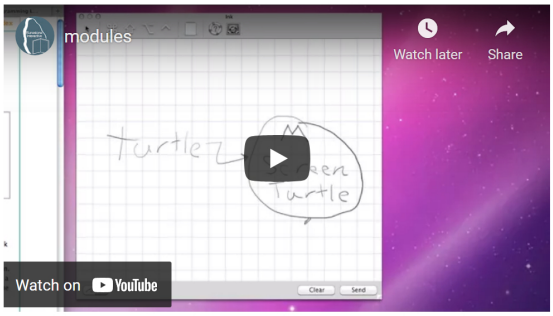
4.2. Modules



Activity: 1 -- Video: (vid_modules)

A **module** is a file containing Python definitions and statements intended for use in other Python programs. There are many Python modules that come with Python as part of the **standard library**. Providing additional functionality through modules allows you to only use the functionality you need when you need it, and it keeps your code cleaner.

Functions imported as part of a module live in their own **namespace**. A namespace is simply a space within which all names are distinct from each other. The same name can be reused in different namespaces but two objects can't have the same name within a single namespace. One example of a namespace is the set of street names within a single city. Many cities have a street called "Main Street", but it's very confusing if two streets in the same city have that name! Another example is the folder organization of file systems. You can have a file called todo in your work folder as well as your personal folder, but you know which is which because of the folder it's in; each folder has its own namespace for files. Note that human names are not part of a namespace that enforces uniqueness; that's why governments have invented unique identifiers to assign to people, like passport numbers.

The Python Documentation site for Python version 3.6 is an extremely useful reference for all aspects of Python. The site contains a listing of all the standard modules that are available with Python (see Global Module Index). You will also see that there is a Standard Library Reference and a Tutorial as well as installation instructions, how-tos, and frequently asked questions. We encourage you to become familiar with this site and to use it often.

If you have not done so already, take a look at the Global Module Index. Here you will see an alphabetical listing of all the modules that are available as part of the standard library. Find the turtle module.

4.2.1. Importing Modules

In order to use Python modules, you have to **import** them into a Python program. That happens with an import statement: the word `import`, and then the *name* of the module. The name is case-sensitive. Roughly translated to English, an import statement says "there's some code in another file; please make its functions and variables available in this file." More technically, an import statement causes all the code in another file to be executed. Any variables that are bound during that execution (including functions that are defined) may then be referred in some way (to be discussed) in the current file.

By convention, all `import` commands are put at the very top of your file. They can be put elsewhere, but that can lead to some confusions, so it's best to follow the convention.

Where do these other files that you can import come from? It could be a code file that you wrote yourself, or it could be code that someone else wrote and you copied on to your computer.

For example, if you have a file `myprog.py` in directory `~/Desktop/mycode/`, and myprog.py contains a line of code `import morecode`, then the python interpreter will look for a file called `morecode.py`, excecute its code, and make its object bindings available for reference in the rest of the code in myprog.py.

Note that it is `import morecode`, not `import morecode.py`, but the other file has to be called `morecode.py`.

The tests you see in your problem sets are also using a Python module that's in the standard library, called `unittest`. Right now, you can't see the code that causes those tests to run, because we have hidden it from you, but later in the course, you will learn how to write your own Unit Tests for code, and to do so, you will need to write an import statement at the beginning of your programs. Even before you learn how to write your own tests, you will see code for Unit Tests in your problem set files.

Don't overwrite standard library modules!

Given the order of search for external Python modules that is described in the list above, it is possible to overwrite a standard library. For example, if you create a file `random.py` in the same directory where `myprog.py` lives, and then myprog.py invokes `import random`, it will import *your* file rather than the standard library module. That's not usually what you want, so be careful about how you name your python files!

4.2.2. Syntax for Importing Modules and Functionality

When you see imported modules in a Python program, there are a few variations that have slightly different consequences.

1. The most common is `import morecode`. That imports everything in morecode.py. To invoke a function f1 that is defined in morecode.py, you would write `morecode.f1()`. Note that you have to explicitly mention morecode again, to specify that you want the f1 function from the morecode namespace. If you just write `f1()`, python will look for an f1 that was defined in the current file, rather than in morecode.py.
2. You can also give the imported module an alias (a different name, just for when you use it in your program). For example, after executing `import morecode as mc`, you would invoke `f1` as `mc.f1()`. You have now given the `morecode` module the alias `mc`. Programmers often do this to make code easier to type.
3. A third possibility for importing occurs when you only want to import SOME of the functionality from a module, and you want to make those objects be part of the current module's namespace. For example, you could write `from morecode import f1`. Then you could invoke f1 without referencing morecode again: `f1()`.

Note: Python modules and limitations with activecode

Throughout the chapters of this book, activecode windows allow you to practice the Python that you

are learning. We mentioned in the first chapter that programming is normally done using some type of development environment and that the activecode used here was strictly to help us learn. It is not the way we write production programs.

To that end, it is necessary to mention that many of the modules available in standard Python will **not** work in the activecode environment. In fact, only `turtle`, `math`, `random`, and a couple others have been ported at this point. If you wish to explore any additional modules, you will need to run from the native python interpreter on your computer.

Check your understanding

modules-1-1: In Python a module is:

- (•) A. A file containing Python definitions and statements intended for use in other Python programs.
- ( ) B. A separate block of code within a program.
- ( ) C. One line of code in a program.
- ( ) D. A file that contains documentation about functions in Python.

Check me | Compare me

✔ A module can be reused in different programs.

Activity: 2 -- Multiple Choice (question13_1_1)

modules-1-2: To find out information on the standard modules available with Python you should:

- (•) A. Go to the Python Documentation site.
- ( ) B. Look at the import statements of the program you are working with or writing.
- ( ) C. Ask the professor.
- ( ) D. Look in this textbook.

Check me | Compare me

✔ The site contains a listing of all the standard modules that are available with Python.

Activity: 3 -- Multiple Choice (question13_1_2)

modules-1-3: True / False: All standard Python modules will work in activecode.

- ( ) A. True
- (•) B. False

Check me | Compare me

✔ Only a few modules have been ported to work in activecode at this time.

Activity: 4 -- Multiple Choice (question13_1_3)

You have attempted 4 of 4 activities on this page

4.1. Introduction to Python Modules">
oduction to Python Modules">
4.3. The random module">

✔ Completed. Well Done!

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