Python

Functions

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Define functions to create higher-level operations

"Create a language in which the solution to your original problem is trivial."

Define functions using `def`

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```
def greet():
  return 'Good evening, master'
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def greet():
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temp = greet()
print(temp)
Good evening, master
```

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    answer = 'Hello, ' + name
    return answer
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temp = 'doctor'
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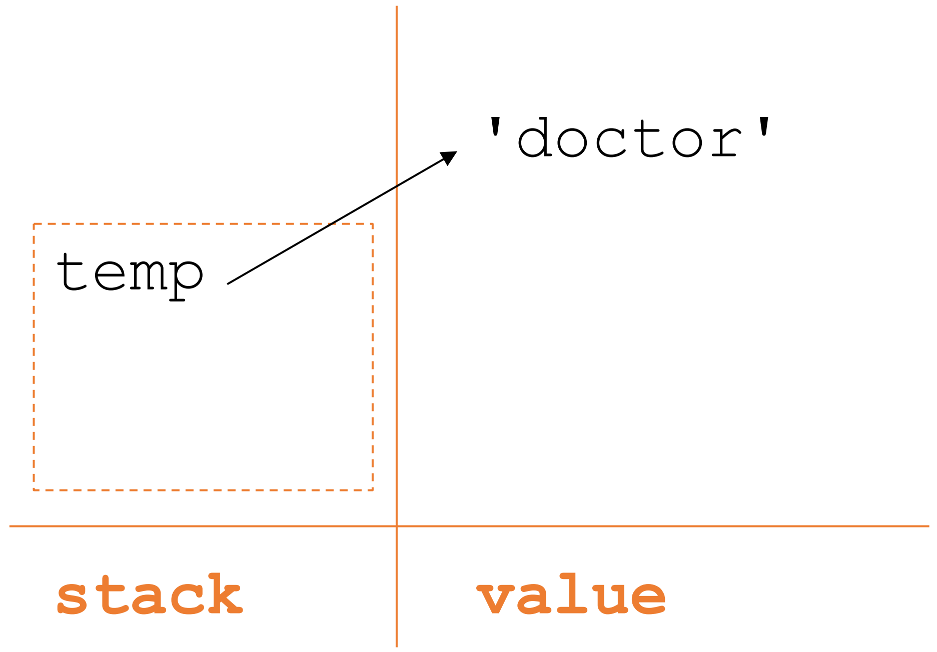

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temp = 'doctor'
result = greet(temp)
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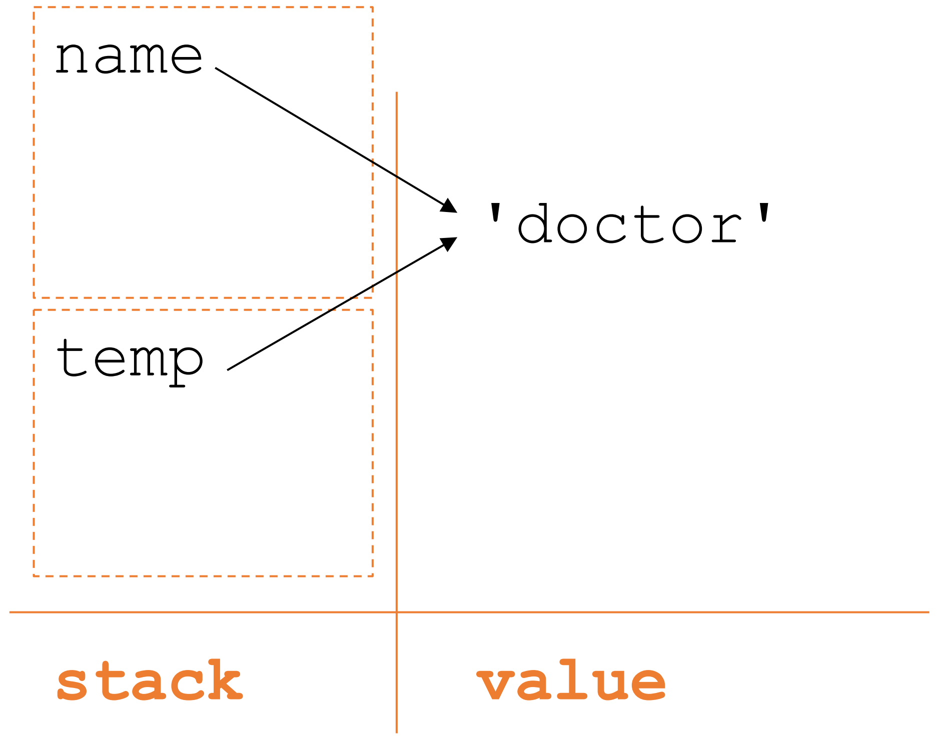

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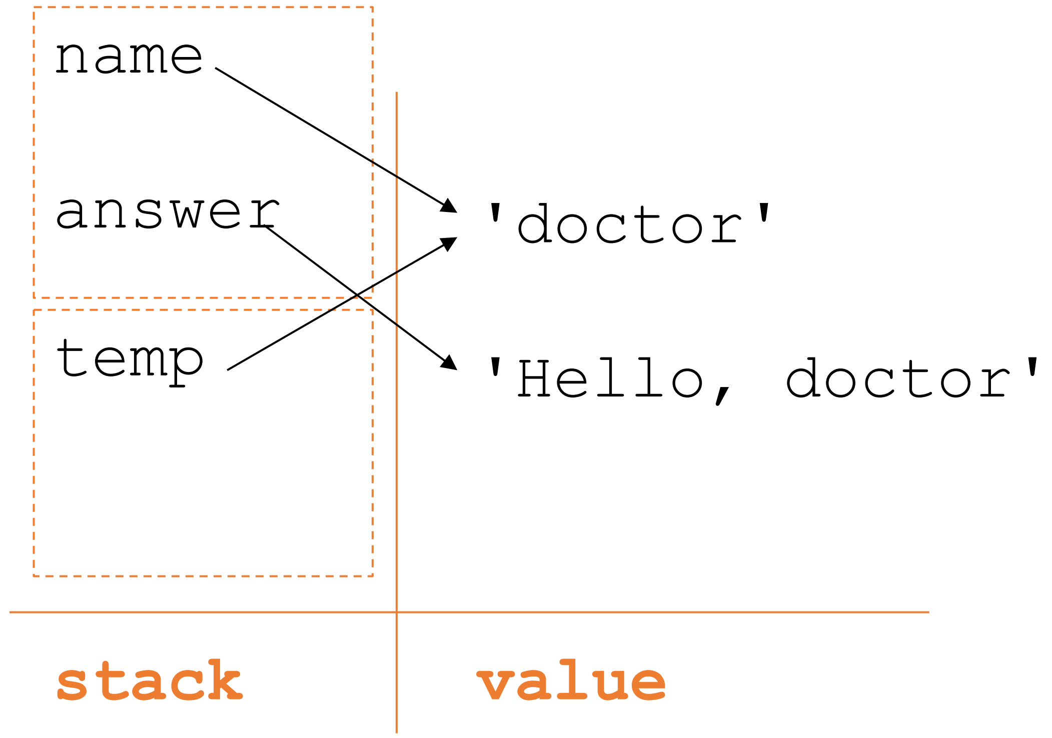

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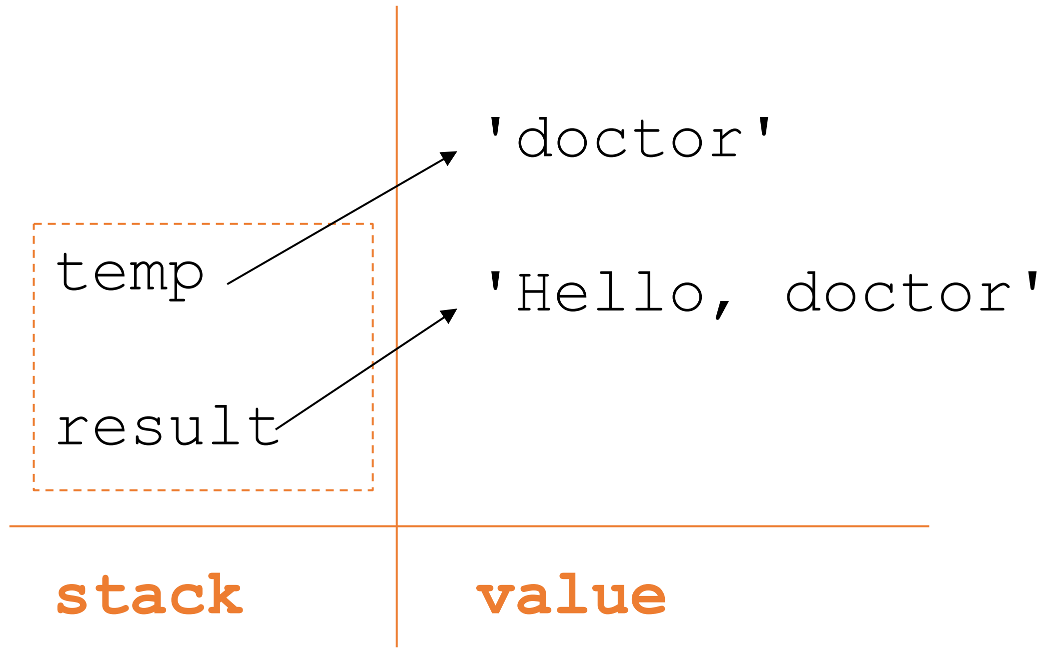

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```

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```
def greet(name):
  return 'Hello, ' + name

print(greet('doctor'))
```

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    return 1
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Over-use makes functions

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No prescription possible, but:

- a few at the beginning to handle special cases
- one at the end for the "general" result

Every function returns something

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If the function doesn't return

a value, Python returns `None`

Centre for Environmental Data Analysis
SCIENCE AND TECHNOLOGY FACILITIES COUNCIL
NATURAL ENVIRONMENT RESEARCH COUNCIL

software carpentry

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NATURAL ENVIRONMENT RESEARCH COUNCIL

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

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print(sign(3))
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None
```

If the function doesn't return a value, Python returns `None`

Yet another reason why commenting out blocks of code is a bad idea...

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  return 2 * x

print(double(2))
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twotwo
```

Only use this when the function's behavior depends *only* on properties that all possible arguments share

```
if type(arg) == int:
   ...
elif type(arg) == str:
   ...
...
```

Can define *default parameter values*

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```
def adjust(value, amount=2.0):
  return value * amount
```

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```
def adjust(value, amount=2.0):
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print(adjust(5))
10.0
```

Can define *default parameter values*

```
def adjust(value, amount=2.0):
  return value * amount

print(adjust(5))
10.0
print(adjust(5, 1.001))
5.004999999999999
```

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Even if each function is only called once

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Break it into comprehensible pieces with functions

Even if each function is only called once

If a piece of code would be copied multiple times:

definitely use a function!

Python

More on Functions

You can assign a function to a variable

```
def threshold(signal):
     return 1.0 / sum(signal)

t = threshold
print(t([0.1, 0.4, 0.2]))
1.4285714285714286
```

Can put (a reference to) the function in a list

```
def area(r):
      return PI * r * r

def circumference(r):
      return 2 * PI * r

funcs = [area, circumference]

for f in funcs:
      print(f(1.0))
3.14159
6.28318
```

Can pass (a reference to) the function into a function

```
def call_it(func, value):
    return func(value)

print(call_it(area, 1.0))
3.14159

print(call_it(circumference, 1.0))
6.28318
```

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```
def add_all(*args):
    total = 0
    for a in args:
        total += a
    return total
```

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```

Must need to know *something* about the function

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Like ~~number of arguments~~

```
def add_all(*args):
    total = 0
    for a in args:
        total += a
    return total

print(add_all())
0
```

Must need to know *something* about the function

in order to call it

Like ~~number of arguments~~

```
def add_all(*args):
    total = 0
    for a in args:
        total += a
    return total

print(add_all())
0
print(add_all(1, 2, 3))
6
```

Connecting functions and sequences (1)

List Comprehensions come in handy:

1. Send a sequence to a function to create a new sequence of only positive numbers:

```
def positive(x):
    return x >= 0

print([x for x in [-3, -2, 0, 1, 2] if positive(x)])
[0, 1, 2]
```

Connecting functions and sequences (2)

2. Send a sequence of numbers to a function that will return the negative value of each item:

```
def negate(x):
    return -x

print([negate(x) for x in [-3, -2, 0, 1, 2]])
[3, 2, 0, -1, -2]
```