

Importing Modules

Python comes with an extensive library of built-in modules that make it easy to accomplish everyday tasks. With just a few lines of code, you can do anything from generating random numbers and drawing graphics to sending emails and accessing websites.

Content Learning Objectives

After completing this activity, students should be able to:

- Use the random module to generate random float and integer sequences.
- Explain the purpose of the common line `if __name__ == "__main__":`.
- Summarize several built-in modules, including random and turtle.

Process Skill Goals

During the activity, students should make progress toward:

- Navigating the Python standard library documentation. (Information Processing)



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Model 1 Random Numbers

You can generate a sequence of numbers using the Python random module. A mathematical function is used to produce the sequence based on a *seed* value. (If no seed is given, the current system time is used.) The sequence is more accurately described as *pseudorandom*, since its output is inherently predictable.

Python code	Shell output
<code>import randint</code>	
<code>import random</code>	
<code>randint(1, 10)</code>	
<code>random.randint(1, 10)</code>	
<code>from random import randint</code>	
<code>randint(1, 10)</code>	
<code>seed(100)</code>	
<code>random.seed(100)</code>	
<code>random.random()</code>	
<code>random.random()</code>	
<code>random.seed(100)</code>	
<code>random.random()</code>	
<code>random.random()</code>	

Questions (20 min)

Start time: _____

1. What is the name of the module that must be imported before generating a random number?
2. Based on Model 1, what are the names of three functions defined in the random module?
3. Identify the syntax of the statement to import:
 - a) a module
 - b) a function

4. Identify the syntax of a function call assuming:
 - a) the module was imported
 - b) the function was imported
5. How could you eliminate the need for typing the word “random” twice (in a function call) to generate a random number?
6. Compare the shell output of your team with at least one other team. Describe the similarities and differences observed.
7. What is the effect on the random numbers generated after calling the seed method?
8. Describe one reason to set the same seed each time a program is run, and one reason to not use the seed method.
9. Run `random.random()` multiple times. Based on the results, describe:
 - a) the range of numbers returned by the random function
 - b) the nature of the distribution of numbers generated. (Do they appear clustered around a particular value, or are they spread out uniformly over the range?)
10. Run `random.randint(1, 10)` multiple times. Based on the results, describe:
 - a) the range of numbers returned by the randint function
 - b) the nature of the distribution of numbers generated. (Do they appear clustered around a particular value, or are they spread out uniformly over the range?)

Model 2 Multiple Modules

Create a new file `move.py`, and enter the code:

```
1 import random
2
3 def angle():
4     number = random.randint(-90, 90)
5     return number
6
7 print("in move: __name__ ==", __name__)
8 print("will always execute: angle ==", angle())
9
10 if __name__ == "__main__":
11     print("only if True: angle ==", angle())
```

Run `move.py`, and record the output below.

Output Line 1	
Output Line 2	
Output Line 3	

Create a new file `stop.py` (in the same directory), and enter the code:

```
1 import move
2
3 print("in stop: __name__ ==", __name__)
4 print("from module: angle ==", move.angle())
```

Run `stop.py`, and record the output below. Draw an arrow from each line of output to its corresponding print statement in the code.

Output Line 1	
Output Line 2	
Output Line 3	
Output Line 4	

Questions (15 min)

Start time: _____

11. Upon execution of `move.py`:

- a) what is the value of the variable `__name__`?
- b) does the output correspond solely to the print statements contained in this file?

12. Upon execution of `stop.py`:

- a) what is the value of the variable `__name__` from the print statement in `move`
- b) what is the value of the variable `__name__` from the print statement in `stop`
- c) does the output correspond solely to the print statements contained in this file?

13. What was the reason to include the `import move` statement in `stop.py`?

14. Based on the output of `stop.py`, describe what happens (as a side effect) when another module is imported.

15. What line in `move.py` did not print when `stop.py` was executed? Why?

16. In order for the output of `stop.py` to correspond solely to the print statements contained in `stop.py`, what modifications need to be made to `move.py`?

17. Describe what code in general to include inside `if __name__ == "__main__":`, and why.

Model 3 Turtle Graphics

The turtle module can be used to create graphics. Create a new file `draw.py` (in the same directory), and enter the following code. Run the program and see what happens.

```
1 import move
2 import turtle
3
4 def randomwalk(steps):
5     turtle.shape("turtle")
6     turtle.color("green")
7     for i in range(steps):
8         turtle.left(move.angle())
9         turtle.forward(10)
10    turtle.bye()
11
12 if __name__ == "__main__":
13     randomwalk(100)
```

Questions (10 min)

Start time: _____

18. For each outcome, describe the type of edit necessary to `draw.py` and `move.py`:

- a) a blue turtle
- b) a longer simulation
- c) a smaller range of angles (e.g., -45 to 45) that define the direction of the turtle
- d) a random range of integers (e.g., 10 to 20) that define the length of a turtle move

19. Describe the type of edit necessary to produce the same outcome in Question #18d if the argument of `forward` is `move.length()` instead of 10:

20. Go to <https://docs.python.org> and click the modules link in the upper right corner. Find at least two built-in modules that interest you, and summarize what functions they provide.