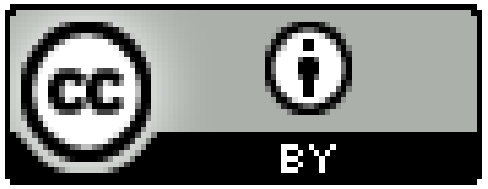
Python

Aliasing



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If the data is immutable, aliases don't matter

Because the data can't change

But if data *can* change, aliases can result in a lot of hard-to-find bugs

Aliasing happens whenever one variable's value is assigned to another variable

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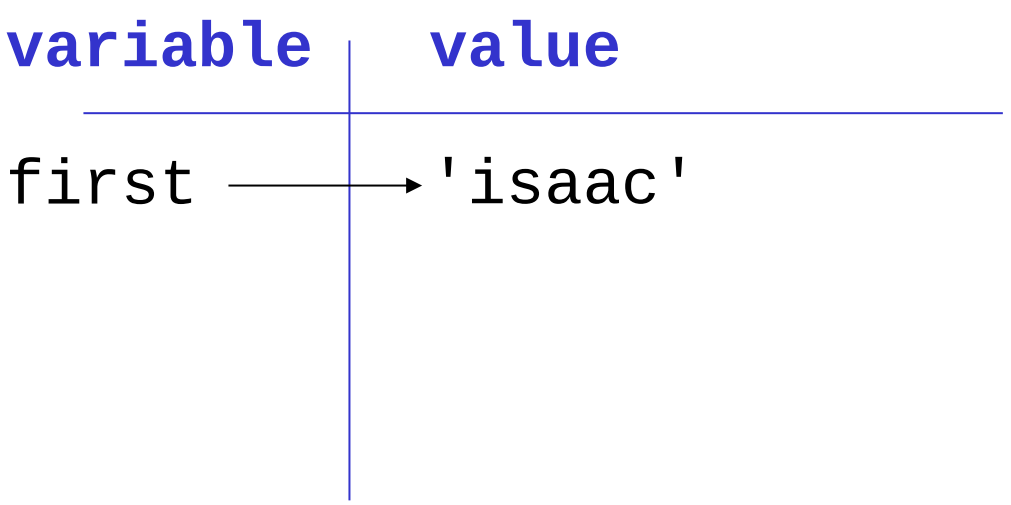
first = 'isaac'
```



Aliasing happens whenever one variable's value is assigned to another variable

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first = 'isaac'
second = first
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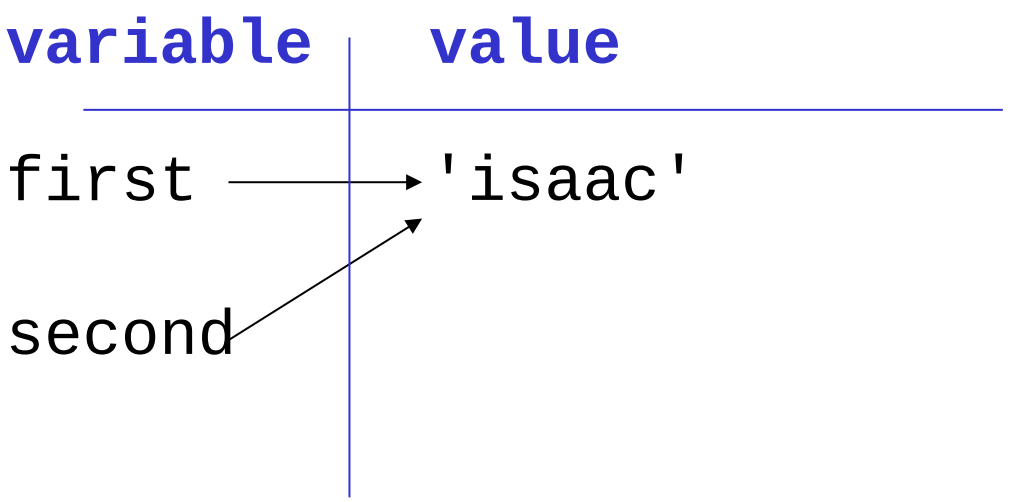

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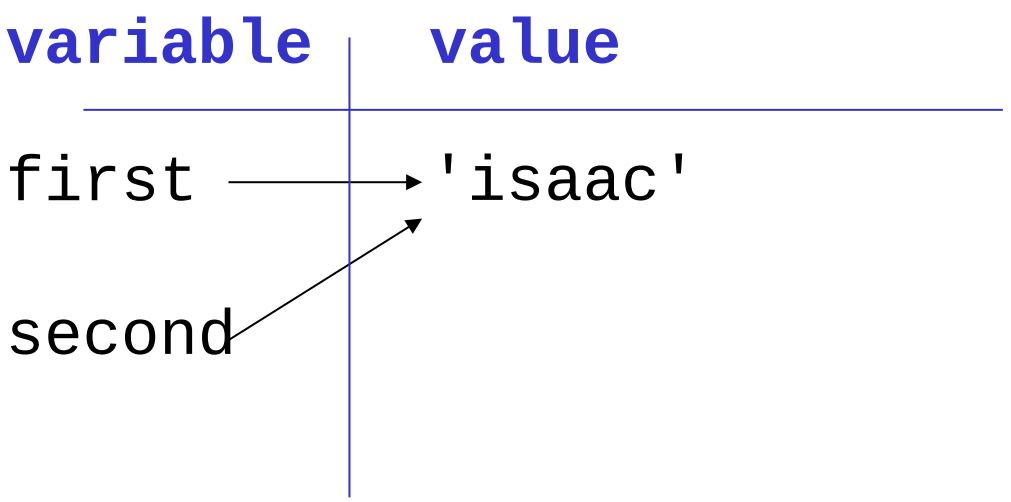

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But as we've already seen…

```
first = first + ' newton'
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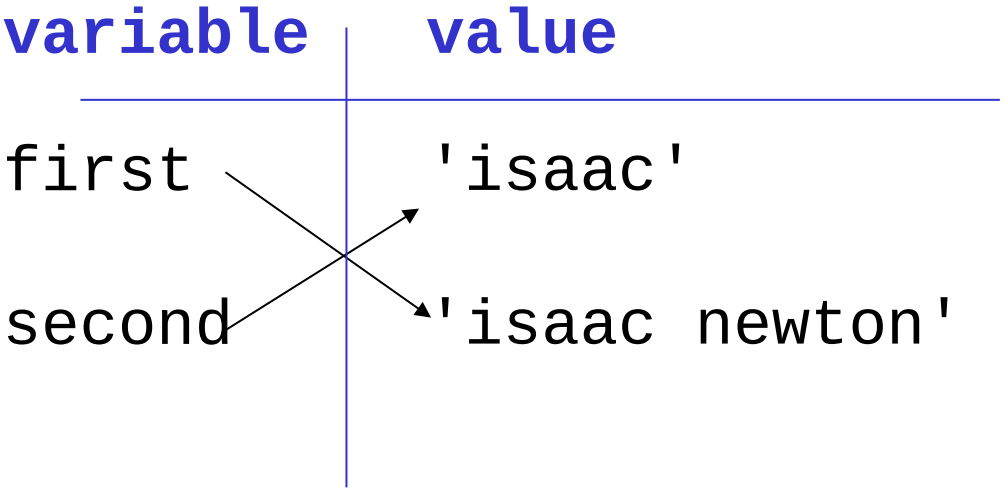

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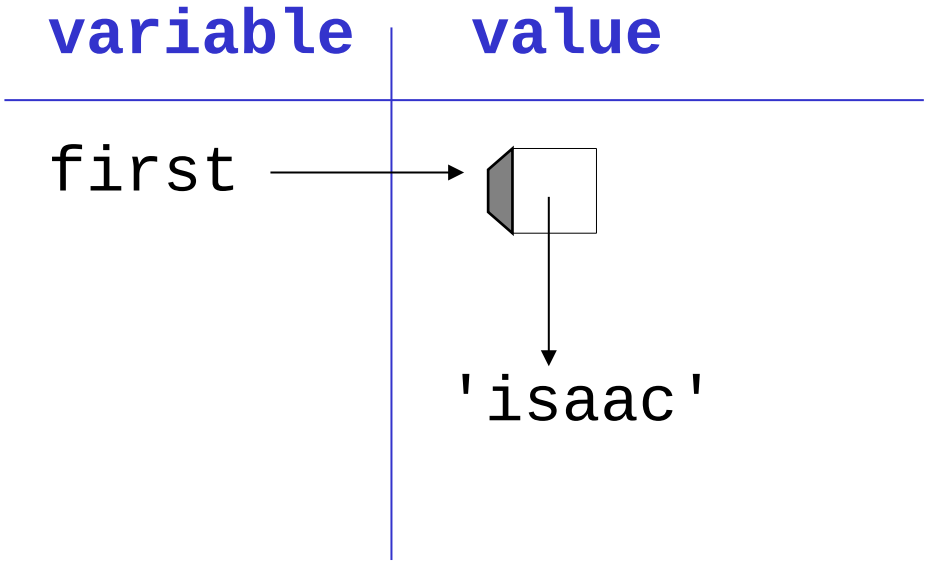

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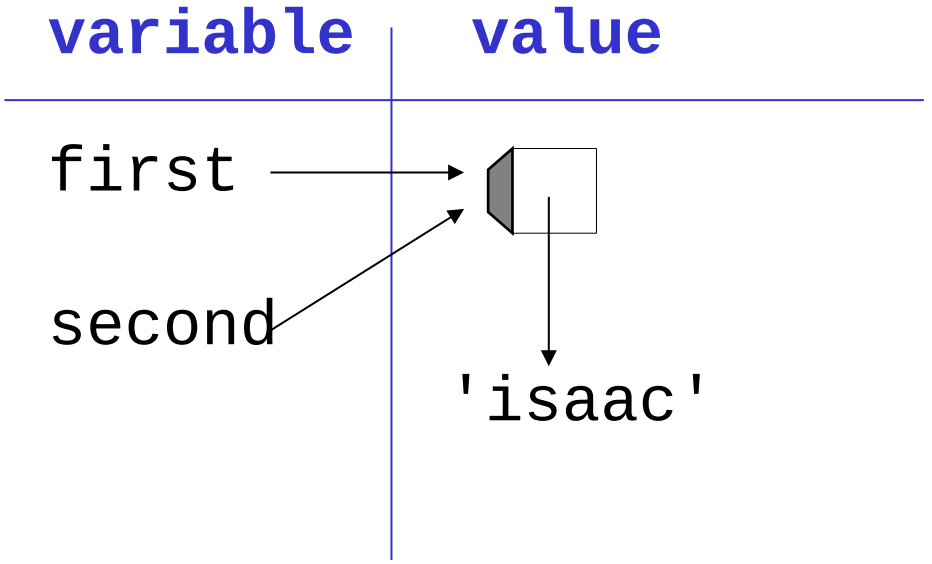

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first = ['isaac']
second = first
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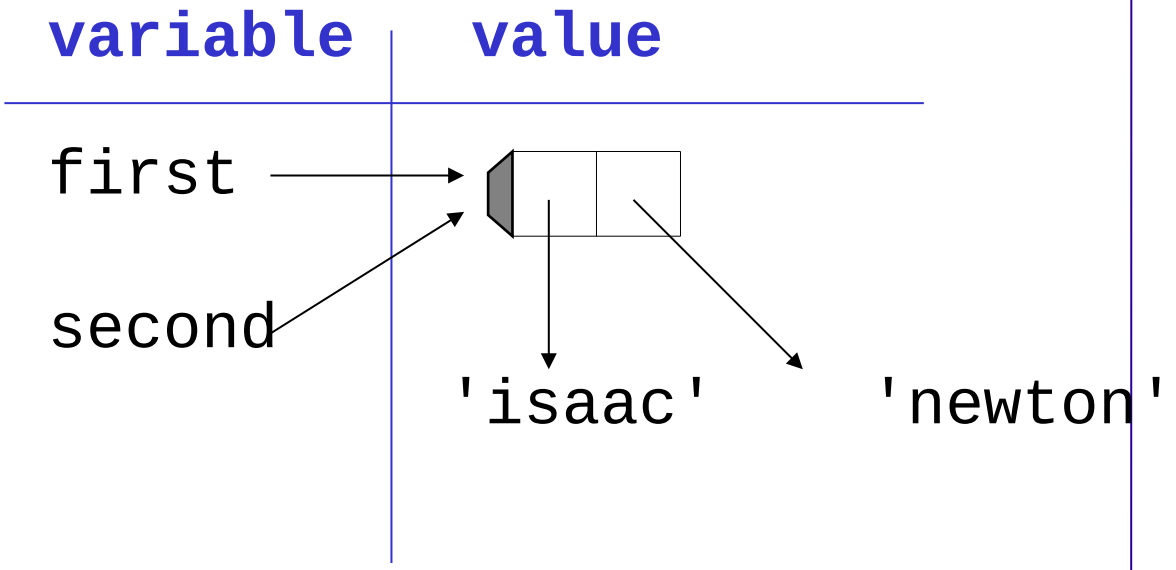
print first
['isaac', 'newton']
```



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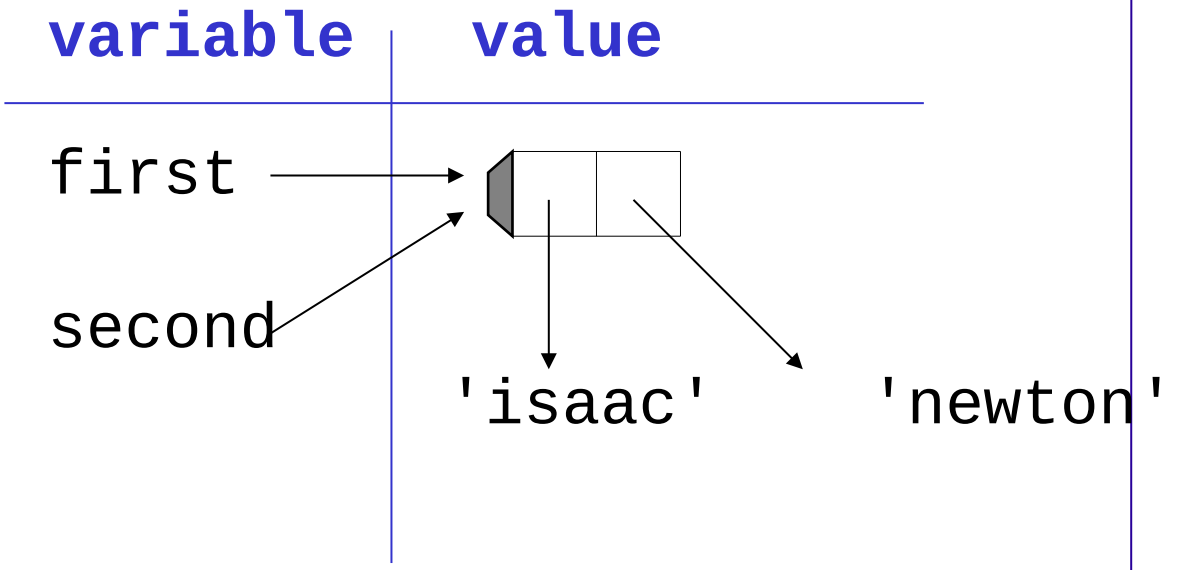

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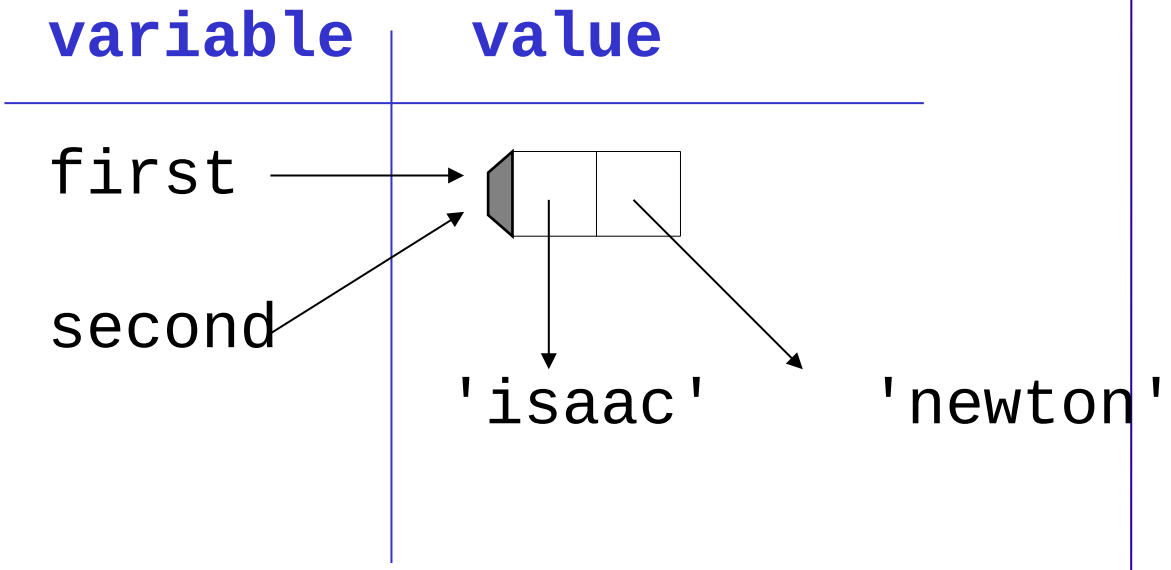

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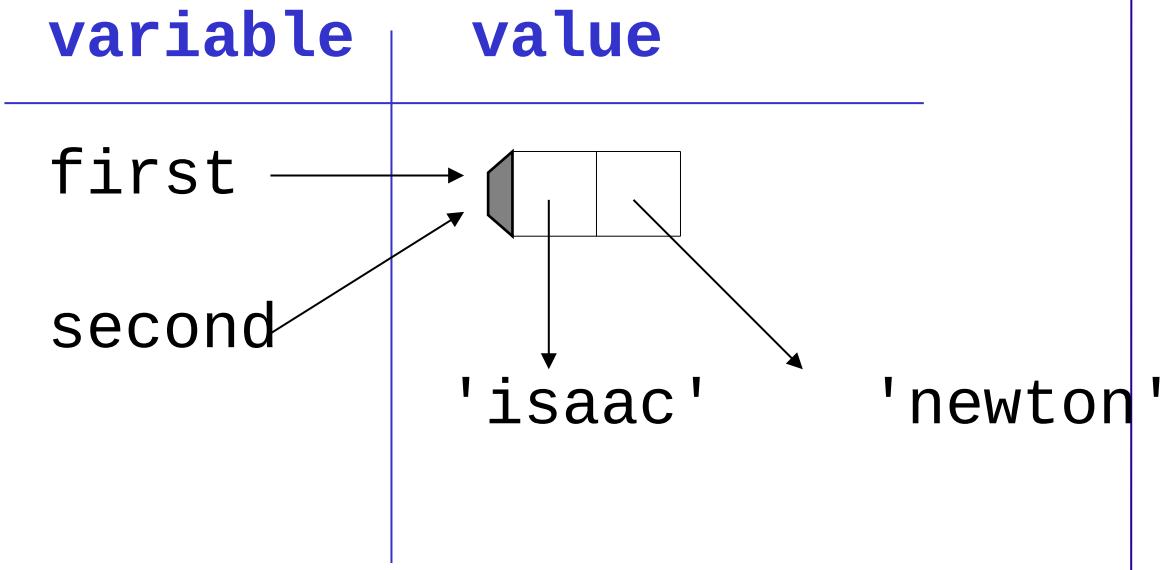

Didn't explicitly

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A *side effect*

Example: use lists of lists

to implement a 2D grid

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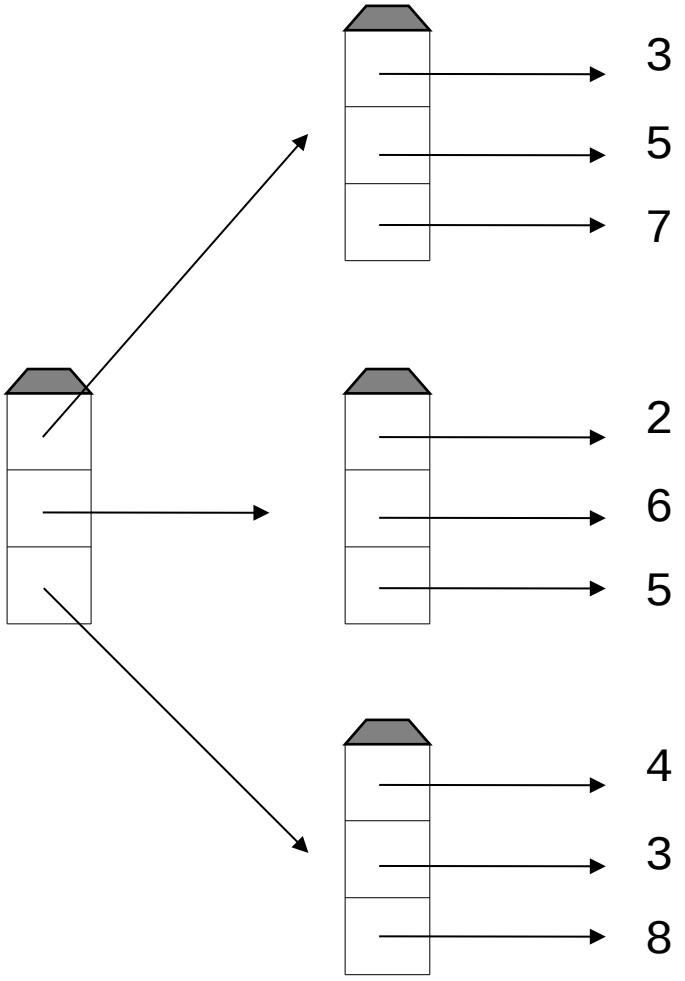
3	2	4
5	6	3
7	5	8



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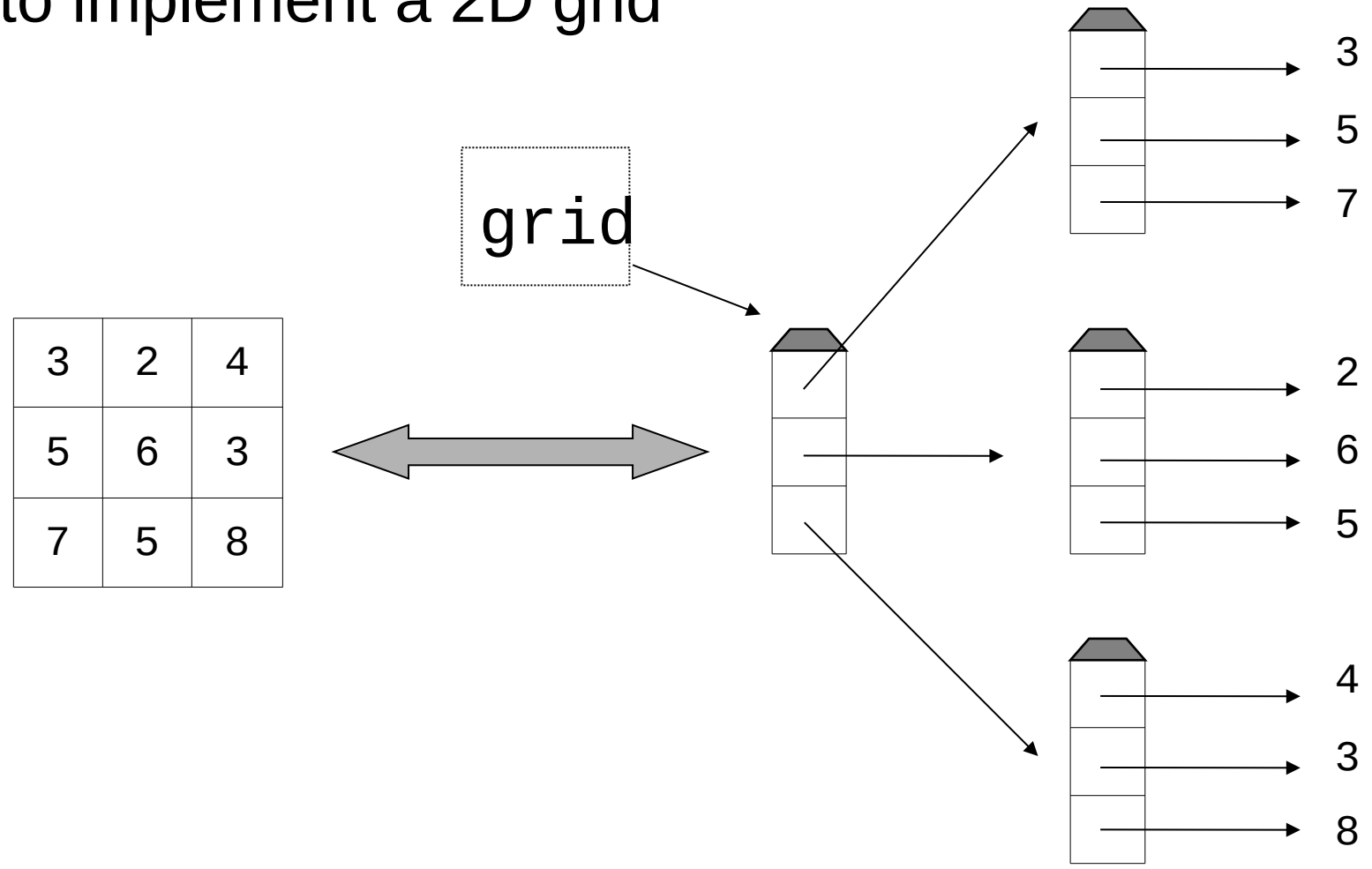

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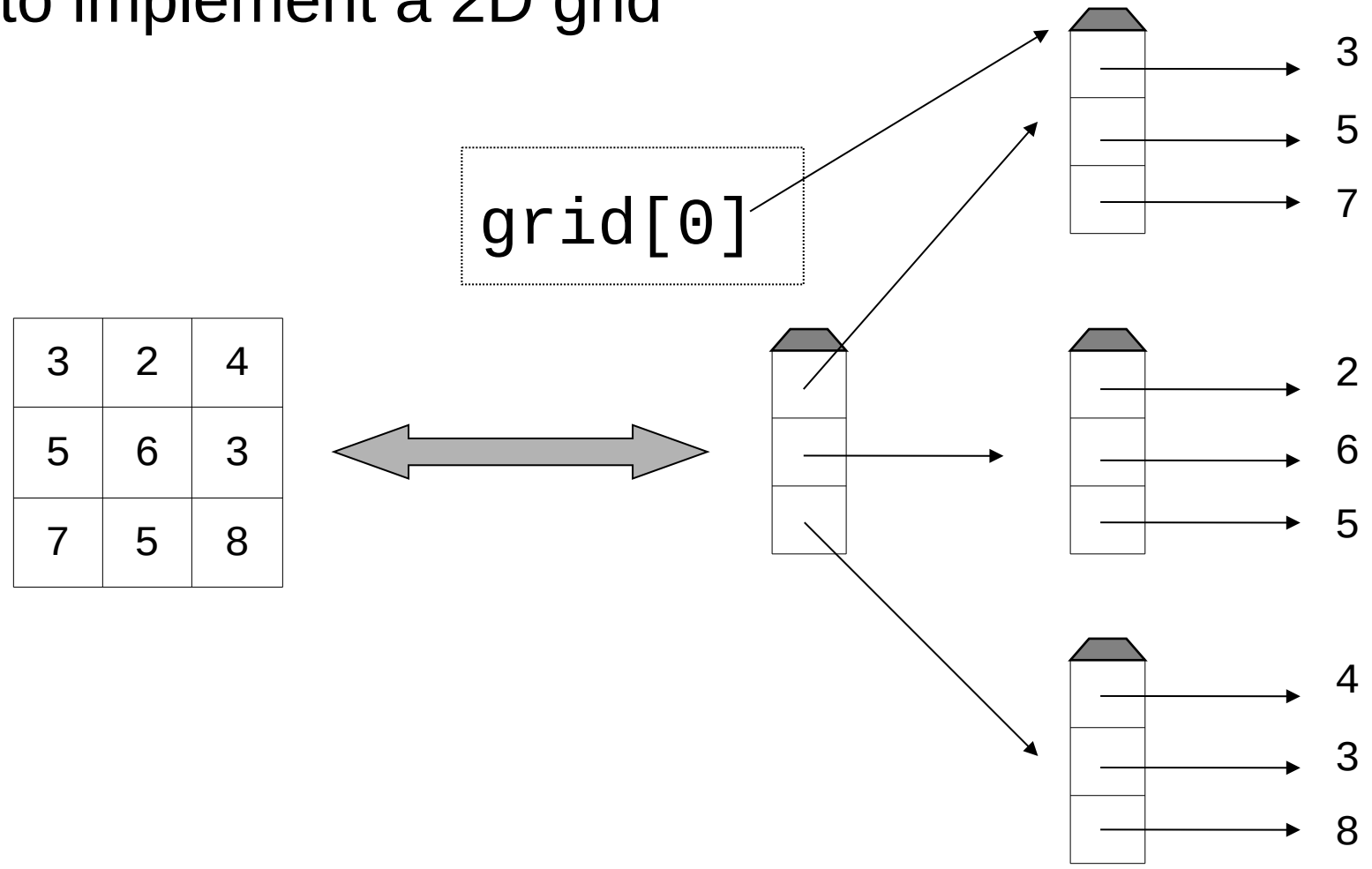

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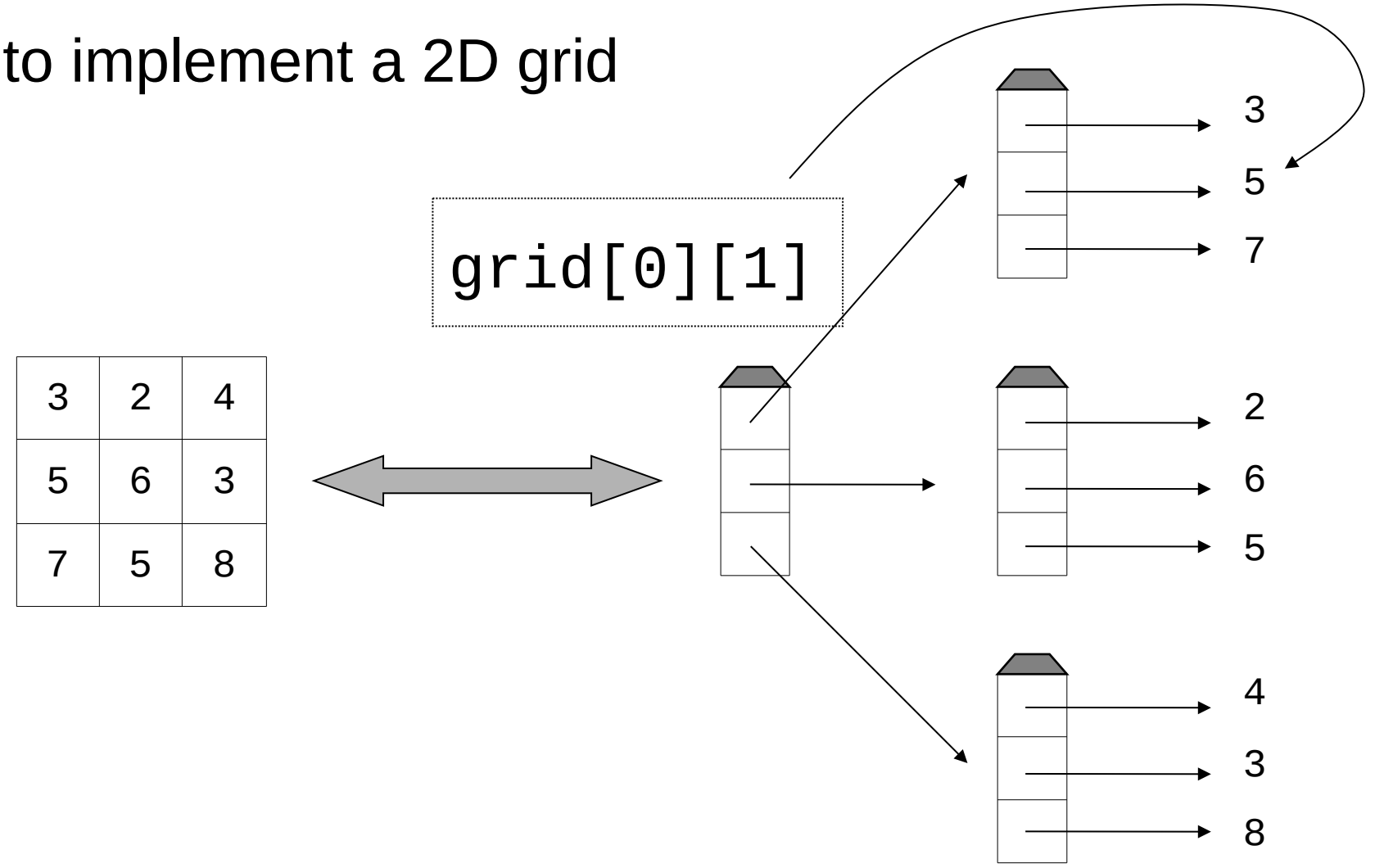

```
# Correct code
grid = []
for x in range(N):
  temp = []
  for y in range(N):
    temp.append(1)
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Outer "spine" of structure

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```

Add N sub-lists to outer list

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grid = []
for x in range(N):
    temp = []
    for y in range(N):
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```

Create a sublist of N 1's

```
# Equivalent code
grid = []
for x in range(N):
  grid.append([])
  for y in range(N):
    grid[-1].append(1)
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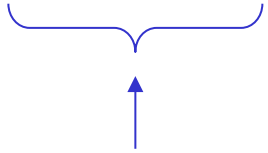

Last element of outer list is the sublist currently being filled in

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# Incorrect code
grid = []
EMPTY = []
for x in range(N):
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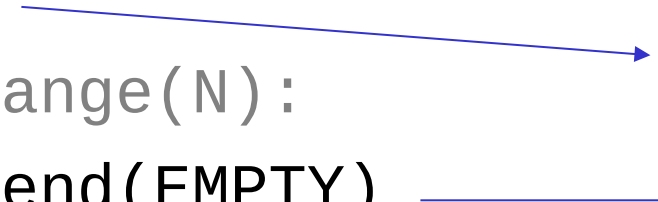

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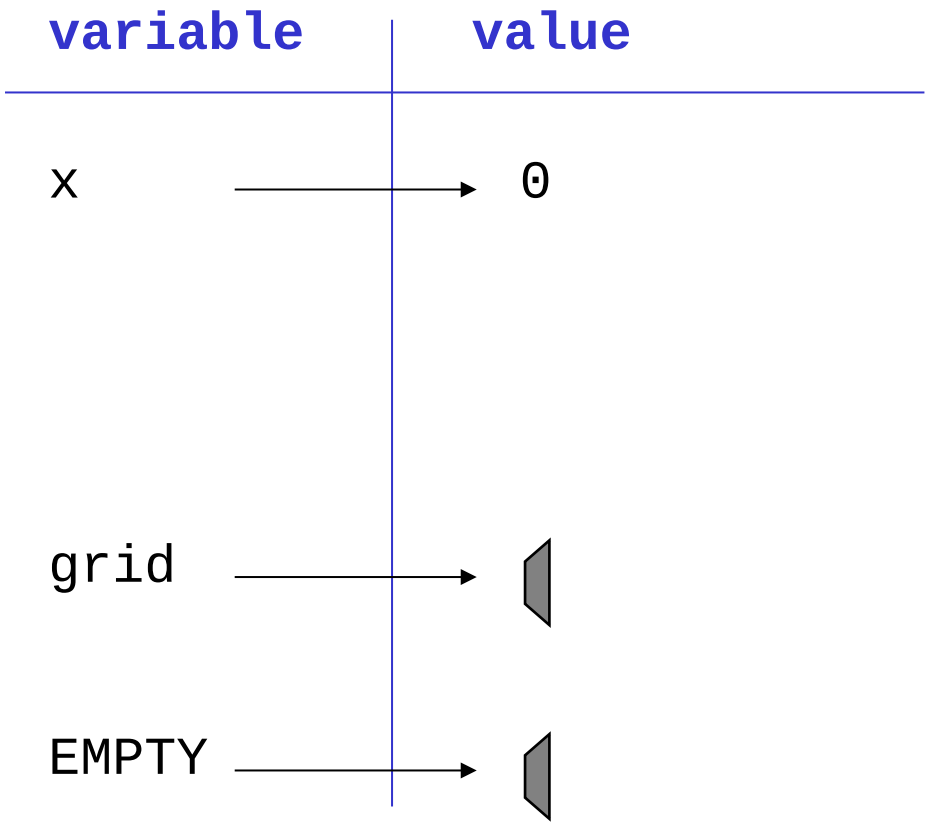
Aren't meaningful variable names supposed to be a good thing?

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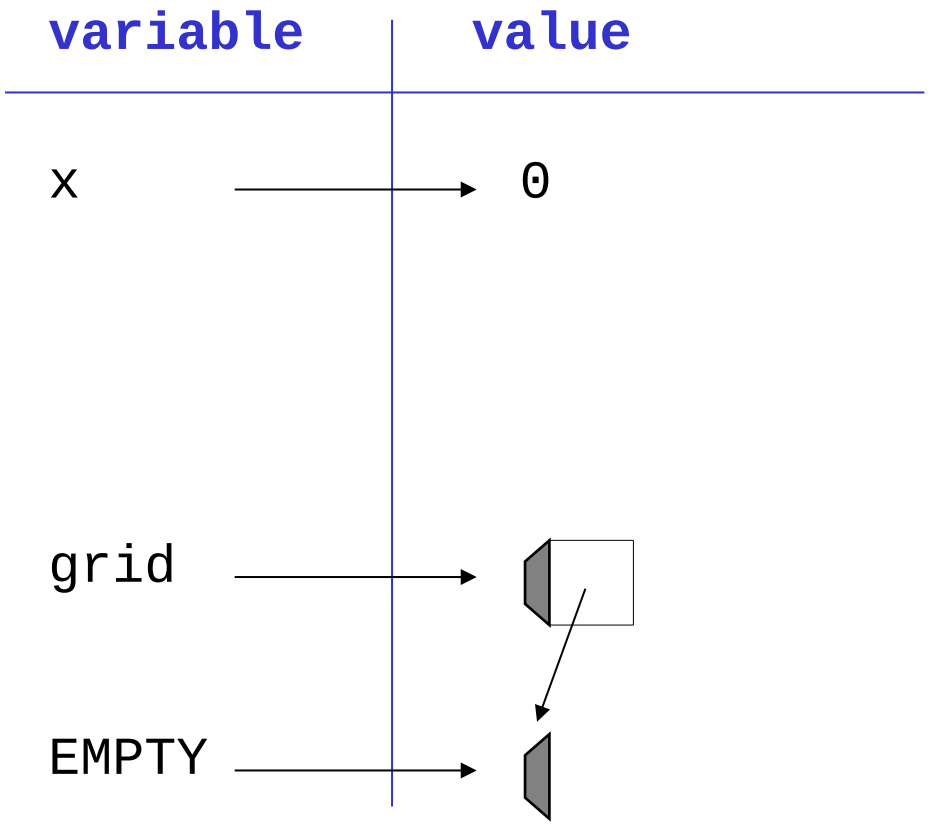


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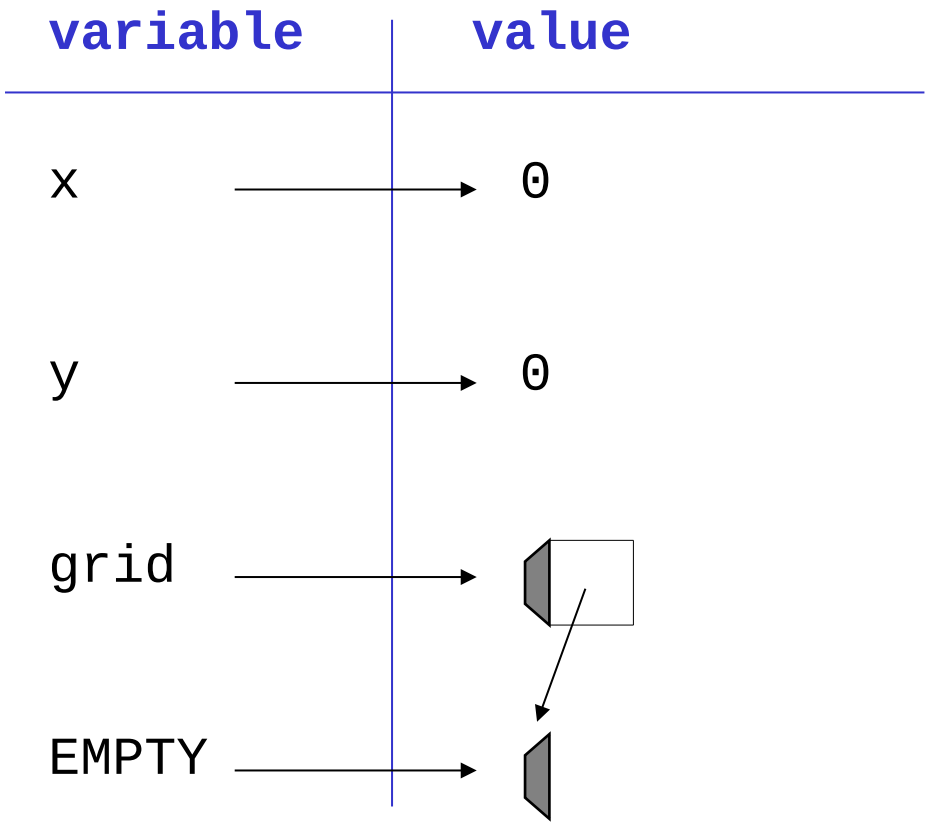


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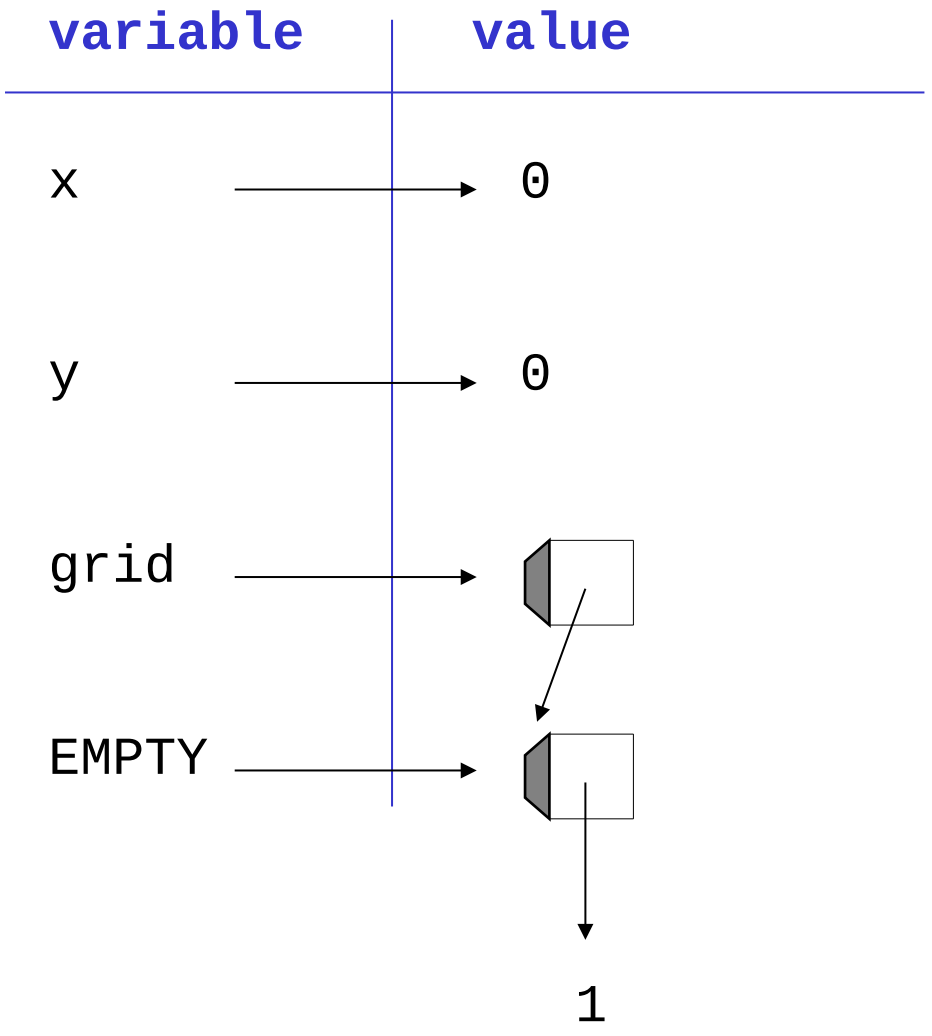


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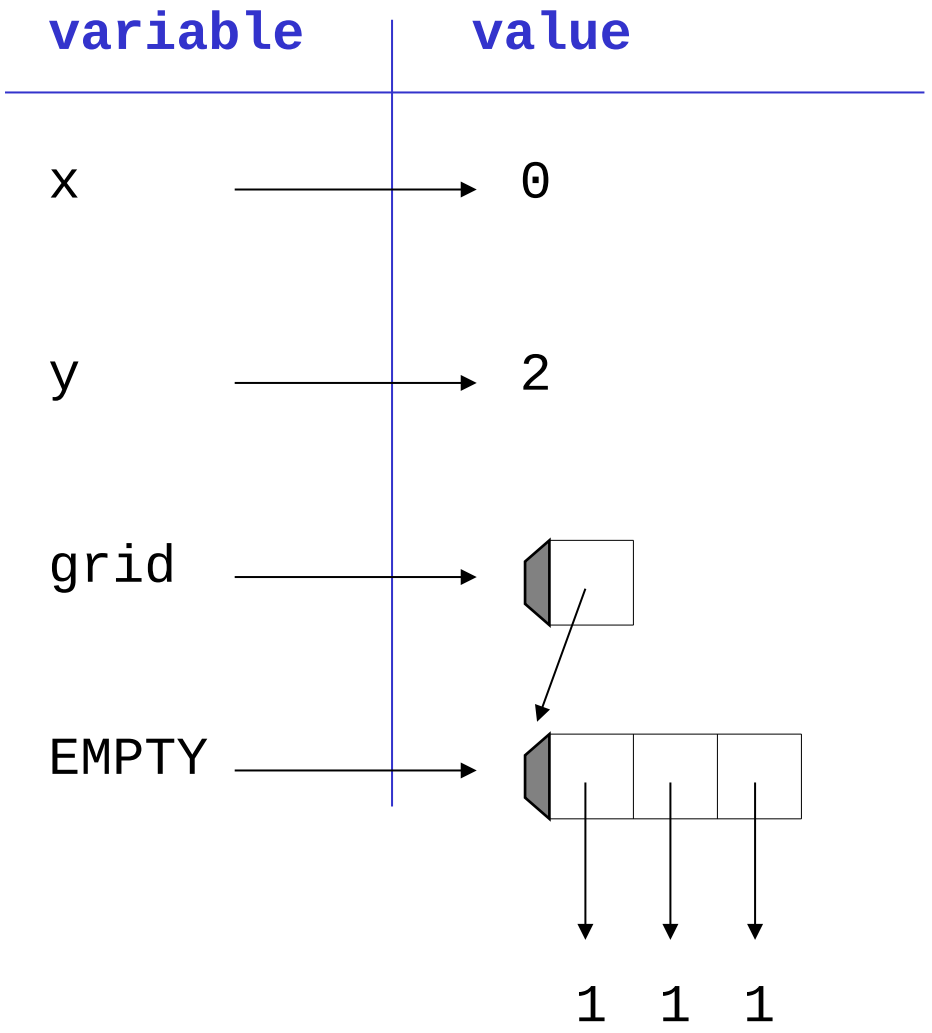


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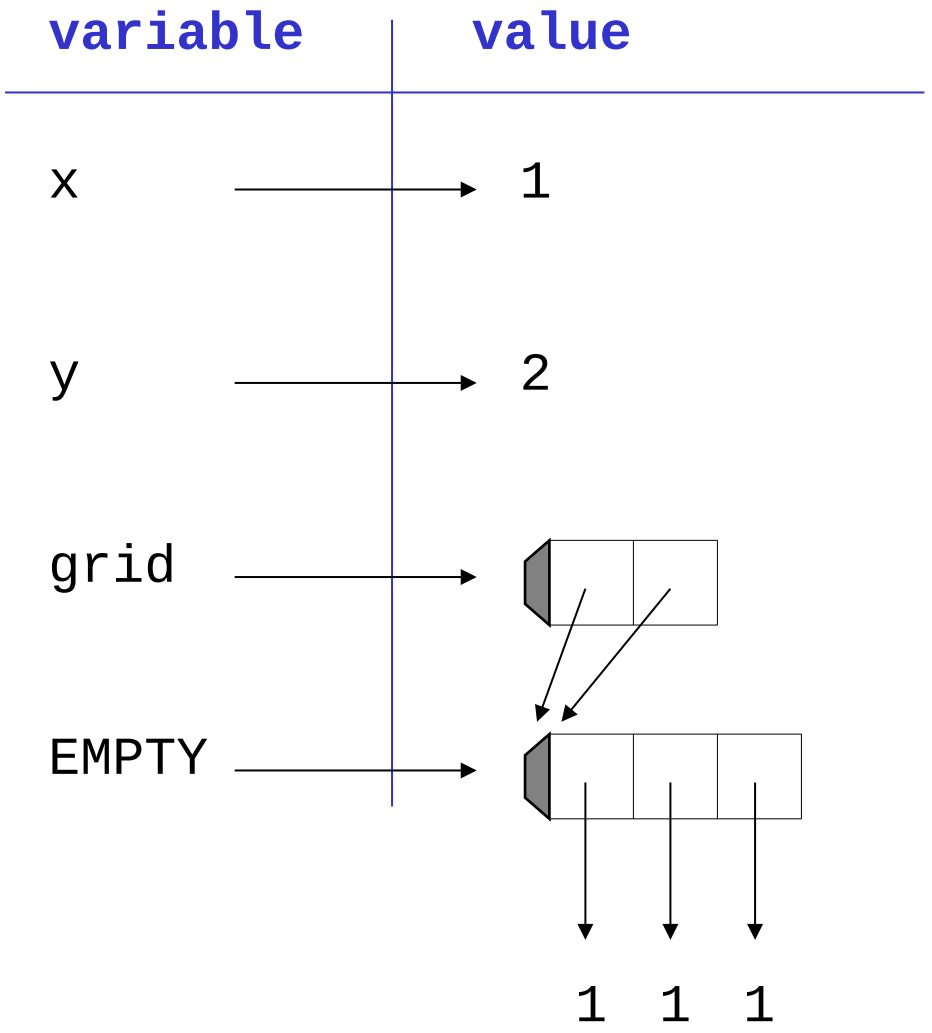


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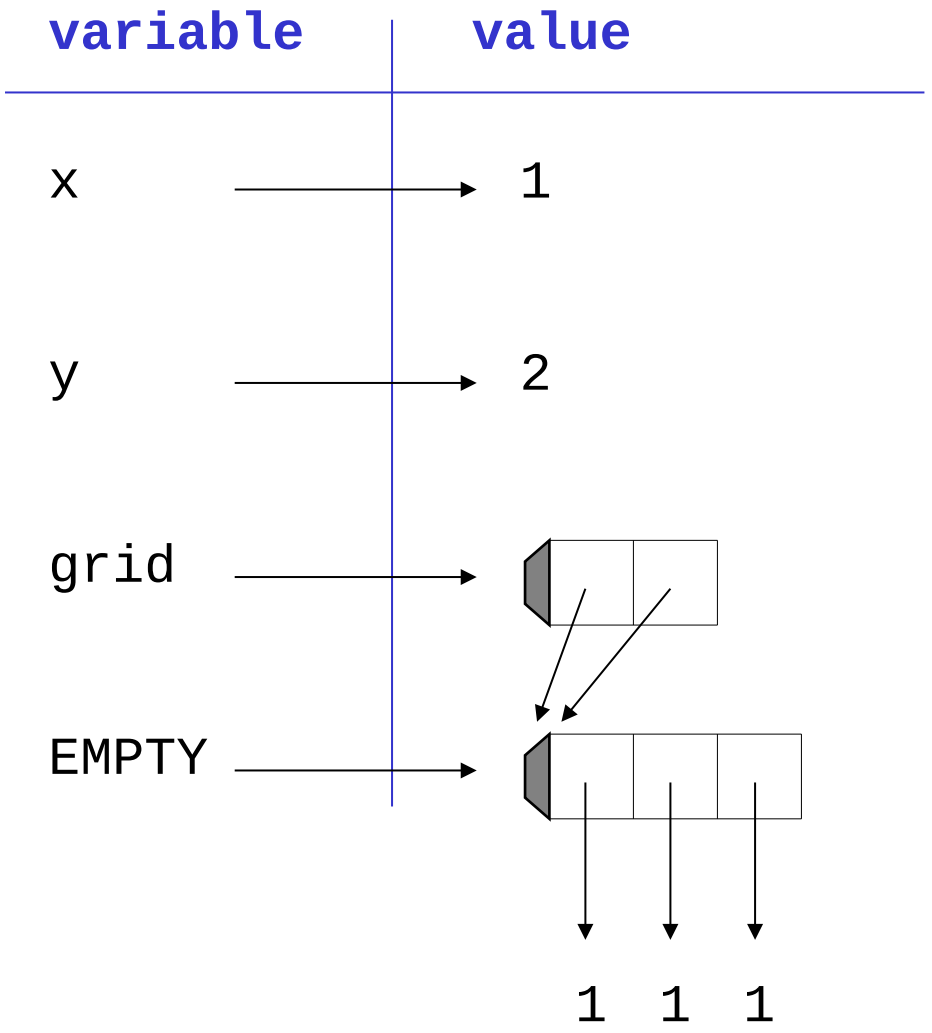


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You see the problem...

No Aliasing

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second = []
```

No Aliasing	Aliasing
`first = []`	`first = []`
`second = []`	`second = first`

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1. Some languages don't

   Or at least appear not to

2. Aliasing a million-element list is more efficient

   than copying it

3. Sometimes you really do want to update a structure

   in place

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Python's **copy.deepcopy** function will make a full copy of an object to want to replicate.

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Python's **copy.deepcopy** function will make a full copy of an object to want to replicate.

```
from copy import deepcopy
new_obj = deepcopy(my_obj)
```

created by

Greg Wilson

October 2010