PEP 8 -- Style Guide for Python Code

Code Lay-out

Indentation

Use 4 spaces per indentation level.

Continuation lines should align wrapped elements either vertically using Python's implicit line joining inside parentheses, brackets and braces, or using a hanging indent. When using a hanging indent the following should be considered; there should be no arguments on the first line and further indentation should be used to clearly distinguish itself as a continuation line.

Yes:

```
# Aligned with opening delimiter.
foo = long_function_name(var_one, var_two,
                         var_three, var_four)

# Add 4 spaces (an extra level of indentation) to distinguish arguments from the rest.
def long_function_name(
        var_one, var_two, var_three,
        var_four):
    print(var_one)

# Hanging indents should add a level.
foo = long_function_name(
    var_one, var_two,
    var_three, var_four)
```

No:

```
# Arguments on first line forbidden when not using vertical alignment.
foo = long_function_name(var_one, var_two,
    var_three, var_four)

# Further indentation required as indentation is not distinguishable.
def long_function_name(
    var_one, var_two, var_three,
    var_four):
    print(var_one)
```

The closing brace/bracket/parenthesis on multiline constructs may either line up under the first non-whitespace character of the last line of list, as in:

```
my_list = [
    1, 2, 3,
    4, 5, 6,
    ]
result = some_function_that_takes_arguments(
    'a', 'b', 'c',
    'd', 'e', 'f',
    )
```

or it may be lined up under the first character of the line that starts the multiline construct, as in:

```
my_list = [
    1, 2, 3,
    4, 5, 6,
]
result = some_function_that_takes_arguments(
    'a', 'b', 'c',
    'd', 'e', 'f',
)
```

Tabs or Spaces?

Spaces are the preferred indentation method.

Tabs should be used solely to remain consistent with code that is already indented with tabs.

Python 3 disallows mixing the use of tabs and spaces for indentation.

Python 2 code indented with a mixture of tabs and spaces should be converted to using spaces exclusively.

When invoking the Python 2 command line interpreter with the `-t` option, it issues warnings about code that illegally mixes tabs and spaces. When using `-tt` these warnings become errors. These options are highly recommended!

Maximum Line Length

Limit all lines to a maximum of 79 characters.

For flowing long blocks of text with fewer structural restrictions (docstrings or comments), the line length should be limited to 72 characters.

Limiting the required editor window width makes it possible to have several files open side-by-side, and works well when using code review tools that present the two versions in adjacent columns.

Backslashes may still be appropriate at times. For example, long, multiple with-statements cannot use implicit continuation, so backslashes are acceptable:

```
with open('/file/you/want/to/read') as file_1, \
     open('/file/being/written', 'w') as file_2:
    file_2.write(file_1.read())
```

Should a Line Break Before or After a Binary Operator?

For decades the recommended style was to break after binary operators. But this can hurt readability in two ways: the operators tend to get scattered across different columns on the screen, and each operator is moved away from its operand and onto the previous line. Here, the eye has to do extra work to tell which items are added and which are subtracted:

```
# No: operators sit far away from their operands
income = (gross_wages +
          taxable_interest +
          (dividends - qualified_dividends) -
          ira_deduction -
          student_loan_interest)
```

To solve this readability problem, mathematicians and their publishers follow the opposite convention. Donald Knuth explains the traditional rule in his Computers and Typesetting series: "Although formulas within a paragraph always break after binary operations and relations, displayed formulas always break before binary operations".

Following the tradition from mathematics usually results in more readable code:

```
# Yes: easy to match operators with operands
income = (gross_wages
          + taxable_interest
          + (dividends - qualified_dividends)
          - ira_deduction
          - student_loan_interest)
```

In Python code, it is permissible to break before or after a binary operator, as long as the convention is consistent locally. For new code Knuth's style is suggested.

Imports

- Imports should usually be on separate lines:

```
Yes: import os
     import sys

No:  import sys, os
```

It's okay to say this though:

```
from subprocess import Popen, PIPE
```

- Imports are always put at the top of the file, just after any module comments and docstrings, and before module globals and constants.

Imports should be grouped in the following order:

1. Standard library imports.
2. Related third party imports.
3. Local application/library specific imports.

You should put a blank line between each group of imports.

- Absolute imports are recommended, as they are usually more readable and tend to be better behaved (or at least give better error messages) if the import system is incorrectly configured (such as when a directory inside a package ends up on sys.path):

```
import mypkg.sibling
from mypkg import sibling
from mypkg.sibling import example
```

However, explicit relative imports are an acceptable alternative to absolute imports, especially when dealing with complex package layouts where using absolute imports would be unnecessarily verbose:

```
from . import sibling
from .sibling import example
```

Standard library code should avoid complex package layouts and always use absolute imports.

Implicit relative imports should never be used and have been removed in Python 3.

- When importing a class from a class-containing module, it's usually okay to spell this:

```
from myclass import MyClass
from foo.bar.yourclass import YourClass
```

If this spelling causes local name clashes, then spell them explicitly:

```
import myclass
import foo.bar.yourclass
```

and use "myclass.MyClass" and "foo.bar.yourclass.YourClass".

- Wildcard imports (`from <module> import *`) should be avoided, as they make it unclear which names are present in the namespace, confusing both readers and many automated tools. There is one defensible use case for a wildcard import, which is to republish an internal interface as part of a public API (for example, overwriting a pure Python implementation of an interface with the definitions from an optional accelerator module and exactly which definitions will be overwritten isn't known in advance).

When republishing names this way, the guidelines below regarding public and internal interfaces still apply.

String Quotes

In Python, single-quoted strings and double-quoted strings are the same. This PEP does not make a recommendation for this. Pick a rule and stick to it. When a string contains single or double quote characters, however, use the other one to avoid backslashes in the string. It improves readability.

For triple-quoted strings, always use double quote characters to be consistent with the docstring convention in PEP 257.

Whitespace in Expressions and Statements

Pet Peeves

Avoid extraneous whitespace in the following situations:

- Immediately inside parentheses, brackets or braces.

```
Yes: spam(ham[1], {eggs: 2})
No:  spam( ham[ 1 ], { eggs: 2 } )
```

- Between a trailing comma and a following close parenthesis.

```
Yes: foo = (0,)
No:  bar = (0, )
```

- Immediately before a comma, semicolon, or colon:

```
Yes: if x == 4: print x, y; x, y = y, x
No:  if x == 4 : print x , y ; x , y = y , x
```

- However, in a slice the colon acts like a binary operator, and should have equal amounts on either side (treating it as the operator with the lowest priority). In an extended slice, both colons must have the same amount of spacing applied. Exception: when a slice parameter is omitted, the space is omitted.

Yes:

```
ham[1:9], ham[1:9:3], ham[:9:3],
ham[1::3], ham[1:9:]
ham[lower:upper], ham[lower:upper:],
ham[lower::step]
ham[lower+offset : upper+offset]
ham[: upper_fn(x) : step_fn(x)], ham[::
step_fn(x)]
ham[lower + offset : upper + offset]
```

No:

```
ham[lower + offset:upper + offset]
ham[1: 9], ham[1 :9], ham[1:9 :3]
ham[lower : : upper]
ham[ : upper]
```

- Immediately before the open parenthesis that starts the argument list of a function call:

```
Yes: spam(1)
No:  spam (1)
```

- Immediately before the open parenthesis that starts an indexing or slicing:

```
Yes: dct['key'] = lst[index]
No:  dct ['key'] = lst [index]
```

- More than one space around an assignment (or other) operator to align it with another.

Yes:

```
x = 1
y = 2
long_variable = 3
```

No:

```
x             = 1
y             = 2
long_variable = 3
```

Other Recommendations

- Avoid trailing whitespace anywhere.
- Always surround these binary operators with a single space on either side: assignment (=), augmented assignment (+=, -= etc.), comparisons (==, <, >, !=, <>, <=, >=, in, not in, is, is not), Booleans (and, or, not).
- If operators with different priorities are used, consider adding whitespace around the operators with the lowest priority(ies). Use your own judgment; however, never use more than one space, and always have the same amount of whitespace on both sides of a binary operator.

Yes:

```
i = i + 1
submitted += 1
x = x*2 - 1
hypot2 = x*x + y*y
c = (a+b) * (a-b)
```

No:

```
i=i+1
submitted +=1
x = x * 2 - 1
hypot2 = x * x + y * y
c = (a + b) * (a - b)
```

- Function annotations should use the normal rules for colons and always have spaces around the `->` arrow if present. (See Function Annotations below for more about function annotations.)whitespace on both sides of a binary operator.

Yes:

```
def munge(input: AnyStr): ...
def munge() -> AnyStr: ...
```

No:

```
def munge(input:AnyStr): ...
def munge()->PosInt: ...
```

- Don't use spaces around the = sign when used to indicate a keyword argument, or when used to indicate a default value for an unannotated function parameter.

Yes:

```
def complex(real, imag=0.0):
    return magic(r=real, i=imag)
```

No:

```
def complex(real, imag = 0.0):
    return magic(r = real, i = imag)
```

When combining an argument annotation with a default value, however, do use spaces around the = sign:

Yes:

```
def munge(sep: AnyStr = None): ...
def munge(input: AnyStr, sep: AnyStr = None, limit=1000): ...
```

No:

```
def munge(input: AnyStr=None): ...
def munge(input: AnyStr, limit = 1000): ...
```

- Compound statements (multiple statements on the same line) are generally discouraged.

Yes:

```
if foo == 'blah':
    do_blah_thing()
do_one()
do_two()
do_three()
```

Rather not:

```
if foo == 'blah': do_blah_thing()
do_one(); do_two(); do_three()
```

- While sometimes it's okay to put an if/for/while with a small body on the same line, never do this for multi-clause statements. Also avoid folding such long lines!

Rather not:

```
if foo == 'blah': do_blah_thing()
for x in lst: total += x
while t < 10: t = delay()
```

Definitely not:

```
if foo == 'blah': do_blah_thing()
else: do_non_blah_thing()

try: something()
finally: cleanup()

do_one(); do_two(); do_three(long, argument,
                             list, like, this)

if foo == 'blah': one(); two(); three()
```

When to Use Trailing Commas

Pet Peeves

Trailing commas are usually optional, except they are mandatory when making a tuple of one element (and in Python 2 they have semantics for the print statement). For clarity, it is recommended to surround the latter in (technically redundant) parentheses.

Yes:

```
FILES = ('setup.cfg',)
```

OK, but confusing:

```
FILES = 'setup.cfg',
```

When trailing commas are redundant, they are often helpful when a version control system is used, when a list of values, arguments or imported items is expected to be extended over time. The pattern is to put each value (etc.) on a line by itself, always adding a trailing comma, and add the close parenthesis/bracket/brace on the next line. However it does not make sense to have a trailing comma on the same line as the closing delimiter (except in the above case of singleton tuples).

Yes:

```
FILES = [
    'setup.cfg',
    'tox.ini',
    ]
initialize(FILES,
           error=True,
           )
```

No:

```
FILES = ['setup.cfg', 'tox.ini',]
initialize(FILES, error=True,)
```

Comments

Comments that contradict the code are worse than no comments. Always make a priority of keeping the comments up-to-date when the code changes!

Comments should be complete sentences. The first word should be capitalized, unless it is an identifier that begins with a lower case letter (never alter the case of identifiers!).

Block comments generally consist of one or more paragraphs built out of complete sentences, with each sentence ending in a period.

You should use two spaces after a sentence-ending period in multi-sentence comments, except after the final sentence.

When writing English, follow Strunk and White.

Python coders from non-English speaking countries: please write your comments in English, unless you are 120% sure that the code will never be read by people who don't speak your language.

Block Comments

Block comments generally apply to some (or all) code that follows them, and are indented to the same level as that code. Each line of a block comment starts with a # and a single space (unless it is indented text inside the comment).

Paragraphs inside a block comment are separated by a line containing a single #.

Inline Comments

Use inline comments sparingly.

An inline comment is a comment on the same line as a statement. Inline comments should be separated by at least two spaces from the statement. They should start with a # and a single space.

Inline comments are unnecessary and in fact distracting if they state the obvious. Don't do this:

```
x = x + 1                 # Increment x
```

But sometimes, this is useful:

```
x = x + 1                 # Compensate
for border
```

Documentation Strings

Conventions for writing good documentation strings (a.k.a. "docstrings") are immortalized in PEP 257.

- Write docstrings for all public modules, functions, classes, and methods. Docstrings are not necessary for non-public methods, but you should have a comment that describes what the method does. This comment should appear after the def line.tions.)whitespace on both sides of a binary operator.
- PEP 257 describes good docstring conventions. Note that most importantly, the """ that ends a multiline docstring should be on a line by itself:

```
"""Return a foobang

Optional plotz says to frobnicate the
bizbaz first.
"""
```

- For one liner docstrings, please keep the closing """ on the same line.

Naming Conventions

The naming conventions of Python's library are a bit of a mess, so we'll never get this completely consistent -- nevertheless, here are the currently recommended naming standards. New modules and packages (including third party frameworks) should be written to these standards, but where an existing library has a different style, internal consistency is preferred.

Overriding Principle

Names that are visible to the user as public parts of the API should follow conventions that reflect usage rather than implementation.

Descriptive: Naming Styles

There are a lot of different naming styles. It helps to be able to recognize what naming style is being used, independently from what they are used for.

The following naming styles are commonly distinguished:

- b (single lowercase letter)
- B (single uppercase letter)
- lowercase
- lower_case_with_underscores
- UPPERCASE
- UPPER_CASE_WITH_UNDERSCORES
- CapitalizedWords (or CapWords, or CamelCase -- so named because of the bumpy look of its letters [4]). This is also sometimes known as StudlyCaps.
- Note: When using acronyms in CapWords, capitalize all the letters of the acronym. Thus HTTPServerError is better than HttpServerError.
- mixedCase (differs from CapitalizedWords by initial lowercase character!)
- Capitalized_Words_With_Underscores (ugly!)

There's also the style of using a short unique prefix to group related names together. This is not used much in Python, but it is mentioned for completeness. For example, the os.stat() function returns a tuple whose items traditionally have names like st_mode, st_size, st_mtime and so on. (This is done to emphasize the correspondence with the fields of the POSIX system call struct, which helps programmers familiar with that.)

The X11 library uses a leading X for all its public functions. In Python, this style is generally deemed unnecessary because attribute and method names are prefixed with an object, and function names are prefixed with a module name.

In addition, the following special forms using leading or trailing underscores are recognized (these can generally be combined with any case convention):

- _single_leading_underscore: weak "internal use" indicator. E.g. from M import * does not import objects whose names start with an underscore.(single uppercase letter)
- single_trailing_underscore_: used by convention to avoid conflicts with Python keyword, e.g.

```
Tkinter.Toplevel(master, class_='ClassName')
```

- __double_leading_underscore: when naming a class attribute, invokes name mangling (inside class FooBar, __boo becomes _FooBar__boo; see below).
- __double_leading_and_trailing_underscore__: "magic" objects or attributes that live in user-controlled namespaces. E.g. __init__, __import__ or __file__. Never invent such names; only use them as documented.

Prescriptive: Naming Conventions

Names to Avoid

Never use the characters 'l' (lowercase letter el), 'O' (uppercase letter oh), or 'I' (uppercase letter eye) as single character variable names.

In some fonts, these characters are indistinguishable from the numerals one and zero. When tempted to use 'l', use 'L' instead.

ASCII Compatibility

Identifiers used in the standard library must be ASCII compatible as described in the policy section of PEP 3131.

Package and Module Names

Modules should have short, all-lowercase names. Underscores can be used in the module name if it improves readability. Python packages should also have short, all-lowercase names, although the use of underscores is discouraged.

When an extension module written in C or C++ has an accompanying Python module that provides a higher level (e.g. more object oriented) interface, the C/C++ module has a leading underscore (e.g. _socket).

Class Names

Class names should normally use the CapWords convention.

The naming convention for functions may be used instead in cases where the interface is documented and used primarily as a callable.

Note that there is a separate convention for builtin names: most builtin names are single words (or two words run together), with the CapWords convention used only for exception names and builtin constants.

Type Variable Names

Names of type variables introduced in PEP 484 should normally use CapWords preferring short names: T, AnyStr, Num. It is recommended to add suffixes _co or _contra to the variables used to declare covariant or contravariant behavior correspondingly:

```
from typing import TypeVar

VT_co = TypeVar('VT_co', covariant=True)
KT_contra = TypeVar('KT_contra', contravariant=True)
```

Exception Names

Because exceptions should be classes, the class naming convention applies here. However, you should use the suffix "Error" on your exception names (if the exception actually is an error).

Global Variable Names

(Let's hope that these variables are meant for use inside one module only.) The conventions are about the same as those for functions.

Modules that are designed for use via from M import * should use the __all__ mechanism to prevent exporting globals, or use the older convention of prefixing such globals with an underscore (which you might want to do to indicate these globals are "module non-public").

Function and Variable Names

Function names should be lowercase, with words separated by underscores as necessary to improve readability.

Variable names follow the same convention as function names.

mixedCase is allowed only in contexts where that's already the prevailing style (e.g. threading.py), to retain backwards compatibility.

Function and Method Arguments

Always use self for the first argument to instance methods.

Always use cls for the first argument to class methods.

If a function argument's name clashes with a reserved keyword, it is generally better to append a single trailing underscore rather than use an abbreviation or spelling corruption. Thus class_ is better than clss. (Perhaps better is to avoid such clashes by using a synonym.)

Method Names and Instance Variables

Use the function naming rules: lowercase with words separated by underscores as necessary to improve readability.

Use one leading underscore only for non-public methods and instance variables.

To avoid name clashes with subclasses, use two leading underscores to invoke Python's name mangling rules.

Python mangles these names with the class name: if class Foo has an attribute named __a, it cannot be accessed by Foo.__a. (An insistent user could still gain access by calling Foo._Foo__a.) Generally, double leading underscores should be used only to avoid name conflicts with attributes in classes designed to be subclassed.

Note: there is some controversy about the use of __names (see below).

Constants

Constants are usually defined on a module level and written in all capital letters with underscores separating words. Examples include MAX_OVERFLOW and TOTAL.

Programming Recommendations

- Comparisons to singletons like None should always be done with is or is not, never the equality operators.

Yes:

```
if foo is None:
```

No:

```
if foo == None:
```

- Use is not operator rather than not ... is. While both expressions are functionally identical, the former is more readable and preferred.

Yes:

```
if foo is not None:
```

No:

```
if not foo is None:
```

- Always use a def statement instead of an assignment statement that binds a lambda expression directly to an identifier.

Yes:

```
def f(x): return 2*x
```

No:

```
f = lambda x: 2*x
```

- Be consistent in return statements. Either all return statements in a function should return an expression, or none of them should. If any return statement returns an expression, any return statements where no value is returned should explicitly state this as return None, and an explicit return statement should be present at the end of the function (if reachable).

Yes:

```
def foo(x):
    if x >= 0:
        return math.sqrt(x)
    else:
        return None

def bar(x):
    if x < 0:
        return None
    return math.sqrt(x)
```

No:

```
def foo(x):
    if x >= 0:
        return math.sqrt(x)

def bar(x):
    if x < 0:
        return
    return math.sqrt(x)
```

- Use ".startswith() and ".endswith() instead of string slicing to check for prefixes or suffixes.

startswith() and endswith() are cleaner and less error prone:

```
Yes: if foo.startswith('bar'):
No:  if foo[:3] == 'bar':
```

- Object type comparisons should always use isinstance() instead of comparing types directly.

```
Yes: if isinstance(obj, int):

No:  if type(obj) is type(1):
```

When checking if an object is a string, keep in mind that it might be a unicode string too! In Python 2, str and unicode have a common base class, basestring, so you can do:

```
if isinstance(obj, basestring):
```

Note that in Python 3, unicode and basestring no longer exist (there is only str) and a bytes object is no longer a kind of string (it is a sequence of integers instead).

- For sequences, (strings, lists, tuples), use the fact that empty sequences are false.

```
Yes: if not seq:
       if seq:

No:  if len(seq):
     if not len(seq):
```

- Don't write string literals that rely on significant trailing whitespace. Such trailing whitespace is visually indistinguishable and some editors (or more recently, reindent.py) will trim them.
- Don't compare boolean values to True or False using ==.

```
Yes:   if greeting:
No:    if greeting == True:
Worse: if greeting is True:
```

This quotation that 'Code is read more often than it is written' was extracted from Daniel Scheufler's blog.
Visit **https://daniel.scheufler.io**

For more information about PEP 8,
Visit **www.python.org/dev/peps/pep-0008/**