Extended Argument and Call Syntax

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Overview

Extended argument syntax

Arbitrary numbers of positional arguments

Arbitrary keyword arguments

Positional-only and keyword-only arguments

Extended call syntax

Forwarding arbitrary function arguments

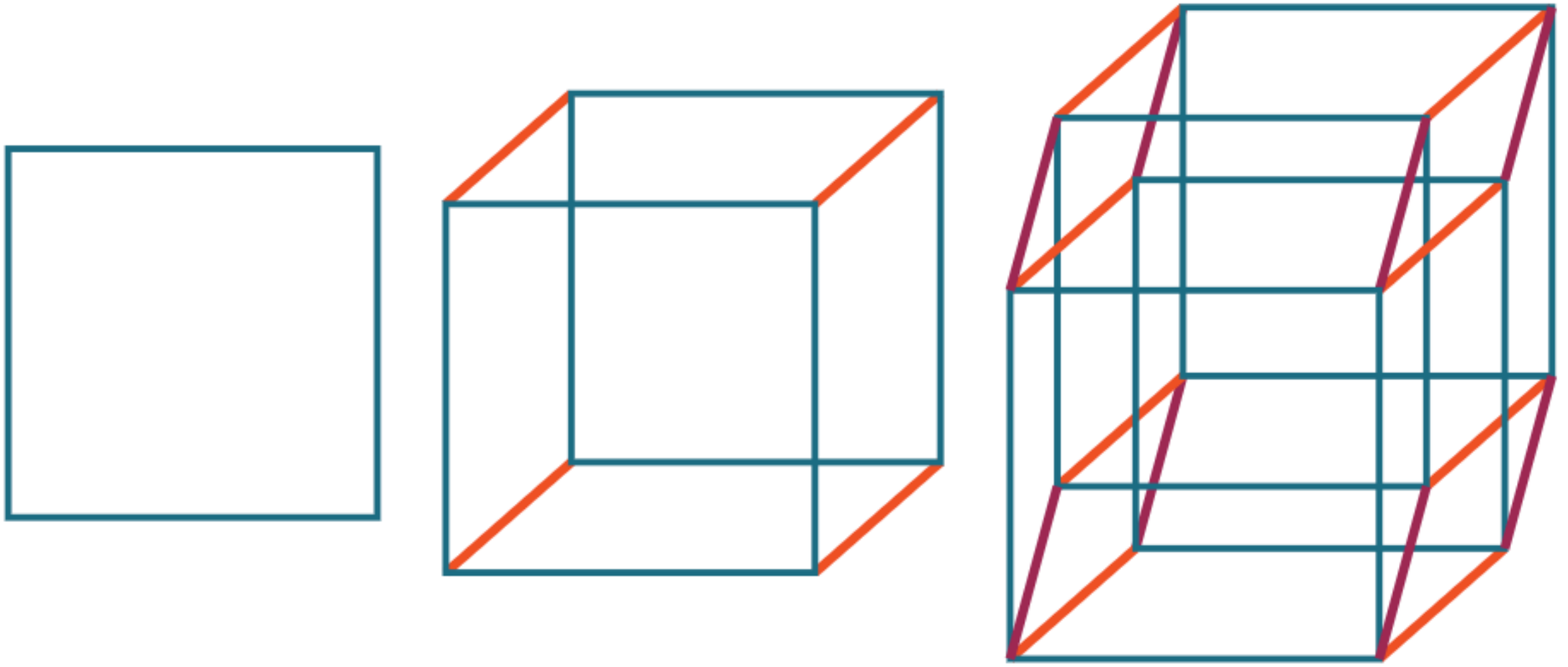
Extended Argument Syntax

Extended Argument Syntax

```
>>> print()

>>> print("one")
one
>>> print("one", "two")
one two
>>> print("one", "two", "three")
one two three
>>> "{a}<===>{b}".format(a="Oslo", b="Stavanger")
'Oslo<===>Stavanger'
>>>
```

Cuboid Volumes



Hypervolume

```
>>> hypervolume(3, 4, 5)
(3, 4, 5)
<class 'tuple'>
>>> def hypervolume(*lengths):
...     i = iter(lengths)
...     v = next(i)
...     for length in i:
...         v *= length
...     return v
...
>>> hypervolume(2, 4)
8
>>> hypervolume(2, 4, 6)
48
>>> hypervolume(2, 4, 6, 8)
384
>>> hypervolume(1)
1
>>> hypervolume()
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "<stdin>", line 3, in hypervolume
StopIteration
>>>
```

Translate the Exception

Catch the `StopIteration` exception thrown by `next()` .

Translate it into the more predictable `TypeError` .

Hypervolume

```
>>> def hypervolume(length, *lengths):
...     v = length
...     for item in lengths:
...         v *= item
...     return v
...
>>> hypervolume(3, 5, 7, 9)
945
>>> hypervolume(3, 5, 7)
105
>>> hypervolume(3, 5)
15
>>> hypervolume(3)
3
>>> hypervolume()
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: hypervolume() missing 1 required positional argument: 'length'
>>>
```

Variable Positional Arguments

`functools.reduce()`

Use positional arguments with star-args

Rules for *args

1. **Must come after normal positional arguments**
2. **Only collects positional arguments**

Arbitrary keyword arguments

Prefix argument with ** to accept arbitrary keyword arguments

Conventionally called **kwargs

HTML Tag Function

```
def tag(name, **kwargs)
```

HTML Tag Function

```
  File "<stdin>", line 1, in <module>
TypeError: name_tag() takes 2 positional arguments but 3 positional arguments (a
nd 1 keyword-only argument) were given
>>> def print_args(arg1, arg2, *args, kwarg1, kwarg2, **kwargs):
...     print(arg1)
...     print(arg2)
...     print(args)
...     print(kwarg1)
...     print(kwarg2)
...     print(kwargs)
...
>>> print_args(1, 2, 3, 4, 5, kwarg1=6, kwarg2=7, kwarg3=8, kwarg4=9)
1
2
(3, 4, 5)
6
7
{'kwarg3': 8, 'kwarg4': 9}
>>> def print_args(arg1, arg2, *args, kwarg1, kwarg2, **kwargs, kwargs99):
  File "<stdin>", line 1
    def print_args(arg1, arg2, *args, kwarg1, kwarg2, **kwargs, kwargs99):
                                                             ^
SyntaxError: invalid syntax
>>>
```

Positional-only Arguments

Positional-only Arguments

```
>>> def number_length(x, /):
...     return len(str(x))
...
>>> number_length(2112)
4
>>> number_length(x=31557600)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: number_length() got some positional-only arguments passed as keyword
arguments: 'x'
>>>
```

Why Positional-only Arguments?

Parity with modules implemented in other languages

Positional-only Arguments in `range()`

```
>>> range(start=1, stop=100)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: range() takes no keyword arguments
>>>
```

Why Positional-only Arguments?

Parity with modules implemented in other languages

Prevent formal argument names from becoming part of the API

This prevents dependencies on the names

Useful when the names have no semantic meaning

Extended argument syntax applies to all types of callables.

Extended Call Syntax

Extended Call Syntax

```
>>> def print_args(arg1, arg2, *args):
...     print(arg1)
...     print(arg2)
...     print(args)
...
>>> t = (11, 12, 13, 14)
>>> print_args(*t)
11
12
(13, 14)
>>>
```

Extended Call Syntax for Mappings

```
>>> def color(red, green, blue, **kwargs):
...     print("r =", red)
...     print("g =", green)
...     print("b =", blue)
...     print(kwargs)
...
>>> k = {'red':21, 'green':68, 'blue':120, 'alpha':52 }
>>> color(**k)
r = 21
g = 68
b = 120
{'alpha': 52}
>>> k = dict(red=21, green=68, blue=120, alpha=52)
>>>
```

`dict()` uses `**kwargs` in its initializer.

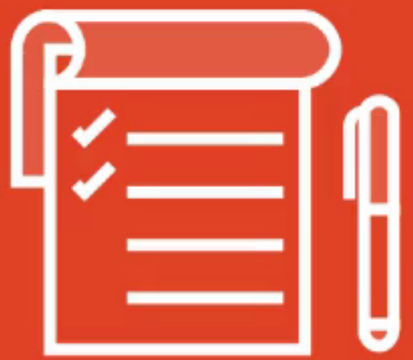
We can use this in our previous example instead of a `dict` literal.

Argument Forwarding

Argument Forwarding

```
>>> def trace(f, *args, **kwargs):
...     print("args =", args)
...     print("kwargs =", kwargs)
...     result = f(*args, **kwargs)
...     print("result =", result)
...     return result
...
>>> trace(int, "ff", base=16)
args = ('ff',)
kwargs = {'base': 16}
result = 255
255
>>>
```

Summary



Extended argument syntax for accepting arbitrary positional arguments

As well as arbitrary keyword arguments

Specifying keyword-only arguments

Specifying positional-only arguments

Extended call syntax

Perfect argument forwarding