



PYTHON DATA SCIENCE TOOLBOX I

Lambda functions



Lambda functions

```
In [1]: raise_to_power = lambda x, y: x ** y
```

```
In [2]: raise_to_power(2, 3)
```

```
Out[2]: 8
```



Anonymous functions

- Function map takes two arguments: `map(func, seq)`
- `map()` applies the function to ALL elements in the sequence

```
In [1]: nums = [48, 6, 9, 21, 1]
```

```
In [2]: square_all = map(lambda num: num ** 2, nums)
```

```
In [3]: print(square_all)
<map object at 0x103e065c0>
```

```
In [4]: print(list(square_all))
[2304, 36, 81, 441, 1]
```



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Let's practice!



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Introduction to error handling



The float() function

The screenshot shows a web browser window with the URL `docs.python.org/3/`. The page content is as follows:

```
class float([x])
```

Return a floating point number constructed from a number or string *x*.

If the argument is a string, it should contain a decimal number, optionally preceded by a sign, and optionally embedded in whitespace. The optional sign may be '+' or '-'; a '+' sign has no effect on the value produced. The argument may also be a string representing a NaN (not-a-number), or a positive or negative infinity. More precisely, the input must conform to the following grammar after leading and trailing whitespace characters are removed:

```
sign          ::= "+" | "-"
infinity      ::= "Infinity" | "inf"
nan           ::= "nan"
numeric_value ::= floatnumber | infinity | nan
numeric_string ::= [sign] numeric_value
```



Passing an incorrect argument

```
In [1]: float(2)
```

```
Out[1]: 2.0
```

```
In [2]: float('2.3')
```

```
Out[2]: 2.3
```

```
In [3]: float('hello')
```

```
-----  
ValueError                                Traceback (most recent call last)  
<ipython-input-3-d0ce8bccc8b2> in <module>()  
----> 1 float('hi')  
ValueError: could not convert string to float: 'hello'
```



Passing valid arguments

```
In [1]: def sqrt(x):  
...:     """Returns the square root of a number."""  
...:     return x ** (0.5)
```

```
In [2]: sqrt(4)
```

```
Out[2]: 2.0
```

```
In [3]: sqrt(10)
```

```
Out[3]: 3.1622776601683795
```




Passing invalid arguments

```
In [4]: sqrt('hello')
```

```
-----  
TypeError                                 Traceback (most recent call last)
```

```
<ipython-input-4-cfb99c64761f> in <module>()  
----> 1 sqrt('hello')
```

```
<ipython-input-1-939b1a60b413> in sqrt(x)
```

```
    1 def sqrt(x):  
----> 2     return x**(0.5)
```

```
TypeError: unsupported operand type(s) for ** or pow(): 'str' and  
'float'
```



Errors and exceptions

- Exceptions - caught during execution
- Catch exceptions with `try-except` clause
 - Runs the code following `try`
 - If there's an exception, run the code following `except`



Errors and exceptions

```
In [1]: def sqrt(x):  
...:     """Returns the square root of a number."""  
...:     try:  
...:         return x ** 0.5  
...:     except:  
...:         print('x must be an int or float')
```

```
In [2]: sqrt(4)  
Out[2]: 2.0
```

```
In [3]: sqrt(10.0)  
Out[3]: 3.1622776601683795
```

```
In [4]: sqrt('hi')  
x must be an int or float
```



Errors and exceptions

```
In [1]: def sqrt(x):
...:     """Returns the square root of a number."""
...:     try:
...:         return x ** 0.5
...:     except TypeError:
...:         print('x must be an int or float')
```

The screenshot shows a web browser window with the URL `docs.python.org/3/lib`. The page content includes the following sections:

- exception `TypeError`**
Raised when an operation or function is applied to an object of inappropriate type. The associated value is a string giving details about the type mismatch.
- exception `UnboundLocalError`**
Raised when a reference is made to a local variable in a function or method, but no value has been bound to that variable. This is a subclass of `NameError`.
- exception `UnicodeError`**
Raised when a Unicode-related encoding or decoding error occurs. It is a subclass of `ValueError`.

Below these sections, there is a paragraph: `UnicodeError` has attributes that describe the encoding or decoding error. For example, `err.object[err.start:err.end]` gives the particular invalid input that the codec failed on.



Errors and exceptions

```
In [2]: sqrt(-9)
Out[2]: (1.8369701987210297e-16+3j)
```

```
In [3]: def sqrt(x):
...:     """Returns the square root of a number."""
...:     if x < 0:
...:         raise ValueError('x must be non-negative')
...:     try:
...:         return x ** 0.5
...:     except TypeError:
...:         print('x must be an int or float')
```



Errors and exceptions

```
In [4]: sqrt(-2)
```

```
-----  
ValueError                                Traceback (most recent call last)  
<ipython-input-2-4cf32322fa95> in <module>()  
----> 1 sqrt(-2)
```

```
<ipython-input-1-a7b8126942e3> in sqrt(x)  
    1 def sqrt(x):  
    2     if x < 0:  
----> 3         raise ValueError('x must be non-negative')  
    4     try:  
    5         return x**(0.5)
```

```
ValueError: x must be non-negative
```



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Let's practice!



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Bringing it all together



Errors and exceptions

sqrt.py

```
def sqrt(x):  
    try:  
        return x ** 0.5  
    except:  
        print('x must be an int or float')
```

```
In [1]: sqrt(4)
```

```
Out[1]: 2.0
```

```
In [2]: sqrt('hi')
```

```
x must be an int or float
```



Errors and exceptions

sqrt.py

```
def sqrt(x):  
    if x < 0:  
        raise ValueError('x must be non-negative')  
    try:  
        return x ** 0.5  
    except TypeError:  
        print('x must be an int or float')
```



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Let's practice!



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Congratulations!



What you've learned:

- Write functions that accept single and multiple arguments
- Write functions that return one or many values
- Use default, flexible, and keyword arguments
- Global and local scope in functions
- Write lambda functions
- Handle errors



There's more to learn!

- Create lists with list comprehensions
- Iterators - you've seen them before!
- Case studies to apply these techniques to Data Science



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Congratulations!