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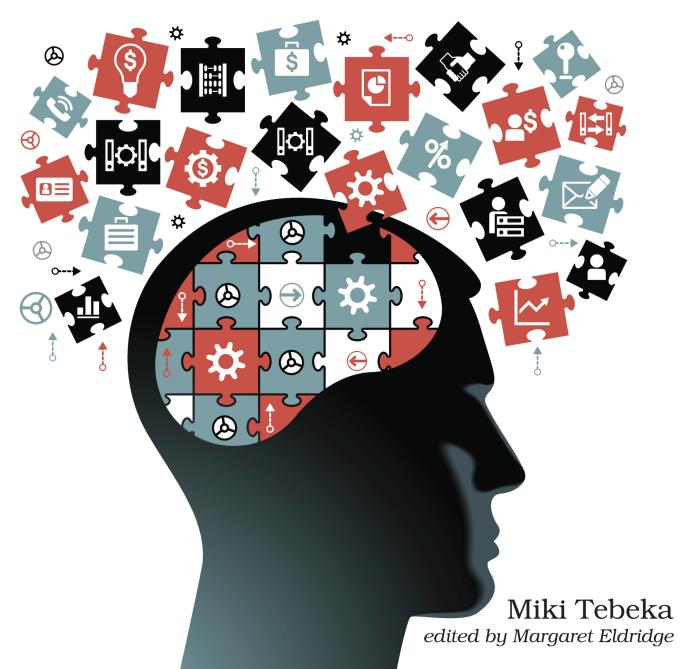
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Puzzle 27

An Inside Job

```
inside.py
def add_n(items, n):
    items += range(n)

items = [1]
add_n(items, 3)
print(items)
```

Guess the Output



Try to guess what the output is before moving to the next page.

This code will print: [1, 0, 1, 2]

In the <u>Call Me Maybe</u> puzzle, we talked about rebinding versus mutation. And most of the time, items += range(n) is translated to items = items + range(n), which is rebinding.

There is a special optimization for += in some cases. Here's what the documentation says (my emphasis):

An augmented assignment expression like x += 1 can be rewritten as x = x + 1 to achieve a similar, but not exactly equal, effect. In the augmented version, x is only evaluated once. Also, when possible, the actual operation is performed in place, meaning that rather than creating a new object and assigning that to the target, the old object is modified instead.

A type defines how the + operator behaves with the _add_ special method and can define _iadd_ as a special case for +=. The documentation says

These methods are called to implement the augmented arithmetic assignments $(+=,-=,=,@=,/=,//=,\%=,*=,<=,>=,\&=,^=,|=)$. These methods should attempt to do the operation in place (modifying self) and return the result (which could be, but does not have to be, self). If a specific method is not defined, the augmented assignment falls back to the normal methods.

The built-in list object defines _iadd_, which calls the extend method.

What will happen if you change the code inside add_n to items = items + range(n)? You will get an exception: TypeError: can only concatenate list (not "range") to list.

In Python 3 the built-in range function returns a range object. Even though it *looks* like a list (len, [], and friends will work), you can't add it to a list.

If you want the rebinding code to work, you'll need to write items = items + list(range(n)) and then the output will be [1].

As a general rule, try not to mutate the object passed to your functions. This style of programming is called *functional* programming. Functional code is easier to test and reason about. Give it a try. It's fun.

Further Reading

Functional Programming on Wikipedia en.wikipedia.org/wiki/Functional programming

Built-in range Documentation docs.python.org/3/library/functions.html#func-range

- "Augmented Assignment Statements" in the Python Reference docs.python.org/3/reference/simple stmts.html#augmented-assignment-statements
- "Functional Programming HOWTO" in the Python Documentation docs.python.org/3/howto/functional.html
- __iadd__ Documentation docs.python.org/3/reference/datamodel.html#object.__iadd__
- "More on Lists" in the Python Documentation docs.python.org/3/tutorial/datastructures.html#more-on-lists