Libraries

can code communities

Libraries

The built-in Python standard library has modules that can be used for common tasks such as mathematical operations, file handling, and more.

There are also libraries from outside sources that are used for various tasks such as image manipulation, GUI applications, data analysis, data visualization, machine learning, and many more topics. Some examples:

- Pillow - image manipulation
- Tkinter - GUI development
- NumPy - numerical computing and data analysis
- Pandas - data science

Terms related to Libraries

- **Library:** A collection of code that can be used for many applications. For example, the Python standard library has math, statistics, etc.
- **Module:** One class (Python file) that might be part of a library. For example, the math module.
- **Package:** The way modules are structured in Python. Multiple modules can be structured into a package.
- **API:** Application Programming Interface, this is the interface of a library, for example, the methods we call when we're using a library.

The difference between these terms is minor, and sometimes even experienced programmers use them interchangeably.

Python Standard Library

Some of the most commonly used built-in modules in Python are math, statistics, and os.

For example, the math module provides mathematical functions such as square root, logarithm, etc.

The statistics module provides functions for statistical analysis such as mean, median, etc.

The os module provides functions for interacting with the operating system, such as accessing and manipulating files.

Import Statements

For built-in libraries, you can import them using just one line of code.

For example, this line imports math:

```
import math
```

You can also change the name of a library you import to a short nickname:

```
import statistics as stat
```

You can also just import part of a library, using either of these lines:

```
import math.pi
```

```
from math import pi
```

Make sure to put your import statements at the top of your code!

Example

Import the math library.

Take the radius of a circle as user input.

Then, compute the area of the circle using the math library.

Exercise

Modify the last example to compute the area of a sphere.

Take the radius as user input, and compute the area of the sphere using math.pi.

Statistics

Some common statistics include mean, median, and mode.

Let's say `data = [1,3,3,4,5,6]`

- Mean: The average of a dataset, which is the sum of all the items divided by how many items there are.

  `mean = (1+3+3+4+5+6)/6 = 23/6 = 3.66`

- Median: The center point of a dataset when it's in sorted order. If there are two center points, the median is the average between them.

  `median = (3+4)/2 = 3.5`

- Mode: The item that appears most frequently in a dataset.

  `mode = 3`

Exercise

Write some code that computes the median of a list.

First, sort the list.

If the list is odd length, the median is the middle value.

If the list is even length, the median is the average of the two middle values.

Statistics Library

The statistics library is a more convenient way to compute the mean, median, mode, and other statistical measures.

You can always compute them manually using Python, but if you import statistics, you can do it only one line, which saves a lot of time.

Let’s rewrite the median example to use the statistics median() function instead.

Outside Libraries

There are many outside libraries to choose from. This is one of the main strengths of Python - it's a popular programming language, so many people have written libraries to go along with it. There are thousands of libraries to choose from, and many of them are free and open source.

Here is a list of some popular Python libraries.

- Many Python libraries are built on top of other libraries. For example, Pandas is built on NumPy, and Seaborn is built on Matplotlib.

What are some Python libraries you would like to use in your code?

Installing Libraries with Pip

Importing outside libraries requires more steps than using built-in modules from the default Python library.

One way to install libraries is with `pip`.

In VSCode, open the terminal, and type this line:

```
pip install [package name]
```

For example, if you want to install NumPy, you would type:

```
pip install numpy
```

Importing Outside Libraries

Once you've installed a library using pip, now you can import and use it just like a default Python library.

For example, if you installed NumPy, you can type this line to import it and shorten the name to np:

```
import numpy as np
```

Now you can use your library, just like we've seen before.

Exercise: Import an outside library of your choice

Resources

Math library: https://docs.python.org/3/library/math.html

Stats library: https://docs.python.org/3/library/statistics.html

Popular Python libraries: https://hackr.io/blog/best-python-libraries