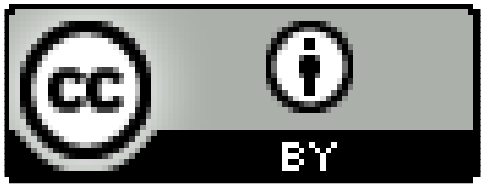
Python

Aliasing



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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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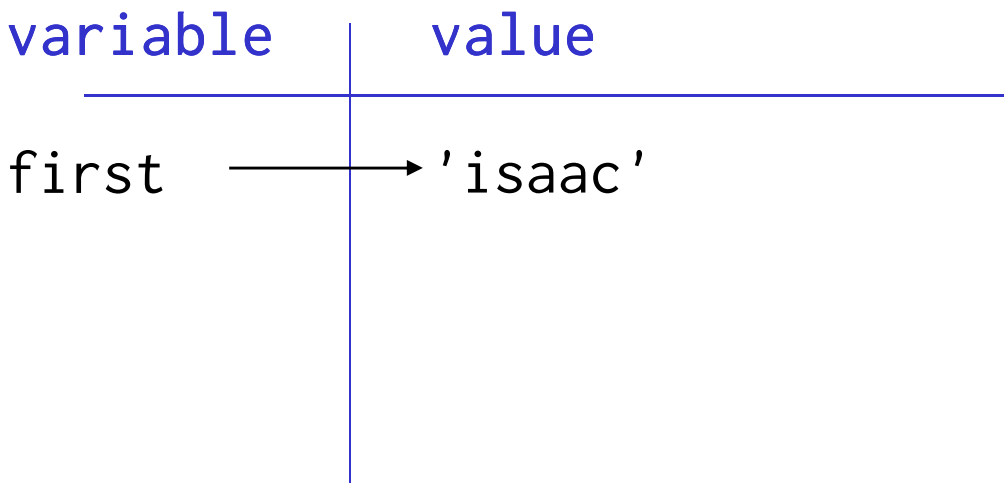
```
first = 'isaac'
```



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second = first
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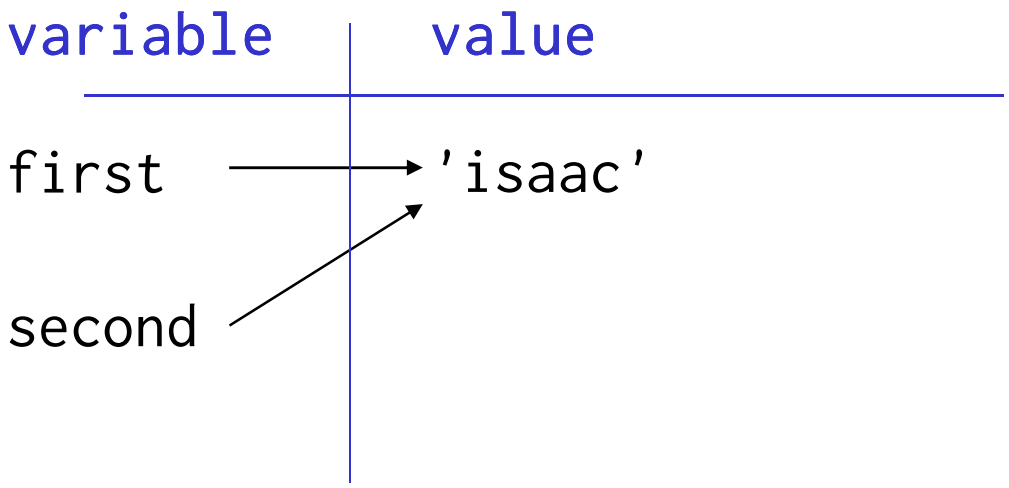

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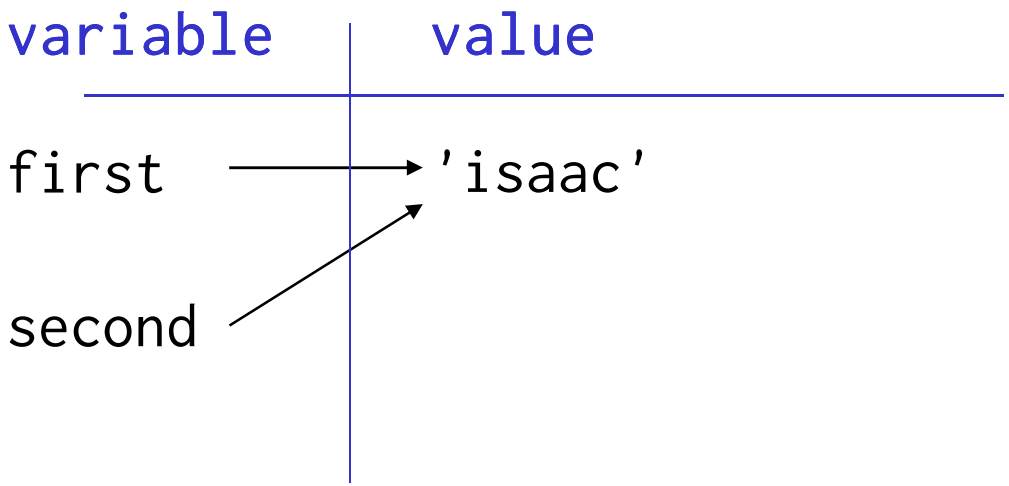

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```
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second = first
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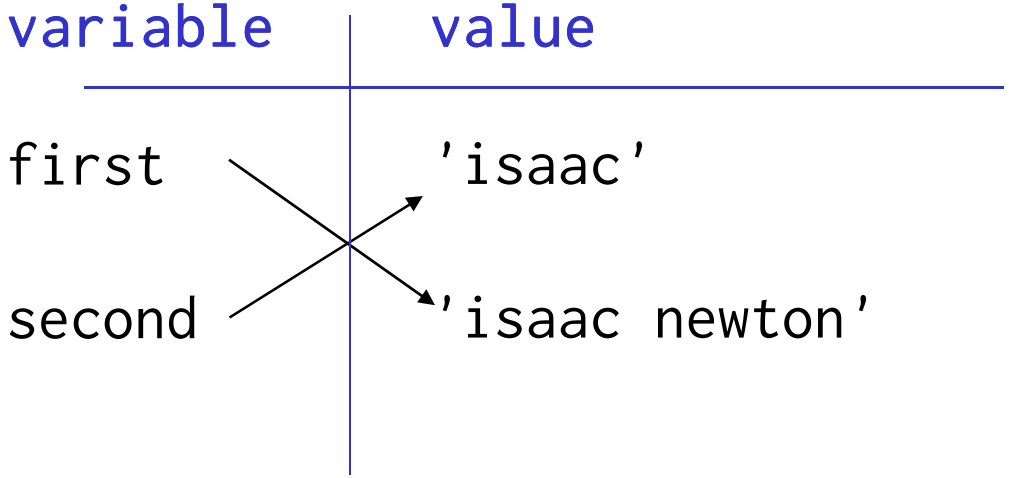
But as we've already seen...

```
first = first + ' newton'
```



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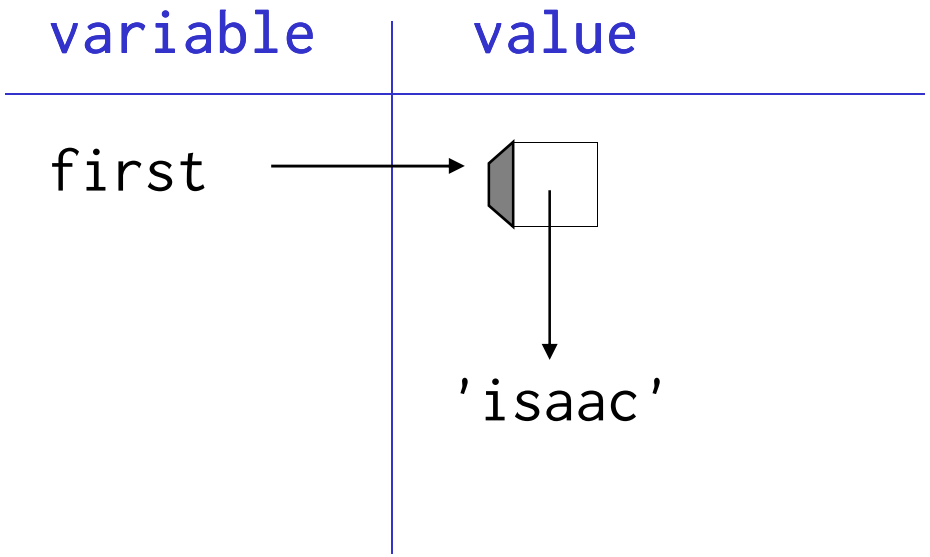

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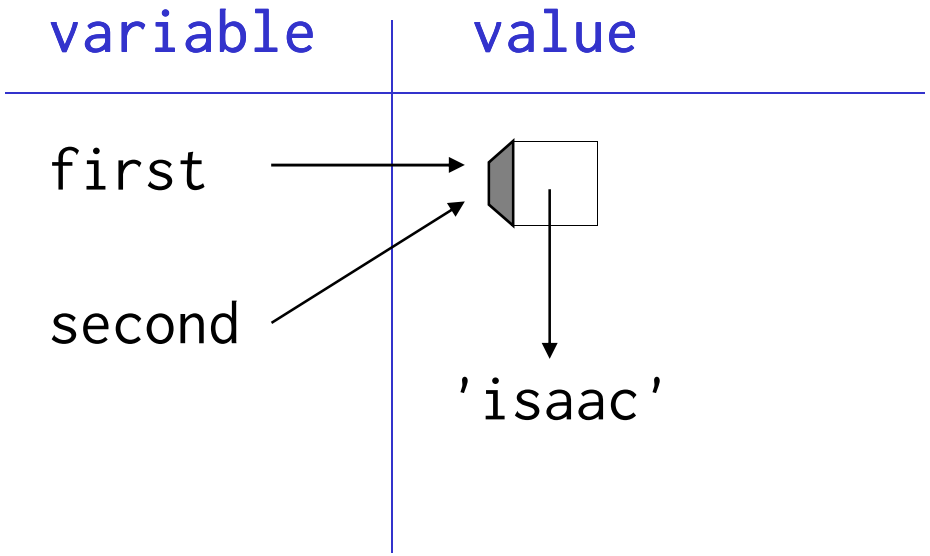

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first = ['isaac']
second = first
first = first.append('newton')
print first
['isaac', 'newton']
```

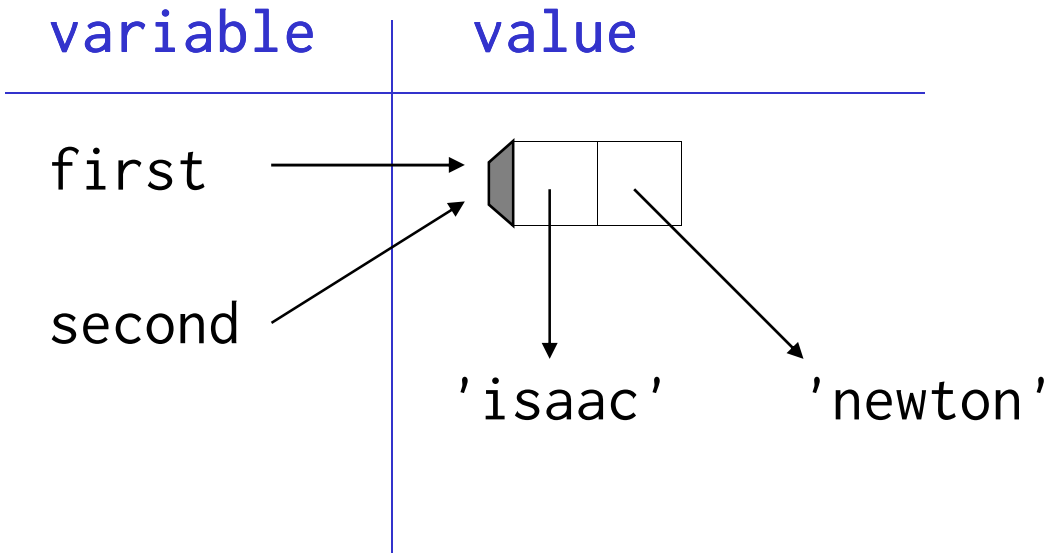

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print first
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print second
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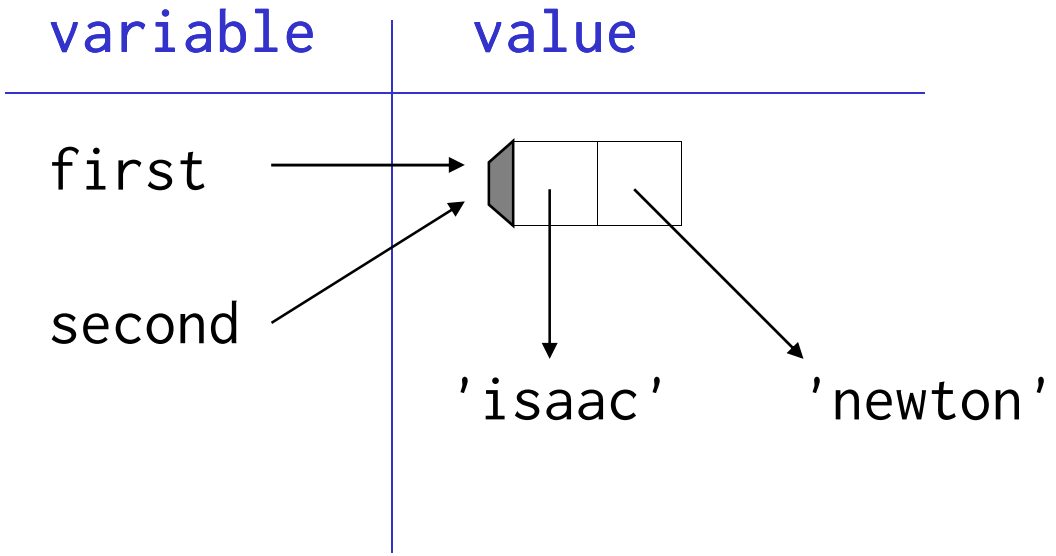

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Didn't explicitly

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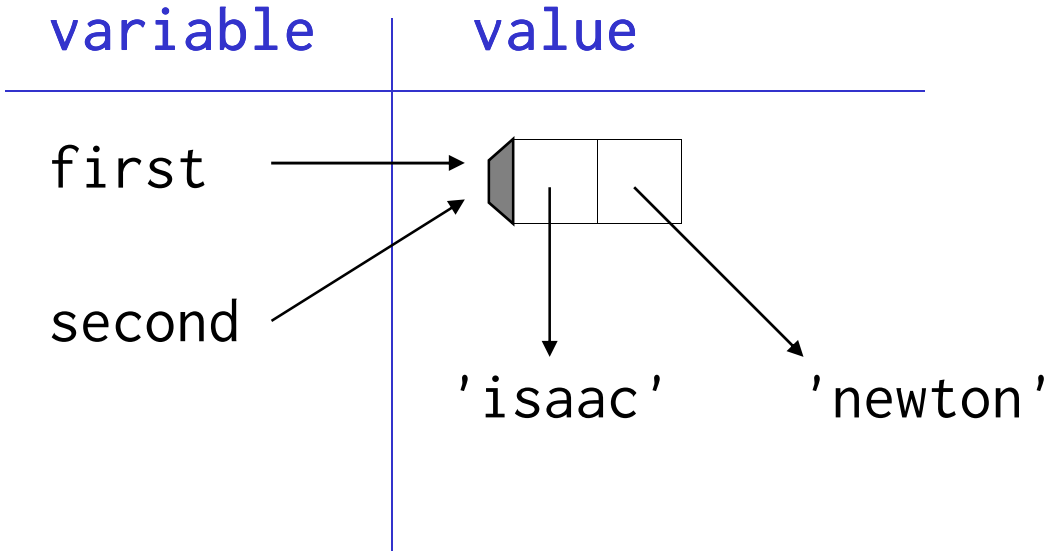

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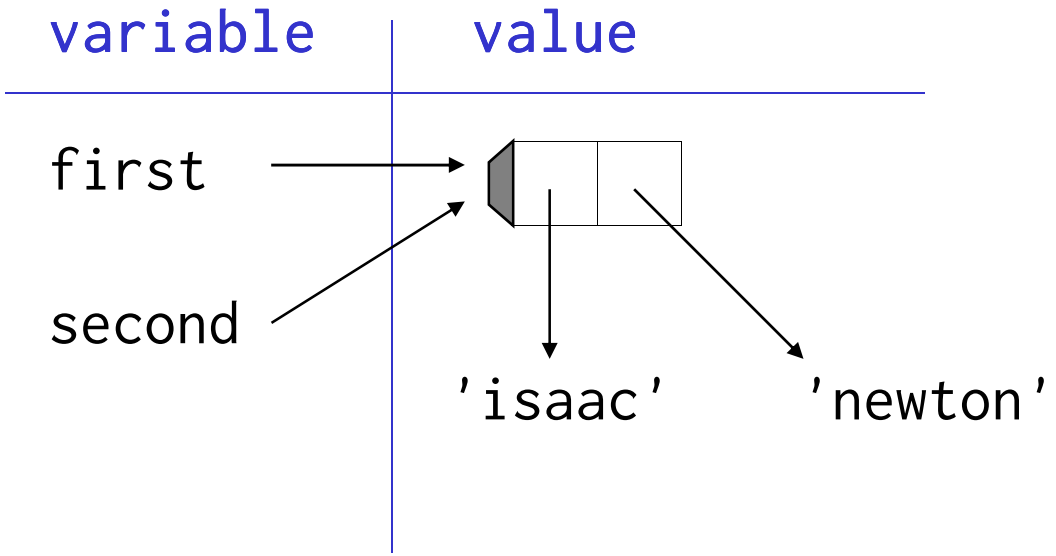

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A *side effect*

Example: use lists of lists

to implement a 2D grid

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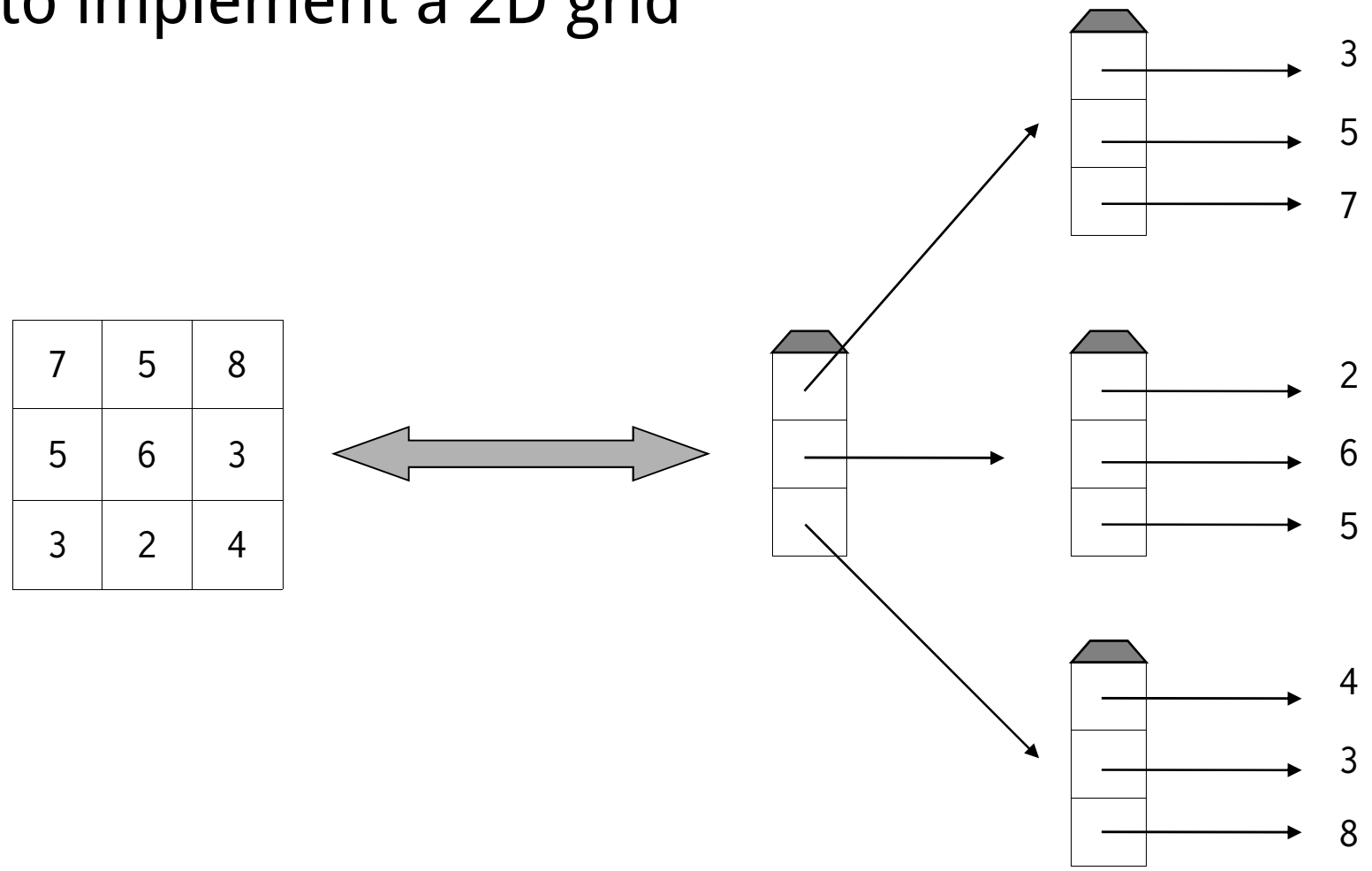
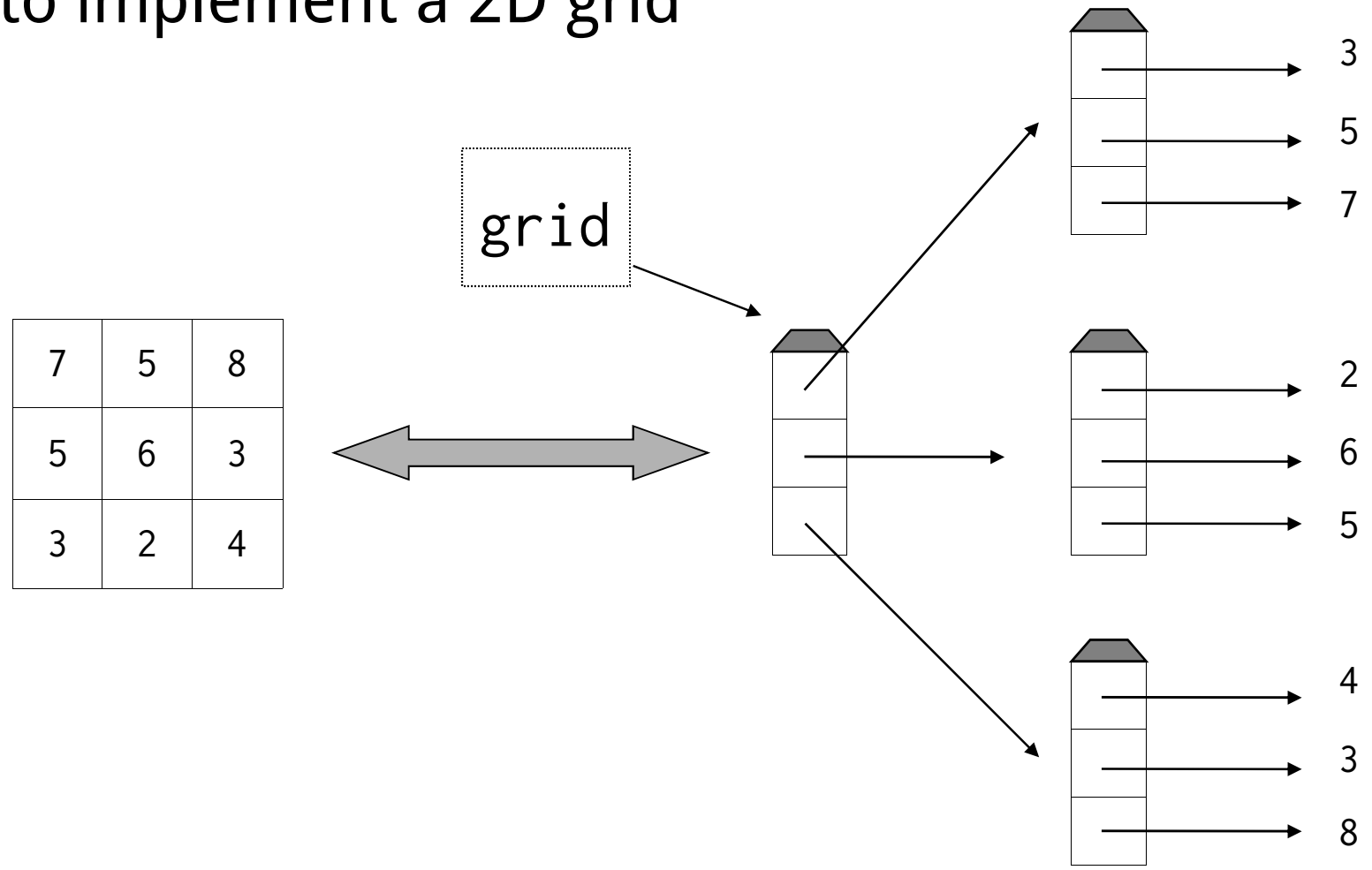


Example: use lists of lists to implement a 2D grid



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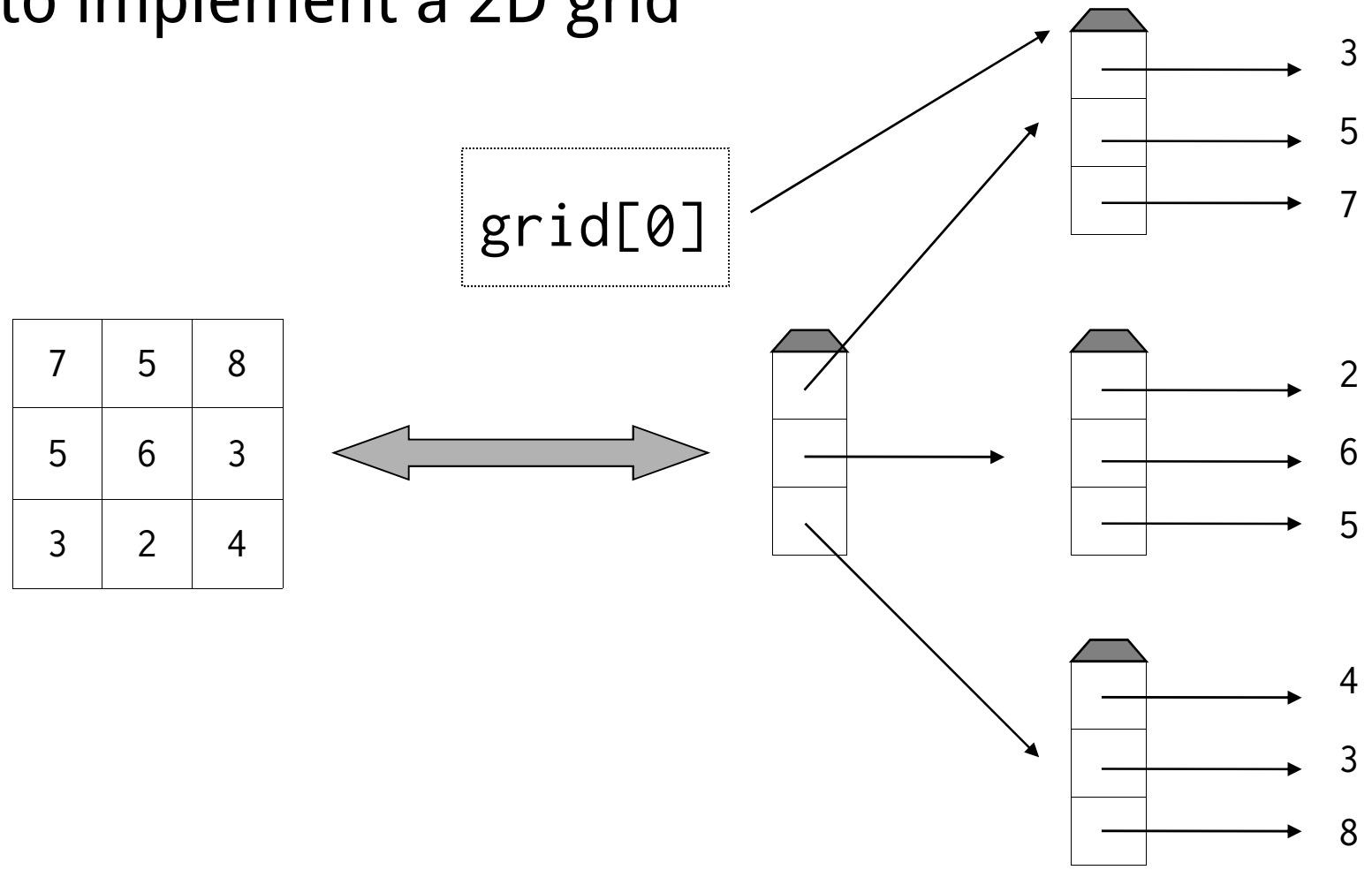

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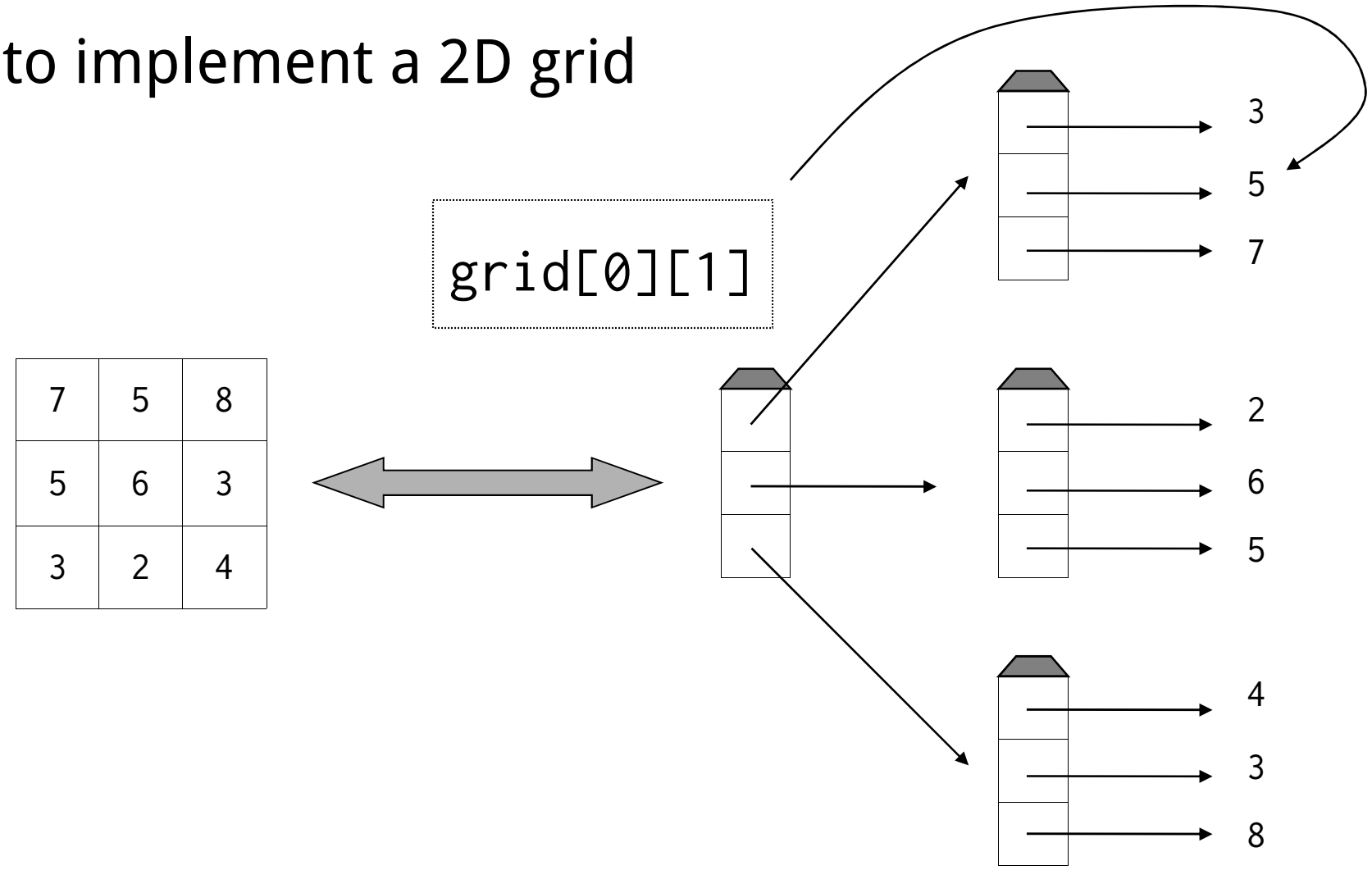

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# Correct code
grid = []
for x in range(N):
  temp = []
  for y in range(N):
    temp.append(1)
  grid.append(temp)
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Outer "spine" of structure

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```

Add N sub-lists to outer list

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

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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grid = []
for x in range(N):
  grid.append([])
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Last element of outer list is the sublist currently being filled in

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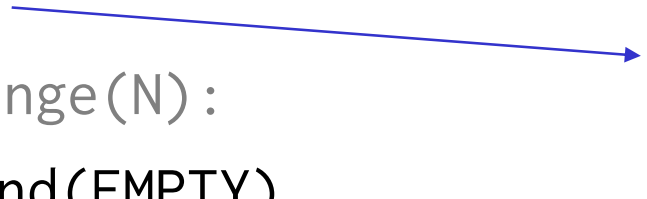

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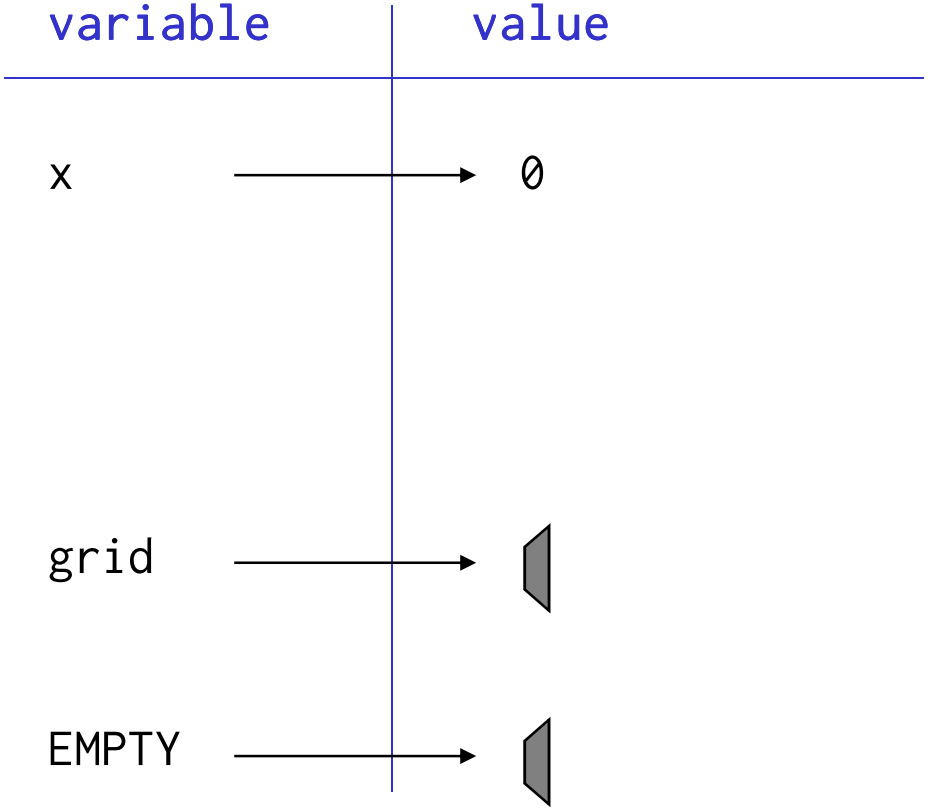
Aren't meaningful variable names supposed to be a good thing?

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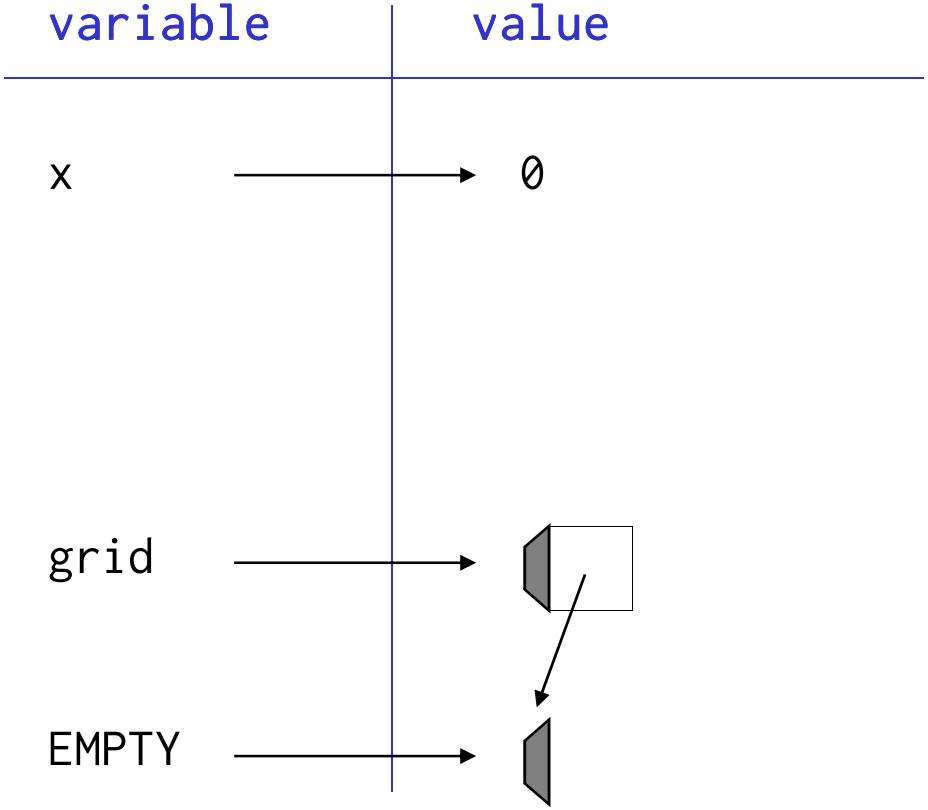


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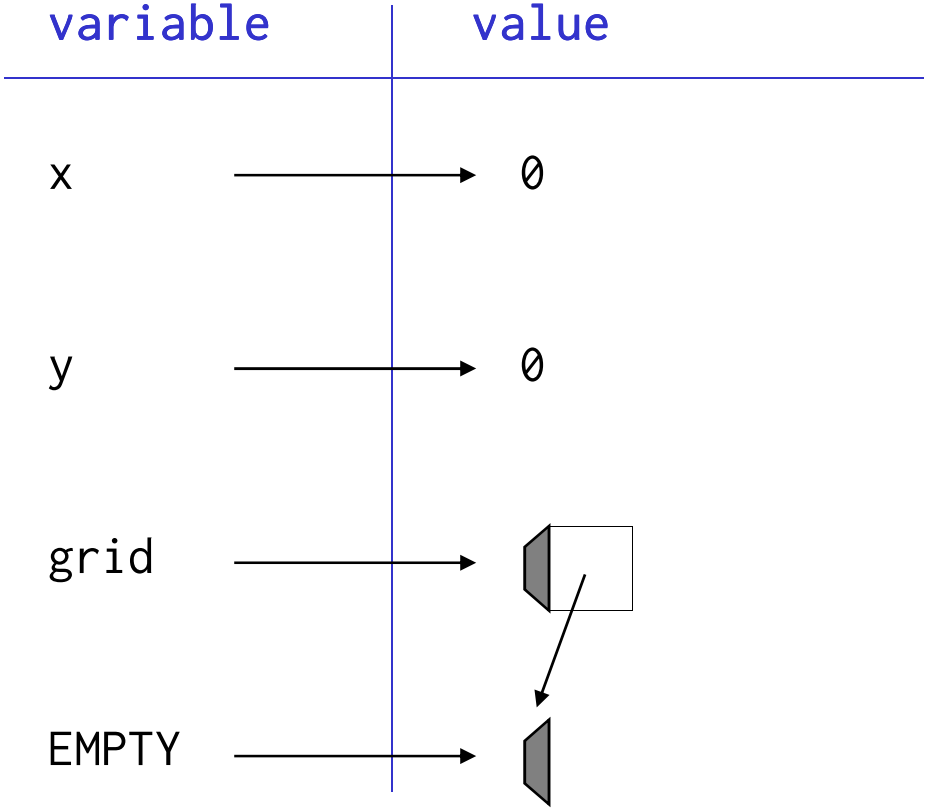


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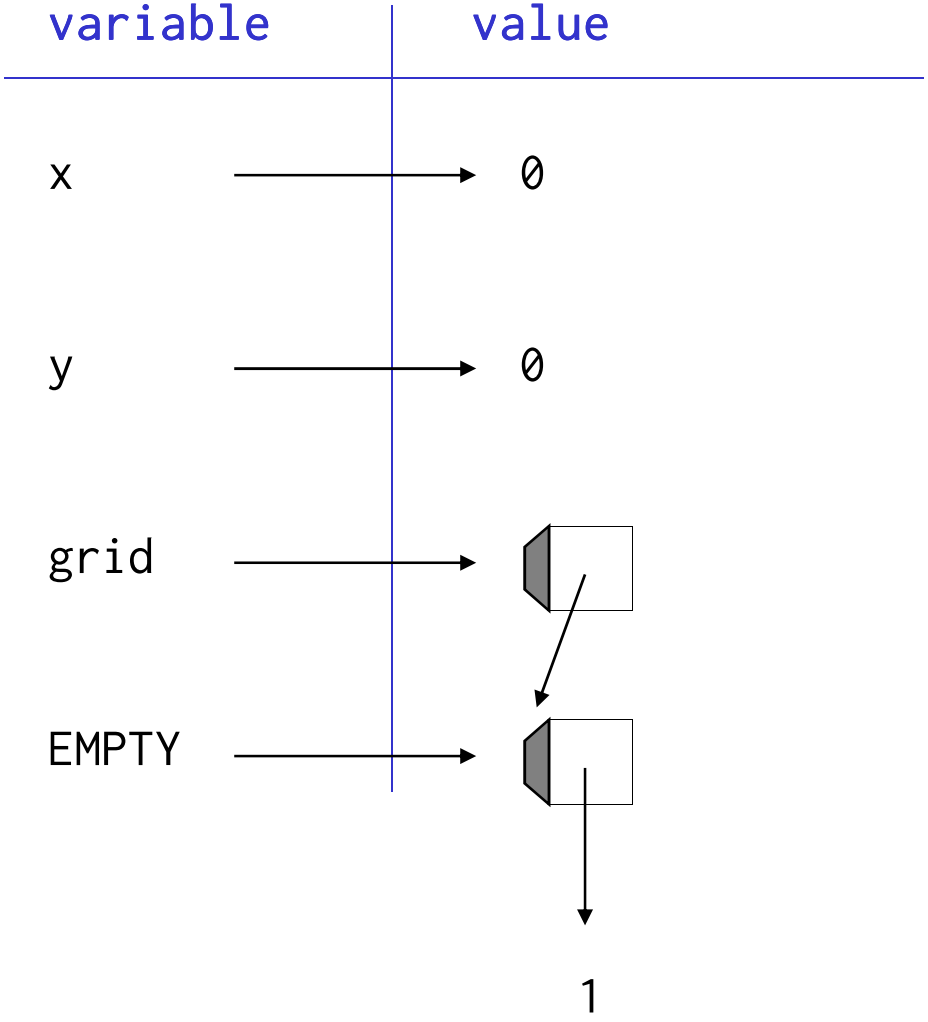


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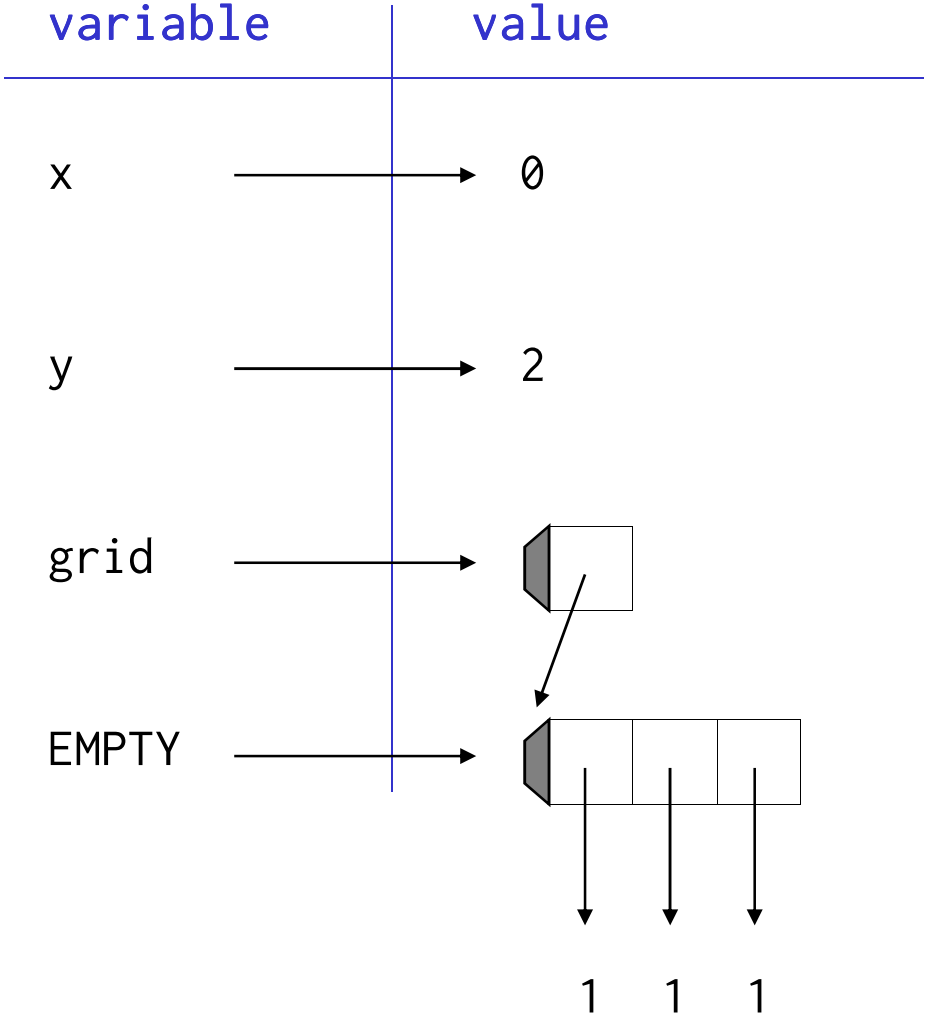


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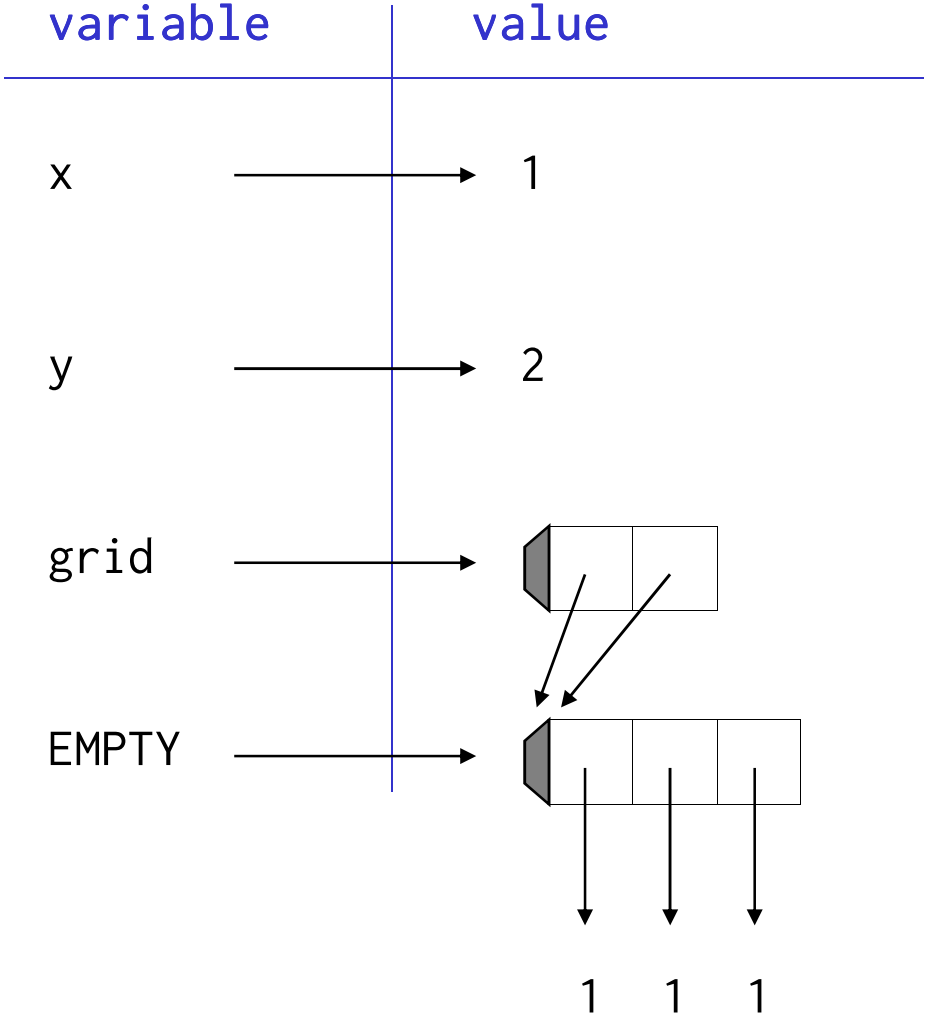


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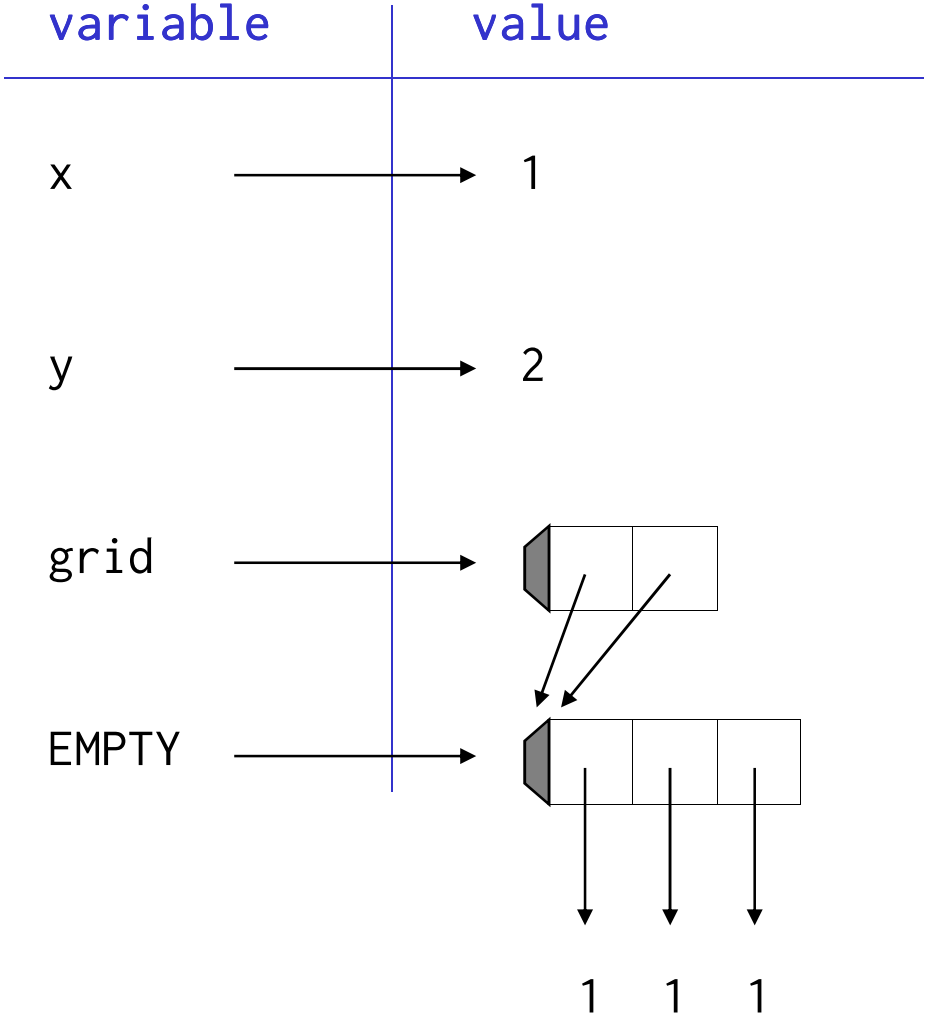


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You see the problem...

No Aliasing

```
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second = []
```

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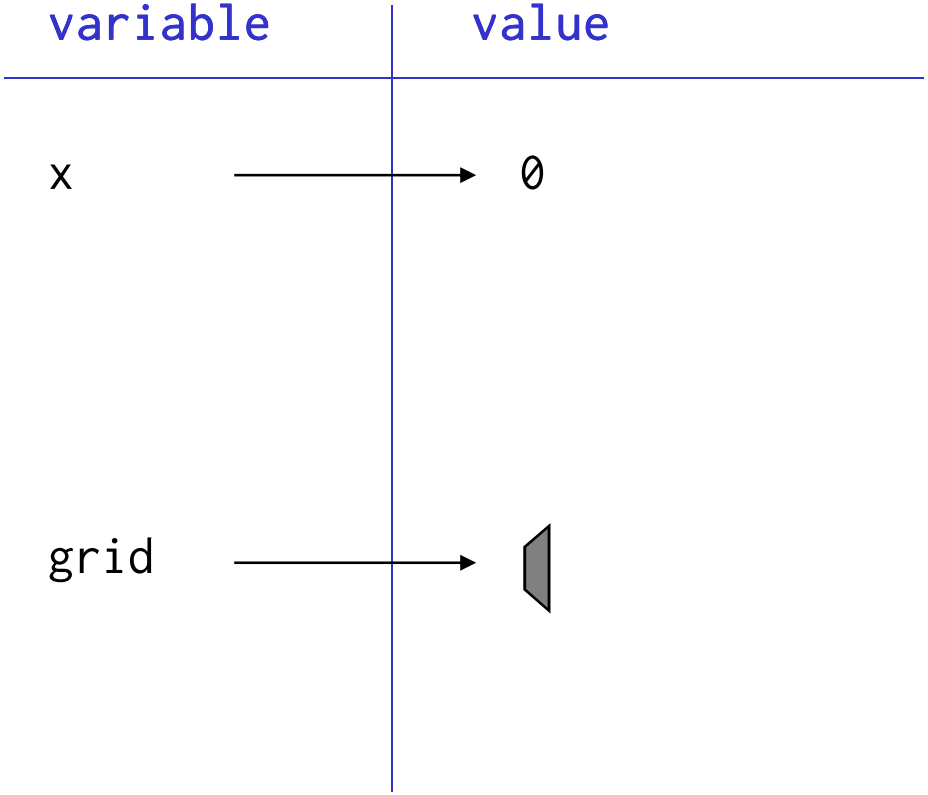
`second = []`	`second = first`

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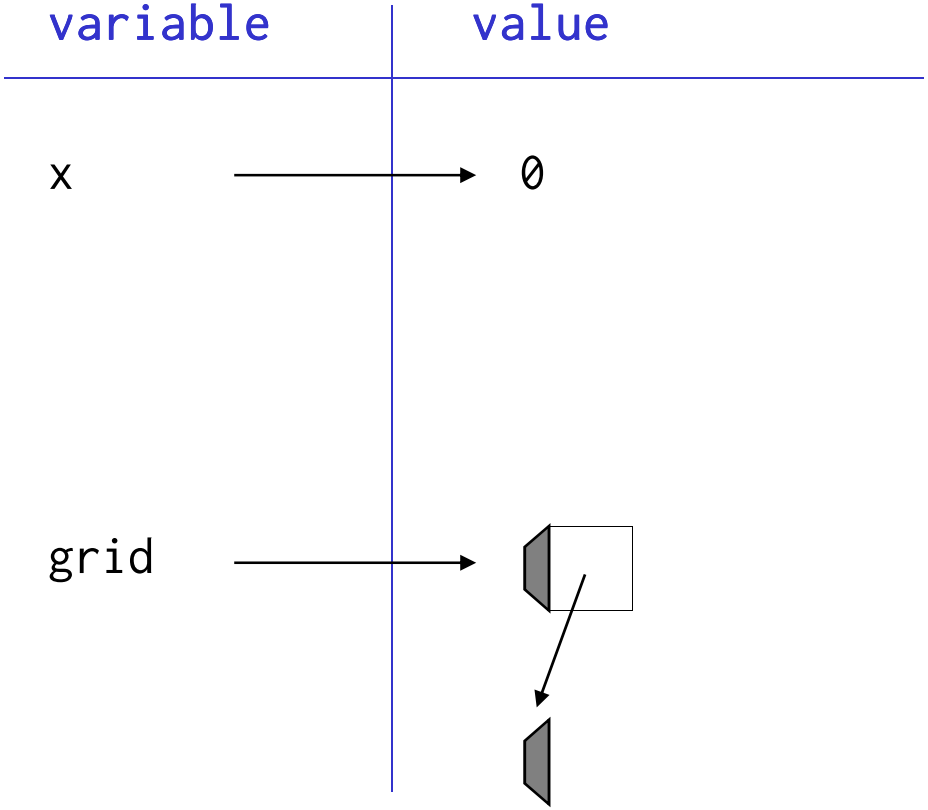


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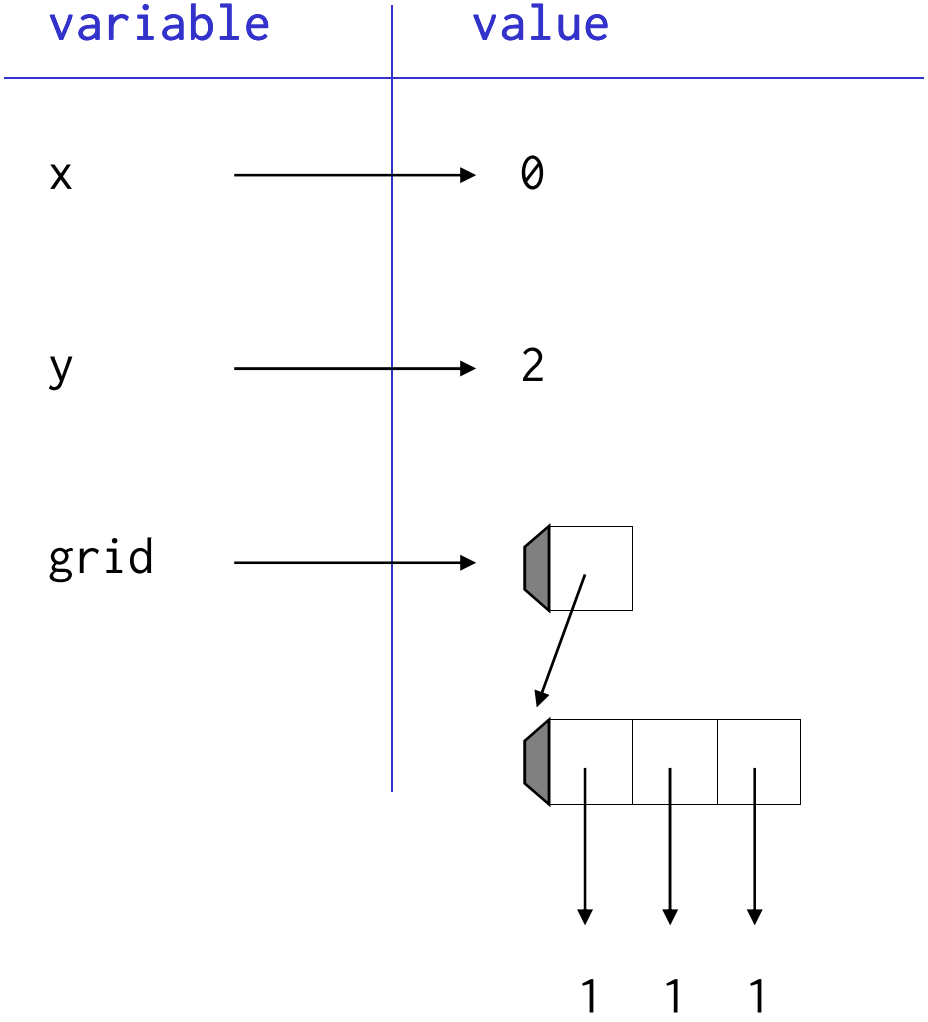


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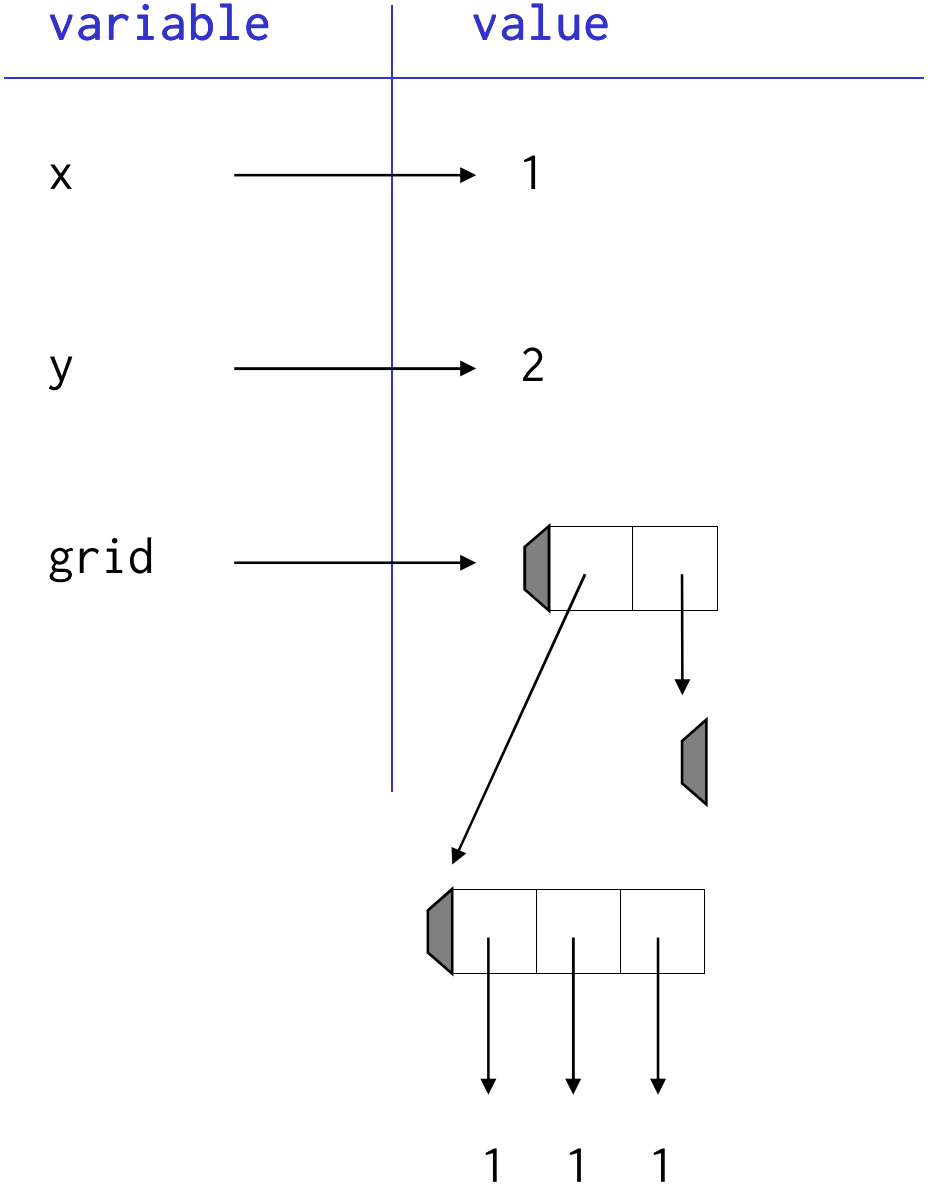


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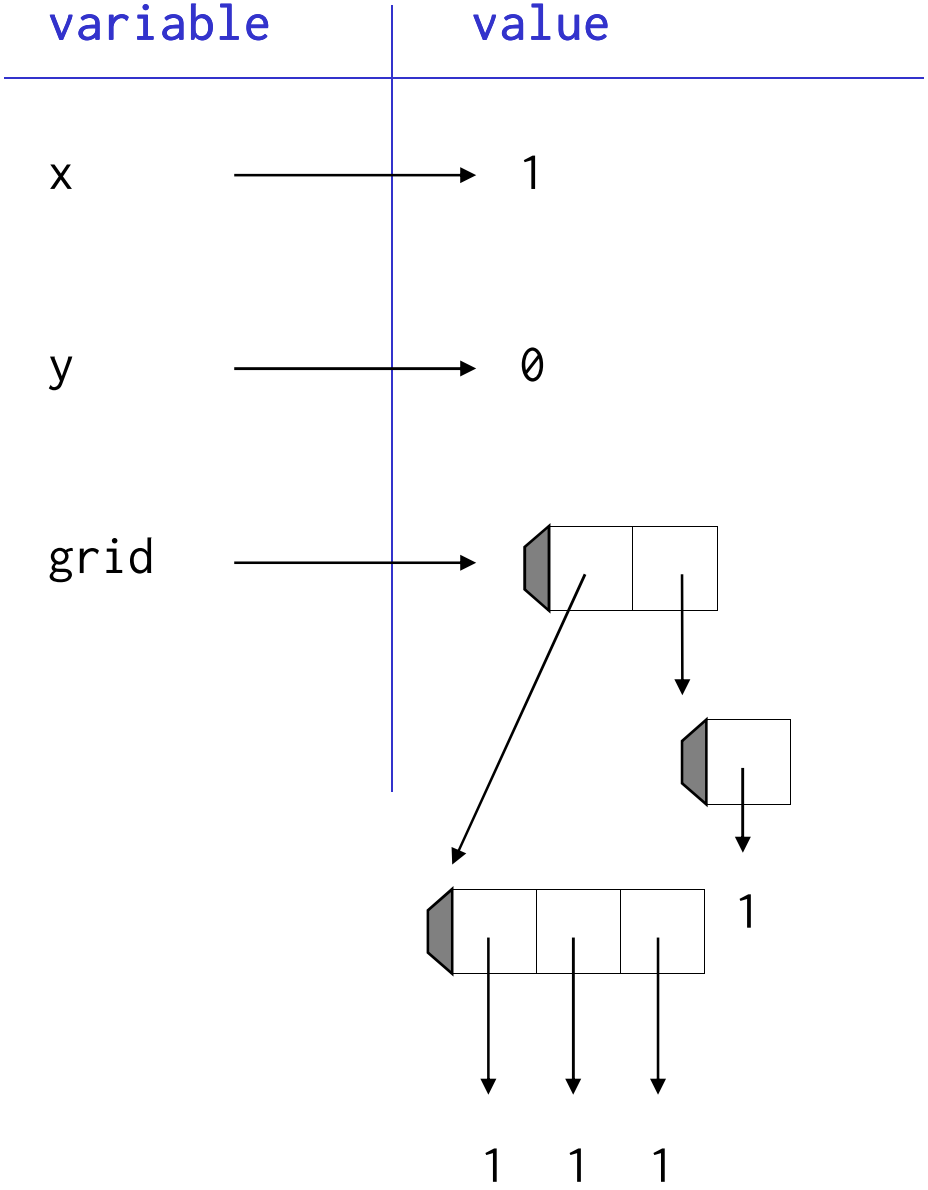


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1. Some languages don't

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2. Aliasing a million-element list is more efficient than copying it

3. Sometimes really do want to update a structure in place

created by

Greg Wilson

October 2010