

What if you did
very bad things
with integers

or, How the CPython sausage is made



Photo by Jeremy Bishop on Unsplash

>>> a = 1000

>>> b = 1000

>>> a == b

???

```
>>> a = 1000
```

```
>>> b = 1000
```

```
>>> a == b
```

True

>>> a = 10

>>> b = 10

>>> a == b

???

```
>>> a = 10
```

```
>>> b = 10
```

```
>>> a == b
```

True

>>> a = 1000

>>> b = 1000

>>> a is b

???

```
>>> a = 1000
```

```
>>> b = 1000
```

```
>>> a is b
```

False

>>> a = 10

>>> b = 10

>>> a is b

???

```
>>> a = 10
```

```
>>> b = 10
```

```
>>> a is b
```

True

WAIT



```
#define _PY_NSMALLPOSINTS          257
#define _PY_NSMALLNEGINTS          5
```

```
// ...code trimmed here ... //
```

```
struct _Py_global_objects {
    struct {
        /* Small integers are preallocated in this array so that they
         * can be shared.
        * The integers that are preallocated are those in the range
        * -_PY_NSMALLNEGINTS (inclusive) to _PY_NSMALLPOSINTS (exclusive).
        */
        PyLongObject small_ints[_PY_NSMALLNEGINTS + _PY_NSMALLPOSINTS];
    };
    // ...code trimmed here ... //

} singlenton;
};
```

Woo yeah small integers



What if you were evil...?



What if you were evil...?



```
>>> import ctypes  
  
>>> def mutate_int(an_int, new_value):  
...     ctypes.memmove(id(an_int) + 24, \  
                     id(new_value) + 24, 8)  
  
>>> mutate_int(7, 10)
```

```
>>> for i in range(0, 10):  
...     print(i)
```

0

1

2

3

4

5

6

10

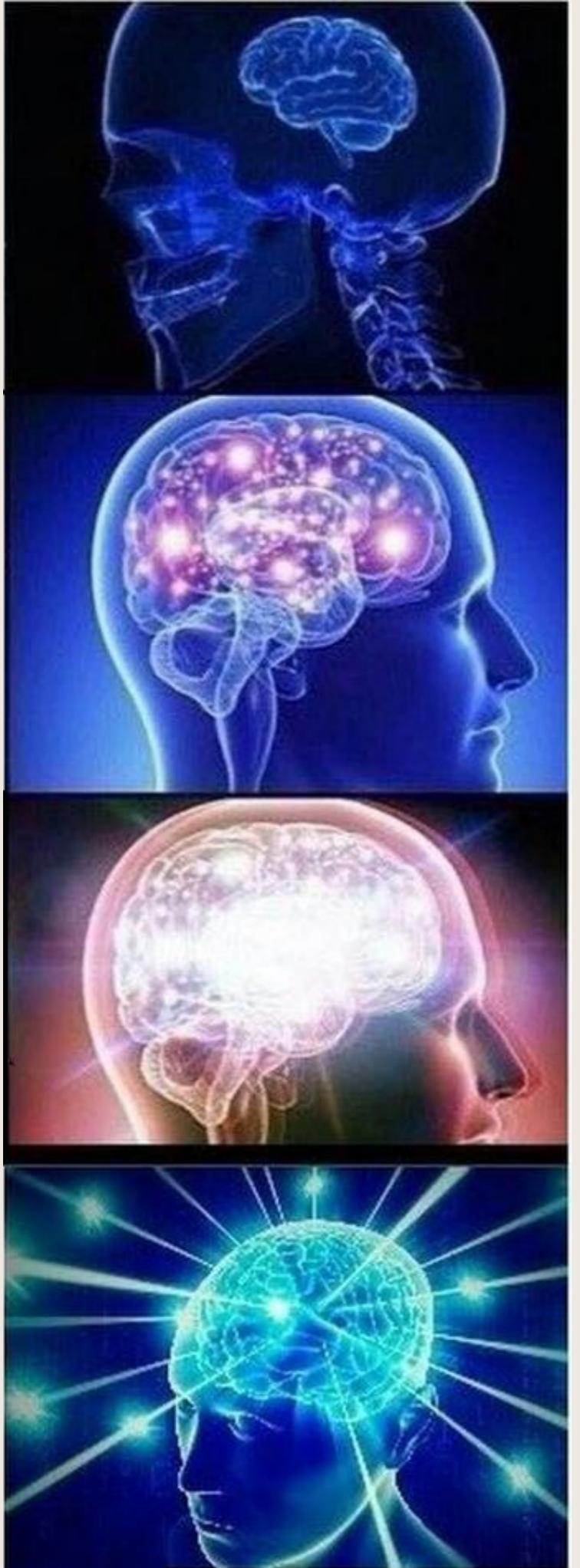
8

9

Math “works” too

```
>>> 7 + 1
```

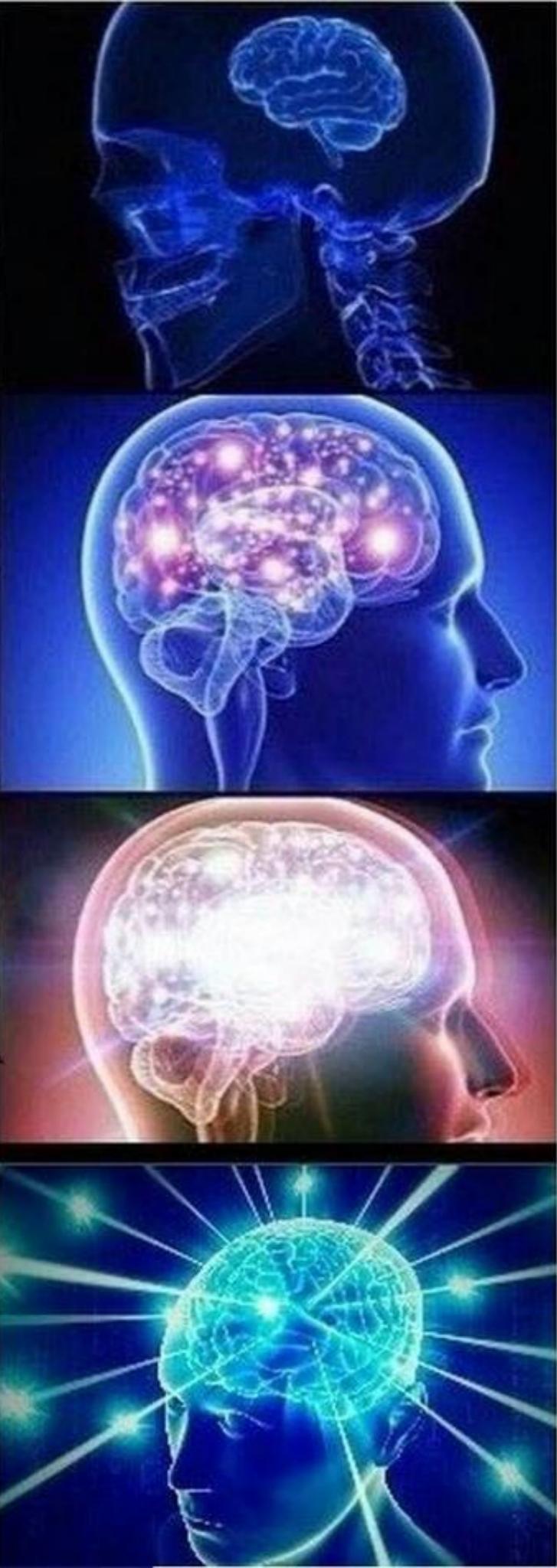
```
11
```



what is truth...?

```
>>> isinstance(True, int)
```

True

A vertical stack of four glowing brain illustrations. The top image shows a side profile of a head with a glowing blue brain. The second image down shows a similar profile with more internal structures visible and glowing pink and purple. The third image shows a front-facing view of a head with a bright white and yellow glowing brain. The bottom image shows a front-facing view with glowing blue lines radiating from the brain, suggesting neural activity or energy.

if you redefine 1...
can you redefine
True?

```
>>> mutate_int(1, 5)
```

```
>>> 1
```

A photograph of a person with long blonde hair wearing a dark baseball cap and a dark hoodie. They are holding a small device, possibly a smoke grenade or a canister, from which a thick, bright orange smoke is billowing out. The person is positioned in the center-left of the frame, with the smoke filling the background and foreground. The overall mood is mysterious and dramatic.

your interpreter
segfaults

```
// weird.py  
mutate_int(1, 2)  
for i in range(0, 10):  
    print(i)
```

```
$ python weird.py
```

```
0  
2  
4  
6  
8
```

Bibliography

<https://kate.io/blog/2017/08/22/weird-python-integers/>

<https://kate.io/blog/2017/08/24/python-constants-in-bytecode/>

<http://www.laurentluce.com/posts/python-integer-objects-implementation/>

<https://github.com/python/cpython/>

<https://docs.python.org/3/c-api/intro.html>

WAIT

