Return values, multiple assignment

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import math

def distance(x, y):
    dist = math.sqrt(x**2 + y**2)

dist = 0
x = 3
y = 4
distance(x, y)
print(dist)

• What is printed at the end of the program?
• dist is not changed in the main symbol table and its value computed in the function "disappears"! How can we get the value to "live on"???
The return keyword

```python
import math
def distance(x, y):
    dist = math.sqrt(x**2 + y**2)
    return dist

dist = 0
x = 3
y = 4
dist = distance(x, y)
print(dist)

• Let's make the changes and run the code.
```
A very common error: attempting to assign a value from a function that DOES NOT return a value:

```python
def distance(x, y):
    dist = math.sqrt(x**2 + y**2)

# main code
z = distance(x, y)
```

There is no return statement, so `distance` has nothing to assign to the variable `z` in the main symbol table.

- Python tries its best to avoid crashing and assigns `z` a special value called `None`.
- Python keeps executing the rest of the program.
None (2/3)

• You can assign variables of your own to None: `myVar = None`.

• You can checking if a variable is set to None:
  • `if z is None: ...`
  • or see it printed `print(z)`
Same problem happens if you tried to assign a value to a function call that has an "empty" return statement, but doesn’t return anything:

```python
def distance(x, y):
    return

# main code
z = distance(x, y)
```
Example: Returning values to other functions

Let's write a program that prints the happy birthday song.
Simultaneous assignment

Python lets you return COPIES of more than one variable value from a function symbol table.

```python
def distance(x, y):
    dist = math.sqrt(x**2 + y**2)
    absDiff = abs(x - y)
    return absDiff, dist
```

# main code

d1, d2 = distance(3, 4)

What values are d1 and d2 assigned?

- What about dist and absDiff by the end of the program?
Symbol table and return values

Example: Calculating car's miles-per-gallon (MPG).