Scripting Languages

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Lab #4
- what is evaluated as False; string buffer
- tuple data type
- list comprehension
- control structures
- functions

(last update: 2024-01-19 [yyyy-mm-dd])

2023-2024, 2nd semester

What is evaluated as False?

```
False
None
0    # and: 0.0
''   # or: ""
[]
()
{}
```

empty sequences

empty set

```
>>> bool(None)
False
>>> bool([])
False
>>> bool([1,2,3])
True
>>> bool("py")
True
```

Anything else is considered to to be True.

HW: XOR.

http://docs.python.org/3/library/stdtypes.html#truth-value-testing

String buffer

Example: consider the natural numbers from 1 to 15 (included) and write them down one after the other. Let the result be a string: „123456789101112131415".

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Naïve approach:

```
5 res = ""
6 for i in range(1, 15+1):
7     res += str(i)
8 #
9 print(res)
```

Using a string buffer:

```
5 parts = []
6 for i in range(1, 15+1):
7     parts.append(str(i))
8 #
9 res = "".join(parts)
10 print(res)
```

tuple

```
 4  >>> a = (1, 2, 3)
 5  >>> a[0]
 6  1
 7  >>> a[0] = 5
 8  Traceback (most recent call last):
 9    File "<stdin>", line 1, in <module>
10  TypeError: 'tuple' object does not support item assignment
11  >>>
12  >>> m = ('Total Recall', 1990, 7.5)
13  >>> m
14  ('Total Recall', 1990, 7.5)
15  >>> len(m)
16  3
17  >>> m[:2]
18  ('Total Recall', 1990)
19  >>>
20  >>> (x, y) = (1, 2)
21  >>> x
22  1
23  >>> y
24  2
25  >>> single = ('hi',)
26  >>> single
27  ('hi',)
```

immutable
(read-only)

parallel assignment
(parentheses are
often optional)

tuple with one element
(Notice the special syntax!)

HW: tuple02.py

5

```
 4    def get_movie_info():
 5        # contact database,
 6        # fetch info from a website, etc.
 7        return ('Total Recall', 1990, 7.5)
 8
 9
10    def main():
11        (title, year, score) = get_movie_info()
12        print('Title:', title)
13        print('Year:', year)
14        print('Score:', score)
```

using this method, a function can return **multiple values**

value unpacking

```
 1    >>> a = 3
 2    >>> b = 9
 3    >>> a
 4    3
 5    >>> b
 6    9
 7    >>> a, b = b, a
 8    >>> a
 9    9
10    >>> b
11    3
12    >>>
```

Swap two variables.
No temp variable is needed :)

List comprehension: a compact way for building lists

```
1   >>> nums = [1, 2, 3, 4]
2   >>> squares = [n*n for n in nums]
3   >>> squares
4   [1, 4, 9, 16]
```

```
1   >>> nums = [1, 2, 3, 4]
2   >>> squares = []
3   >>> for n in nums:
4   ...        squares.append(n*n)
5   ...
6   >>> squares
7   [1, 4, 9, 16]
```

Generally:

[*expr*   for   *var*   in   *list*]

Optional „if":

```
1   >>> nums = [8, 3, 2, 1, 5, 9, 2]
2   >>> small = [n for n in nums if n <= 2]
3   >>> small
4   [2, 1, 2]
5   >>>
```

it keeps only those elements that satisy the condition

Exercise

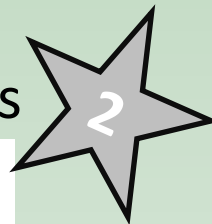Solve the following exercises with list comprehensions.

Link: https://arato.inf.unideb.hu/szathmary.laszlo/pmwiki/index.php?n=EnPy3.20120818d

Common operation: reverse a sequence

```
1   >>> s = 'Python rulz'
2   >>> s[::-1]
3   'zlur nohtyP'
4   >>>
5   >>> li = [23, 76, 84, 12]
6   >>> li[::-1]
7   [12, 84, 76, 23]
8   >>>
```

from the beginning to the end,
but with a reversed step
(it returns a new sequence)

Raising to a power; int and long types

2

```
1   >>> 2**3
2   8
3   >>> 2**64
4   18446744073709551616L
5   >>> 2**128
6   340282366920938463463374607431768211456L
7   >>>
8   >>> import sys
9   >>> sys.maxint
10  9223372036854775807
11  >>> a = sys.maxint + 1
12  >>> a
13  9223372036854775808L
14  >>> type(sys.maxint)
15  <type 'int'>
16  >>> type(a)
17  <type 'long'>
```

Python can handle arbitrarily
large integers
(only depends on the memory)

here: 64 bit int (2**63 - 1)

instead of an overflow, its type
is changed automatically from
„int" to „long"

Python 3: there is only *int* type, but
in the case of big numbers it behaves
like *long* .

9

if / elif / else

```python
4  def main(num):
5      if num < 0:
6          print ('Negative number.')
7      elif num == 0:
8          print('Zero.')
9      elif num < 100:
10         print('Less than 100.')
11     else:
12         print('More than 100.')    # >= 100, actually
```

Instead of „else if" we write „elif".

How to memorize that? The word „elif" is just as long as the word „else"…

Guido van Rossum ✓
@gvanrossum

Random Python History thing: I stole Python's 'elif'
from the C Preprocessor.
gcc.gnu.org/onlinedocs/cpp...

7:10 PM · Jun 22, 2019 · Twitter Web Client

211 Retweets   16 Quote Tweets   1,133 Likes

see also https://gcc.gnu.org/onlinedocs/cpp/Elif.html#Elif

for

```
 4   def main():
 5       li = ['alfa', 'beta', 'gamma']
 6
 7       for e in li:
 8           print(e)
 9
10       for index, e in enumerate(li):
11           print(index, e)
```

alfa
beta
gamma

0 alfa
1 beta
2 gamma

It's a common case that we also need the indexes of the elements.
Use the `enumerate()` function, which is also an iterator in Python 3.

See also `enumerate(my_list, start=1)`.

break / continue
pass

```python
 4  def main():
 5      cnt = 0
 6      while True:
 7          cnt += 1
 8          if cnt == 42:
 9              break
10      #
11      print(cnt)     # 42

13      li = ['ananas', 'banana', 'orange']
14      for e in li:
15          if e == 'banana':
16              continue
17          #
18          print(e)


21  def palindrome(s):
22      pass     # TODO...
```

42

ananas
orange

empty statement

docstring

Documentation should be one line:

```python
4  def square(num):
5      """Return the square of a given number."""
6      return num ** 2
```

Or multiline. In this case the first line should be a short summary in one line. Then leave a line empty, and then you can detail the goal of the function, how it works, what are its side effects, etc.

```python
9   def square_v2(num):
10      """Return the square of a given number.
11
12      Calculate the square of the input number."""
13      return num * num
```

(see also: annex F)

Document your programs! Get used to it!

optional parameters / default parameter values

```
>>> def greet(name, greetings="Hello"):
...     print("{g}, {n}!".format(g=greetings, n=name))
...
>>> greet("Laszlo")
Hello, Laszlo!
>>>
>>> greet("Laszlo", greetings="Hola")
Hola, Laszlo!
>>>
>>> greet("Laszlo", "Bonjour")
Bonjour, Laszlo!
```

optional parameters (another example)

```python
 4   def hello(name, repeat=1, postfix=''):
 5       for i in range(repeat):
 6           print(name + postfix)
 7
 8
 9   def main():
10       hello('Laci')
11       print('#' * 10)
12       hello('Laci', repeat=3)
13       print('#' * 10)
14       hello('Laci', postfix='!')
15       print('#' * 10)
16       hello('Laci', repeat=3, postfix='!')
17       print('#' * 10)
18       print('#' * 10)
19       hello('Laci', 3)
20       print('#' * 10)
21       hello('Laci', 3, '')
22       print('#' * 10)
23       hello('Laci', '')          # error
```

Exercises

1. [20120818a] distance between two points (tuple)
2. [20120818d] list comprehensions (to complete)
3. [20120818e] multiples of 3 or 5 (PE #1)
   (this time with list comprehensions)
4. [20120920e] line break
5. [20130211b] diamond
6. [20120818f] sum square difference (PE #6)
7. [20130305a] XOR (Warning! Requires thinking!)