close()
```

'First Line\nSecond Line\nThird Line'

.
, splitlines:

```
[13]: f = open(path + 'test.txt', 'r')
x = f.read()
x = x.splitlines()
print(repr(x))
f.close()
```

['First Line', 'Second Line', 'Third Line']

. read, .
:

```
[14]: f = open(path + 'test.txt', 'r')
x = f.readline()
print(repr(x))
x = f.readline()
print(repr(x))
f.close()
```

```
'First Line\n'
'Second Line\n'
```

```
, rstrip:
```

```
[16]: f = open(path + 'test.txt', 'r')
x = f.readline().rstrip()
print(repr(x))
x = f.readline().rstrip()
print(repr(x))
f.close()
```

```
'First Line'
'Second Line'
```

```
- file object.
file object , , .
```

```
, , , .
```

```
[19]: f = open(path + 'test.txt', 'r')

for line in f:
    line = line.rstrip()
    print(repr(line))

x = f.read()
print(repr(x))

f.close()
```

```
'First Line'
'Second Line'
'Third Line'
''
```

```
, read
```

4.2 , 'w', 'a'

```
:
```

```
[20]: path = '2.4 File system and files/2.4.2/'
```

```
[22]: f = open(path + 'test1.txt', 'w')

f.write('Hello')
f.write('world')

f.close()

# Helloworld
```



```
[24]: f = open(path + 'test1.txt', 'w')

f.write('Hello\n')
f.write('world')

f.close()
# Hello
# world
```

```
, , , join:
[26]: f = open(path + 'test1.txt', 'w')
lines = ['Line 1', 'Line 2', 'Line 3']
contents = '\n'.join(lines)
f.write(contents)
f.close()
# Line 1
# Line 2
# Line 3
```

```
:
a, , .
[27]: f = open(path + 'test_append.txt', 'a')

f.write('Hello\n')

f.close()
# Hello
```

```
[28]: f = open(path + 'test_append.txt', 'a')

f.write('Hello\n')

f.close()
# Hello
# Hello
```

4.3 with...open

```
- .
, , , , .
close.
close, open .. with
```

```
[29]: path = '2.4 File system and files/2.4.3/'
```

```
[30]: with open(path + 'test.txt') as f:
    for line in f:
        line = line.rstrip()
        print(line)
```

First line
Second line
Third line

```
, with , , .  
with :  
[31]: with open(path + 'test.txt') as f, open(path + 'test_copy.txt', 'w') as w:  
      for line in f:  
          w.write(line)  
      # First line  
      # Second line  
      # Third line
```

4.4 1

```
, .  
 , .  
:  
ab  
c  
dde  
ff  
  
:  
ff  
dde  
c  
ab
```

```
[39]: path = '2.4 File system and files/2.4.4/'  
  
inp_lines = []  
with open(path + 'input.txt') as f, open(path + 'output.txt', 'w') as w:  
    for line in f:  
        line = line.rstrip()  
        inp_lines.append(line)  
    for line in reversed(inp_lines):  
        w.write(line + '\n')
```

4.5 , os, os.path, shutil

```
.  
os os.path .
```

```
 , , , .  
[1]: import os  
      import os.path
```

```
:
```

```
[2]: print(os.listdir())
```

```
['.gitignore', '.ipynb_checkpoints', '.vscode', '1. Basic principles.ipynb', '2. Standart tools.ipynb', '2.1 Errors and exceptions', '2.2 Modules and import', '2.3 Iterators and generators', '2.4 File system and files', 'env', 'github_integration.ipynb', 'input.txt', ' yield.ipynb']
```

```
, :  
[3]: owd = os.getcwd()  
      print(os.getcwd())
```

```
E:\_PR\notebooks\notebooks\stepik\python
```

```
[4]: print(os.listdir('2.4 File system and files/'))
```

```
['2.4.1', '2.4.2', '2.4.3', '2.4.4']
```

```
, :  
[5]: print(os.path.exists('2. Standart tools.ipynb'))  
      print(os.path.exists('222. Standart tools.ipynb'))  
      print(os.path.exists('env'))
```

```
True  
False  
True
```

```
, , -:  
[6]: print(os.path.isfile('2. Standart tools.ipynb'))  
      print(os.path.isdir('2. Standart tools.ipynb'))  
      print('\n')  
      print(os.path.isfile('env'))  
      print(os.path.isdir('env'))
```

```
True  
False
```

```
False  
True
```

```
:  
[7]: print(os.path.abspath('env'))
```

```
E:\_PR\notebooks\notebooks\stepik\python\env
```

```
:
```

```
[11]: os.chdir('2.4 File system and files')
print(os.getcwd())
```

E:__PR\notebooks\notebooks\stepik\python\2.4 File system and files

```
os.walk , ..
os.walk , , 3:1. , 2. , 3.
os.walk('.') - , .
```

```
[12]: # os.chdir(owd)
for current_dir, dirs, files in os.walk('.'):
    print(current_dir, dirs, files)
```

```
. ['2.4.1', '2.4.2', '2.4.3', '2.4.4'] []
.\2.4.1 [] ['test.txt']
.\2.4.2 [] ['test1.txt', 'test_append.txt']
.\2.4.3 [] ['test.txt', 'test_copy.txt']
.\2.4.4 [] ['input.txt', 'output.txt']
```

shutil:

```
[13]: import shutil

shutil.copy('2.4.1/test.txt', '2.4.1/test_copy.txt')

for current_dir, dirs, files in os.walk('.'):
    print(current_dir, dirs, files)
```

```
. ['2.4.1', '2.4.2', '2.4.3', '2.4.4'] []
.\2.4.1 [] ['test.txt', 'test_copy.txt']
.\2.4.2 [] ['test1.txt', 'test_append.txt']
.\2.4.3 [] ['test.txt', 'test_copy.txt']
.\2.4.4 [] ['input.txt', 'output.txt']
```

```
shutil.copytree('dir', 'dir_copy')
```

4.6 2

```
, .
, , ".py".
, .
```

```
[24]: import os
import os.path

os.chdir(owd)
```

```
os.getcwd()
```

```
[24]: 'E:\\_PR\\notebooks\\notebooks\\stepik\\python'
```

```
[25]: os.listdir()
```

```
[25]: ['.gitignore',  
      '.ipynb_checkpoints',  
      '.vscode',  
      '1. Basic principles.ipynb',  
      '2. Standart tools.ipynb',  
      '2.1 Errors and exceptions',  
      '2.2 Modules and import',  
      '2.3 Iterators and generators',  
      '2.4 File system and files',  
      'env',  
      'github_integration.ipynb',  
      'input.txt',  
      'yield.ipynb']
```

```
[26]: os.chdir('2.4 File system and files/2.4.6/')
```

```
[27]: os.listdir()
```

```
[27]: ['sample_ans.txt', 'task', 'test']
```

```
[28]: os.chdir('test/sample/')  
os.listdir()
```

```
[28]: ['sample']
```

```
[29]: for current_dir, dirs, files in os.walk('.'):  
      print(current_dir, dirs, files)
```

```
. ['sample'] []  
.\sample ['a', 'b', 'c'] ['not_py.txt', 'sample.py']  
.\sample\a ['c'] ['a.py', 'not_py.txt']  
.\sample\a\c [] ['ac1.py', 'ac2.py', 'not_py.txt']  
.\sample\b [] ['b.py']  
.\sample\c [] []
```

```
[45]: os.chdir(owd)  
os.chdir('2.4 File system and files/2.4.6/task/main/')  
  
dirs_py = set()  
  
# , .py -  
# , -  
for current_dir, dirs, files in os.walk('main\\'):  
    for file in files:  
        if file.endswith('.py'):  
            dirs_py.add(current_dir)
```

```

        break

os.chdir(owd)

path = '2.4 File system and files/2.4.6/'
with open(path + 'output.txt', 'w') as f:
    for element in sorted(dirs_py):
        f.write(element + '\n')

print(len(dirs_py))

```

104

\, --

5 : functool lambda-

5.1

, Python function.
 , , , int().
 -- , -- .

5.2 map(), filter()

(,) .

```
[2]: n, k = map(int, input().split())
      print(n + k)
```

2 3
5

```
[3]: x = input().split()
      print(x)
      n, k = map(int, x)
      print(n + k)
```

2 3
['2', '3']
5

map int, , x, .
 f: [a, b, c, ...] -> f(a), f(b), f(c), ...
 map .

```
[6]: map_obj = map(int, ['1', '2'])
      print(map_obj)
```

```
n = next(map_obj)
k = next(map_obj)
print(n + k)
```

<map object at 0x0000024A988FFF98>

3

```
Python , .
, -, (,), .
```

[7]: n, k = map(int, ['1', '2', '3'])

```

      □
↪ -----
```

```

      ValueError                                Traceback (most recent call□
↪ last)
```

```

      <ipython-input-7-084a02e0f67f> in <module>
----> 1 n, k = map(int, ['1', '2', '3'])
```

ValueError: too many values to unpack (expected 2)

```
map , , -next():
```

image.png

```

      :
[8]: x = input().split()
      print(x)
      n, k = (int(i) for i in x)
      print(n + k)
```

```
2 3
['2', '3']
5
```

```

      2 - . True .
[9]: x = input().split()
      xs = (int(i) for i in x)

      def even(x):
```

```

    return x % 2 == 0

evens = filter(even, xs)
print(list(evens))

```

```

1 2 3 4 5 6 7 8
[2, 4, 6, 8]

```

```

    filter filter object, , next.
    list, .

```

5.3 lambda

lambda functions - .

- lambda
- , .
- , , *, ,
- - , .

```

[10]: x = input().split()
xs = (int(i) for i in x)

# def even(x):
#     return x % 2 == 0

even = lambda x: x % 2 == 0

evens = filter(even, xs)
print(list(evens))

```

```

1 2 3 4 5 6 7
[2, 4, 6]

```

```

    lambda.
    lambda .
    -, .

```

```

    .
    key - , .

```

```

[12]: x = [
    ('Guido', 'van', 'Rossum'),
    ('Haskell', 'Curry'),
    ('John', 'Backus')
]

```



```

]

def length(name):
    return len(' '.join(name))

name_length = [length(name) for name in x]
print(name_length)

x.sort(key=length)
print(x)

```

```

[16, 13, 11]
[('John', 'Backus'), ('Haskell', 'Curry'), ('Guido', 'van', 'Rossum')]

```

```

[14]: x = [
        ('Guido', 'van', 'Rossum'),
        ('Haskell', 'Curry'),
        ('John', 'Backus')
    ]

x.sort(key=lambda name: len(' '.join(name)))
print(x)

```

```

[('John', 'Backus'), ('Haskell', 'Curry'), ('Guido', 'van', 'Rossum')]

```

5.4 operator

```

, -+ 2 .
operator.

```

```

[15]: import operator as op

print(op.add(4, 5))
print(op.mul(4, 5))
print(op.contains([1, 2, 3], 4))

```

```

9
20
False

```

```

:- itemgetter, - - attrgetter, -

```

```

[16]: x = [1, 2, 3]
# f(x) == x[1]
f = op.itemgetter(1)
print(f(x))

```

2

```
[17]: x = {'123': 'val'}
      # f(x) == x[1]
      f = op.itemgetter('123')
      print(f(x))
```

val

```
[18]: # f(x) = x.sort
      f = op.attrgetter('sort')
      print(f([]))
```

<built-in method sort of list object at 0x0000024A9A4CD108>

```
[19]: :
      x = [
          ('Guido', 'van', 'Rossum'),
          ('Haskell', 'Curry'),
          ('John', 'Backus')
      ]

      x.sort(key=op.itemgetter(-1))
      print(x)
```

[('John', 'Backus'), ('Haskell', 'Curry'), ('Guido', 'van', 'Rossum')]

5.5 functools, partial

```
-functools
partial.
', ', '.
: int(), , .
', ', :
```

```
[20]: from functools import partial

      x = int('1101', base=2)
      print(x)
```

13

```
, , - int() base=2
[21]: from functools import partial

      x = int('1101', base=2)
      print(x)
```

```
int_2 = partial(int, base=2)
x = int_2('1101')
```

13

```
partial - , .
[22]: x = [
        ('Guido', 'van', 'Rossum'),
        ('Haskell', 'Curry'),
        ('John', 'Backus')
      ]

import operator as op
from functools import partial

sort_by_last = partial(list.sort, key=op.itemgetter(-1))

print(x)
sort_by_last(x)
print(x)
```

```
[('Guido', 'van', 'Rossum'), ('Haskell', 'Curry'), ('John', 'Backus')]
[('John', 'Backus'), ('Haskell', 'Curry'), ('Guido', 'van', 'Rossum')]
```

```
[23]: y = ['abc', 'cba', 'abb']
sort_by_last(y)
print(y)
```

```
['cba', 'abb', 'abc']
```

5.6 1

ń ž.

```
' / ' '
mod_checker(x, mod=0), y, True, y x mod, False.
:
```

```
mod_3 = mod_checker(3)
```

```
print(mod_3(3)) # True
print(mod_3(4)) # False
```

```
mod_3_1 = mod_checker(3, 1)
print(mod_3_1(4)) # True
```

```
[24]: def mod_checker(x, mod=0):
        return lambda y: y % x == mod

l = [1, 2, 3, 4, 5, 6, 7, 8, 9]
list(filter(mod_checker(3), l))
```

```
[24]: [3, 6, 9]
```

6 : pep8

6.1 PEP8

.
 pep8 - .
 PEP - Python Enhancement Proposal.
<https://www.python.org/dev/peps/pep-0008>

6.2 docstring

```
[1]: from random import random

class RandomIterator:
    """
    RandomIteratora(k) -new iterator for k random numbers in [0, 1]

    Uses random.random
    """
    def __init__(self, k):
        self.k = k
        self.i = 0

    def __iter__(self):
        return self

    def __next__(self):
        if self.i < self.k:
            self.i += 1
            return random()
        else:
            raise StopIteration
```

```
[2]: print(RandomIterator.__doc__)
```

```
RandomIteratora(k) -new iterator for k random numbers in [0, 1]
```

Uses `random.random`

```
[7]: import sys  
  
print(sys.getrefcount.__doc__)
```

`getrefcount(object) -> integer`

Return the reference count of object. The count returned is generally one higher than you might expect, because it includes the (temporary) reference as an argument to `getrefcount()`.