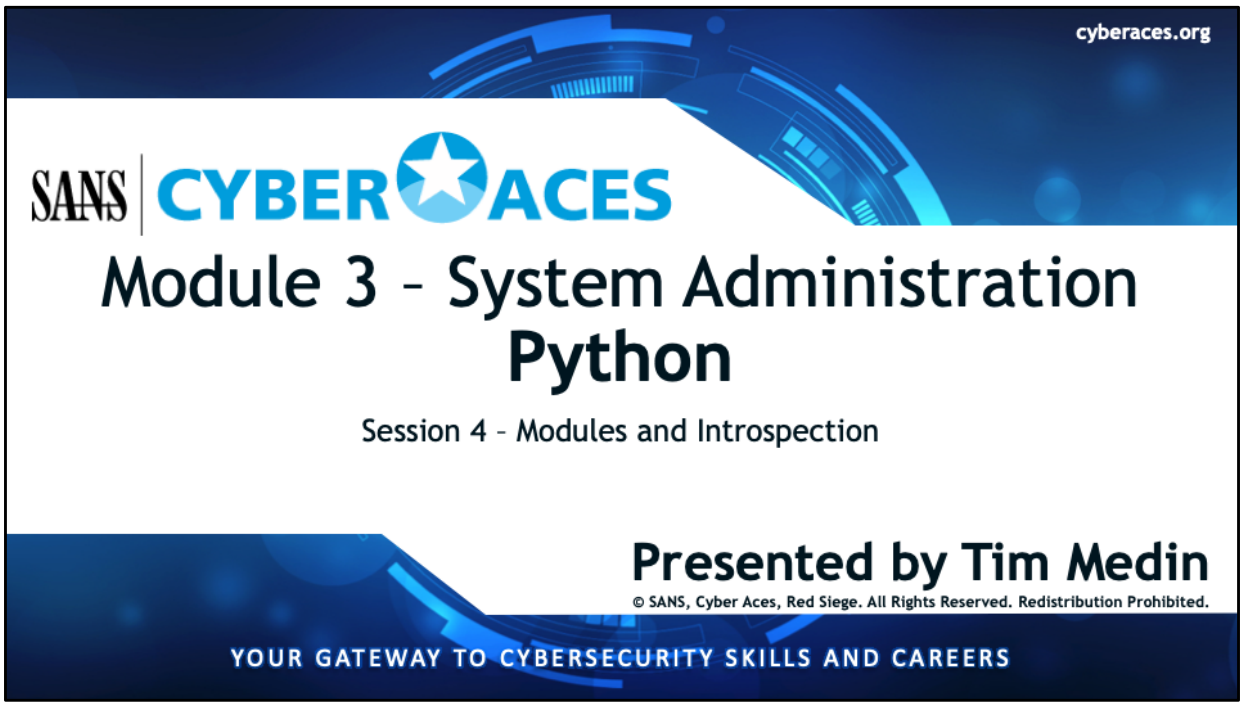
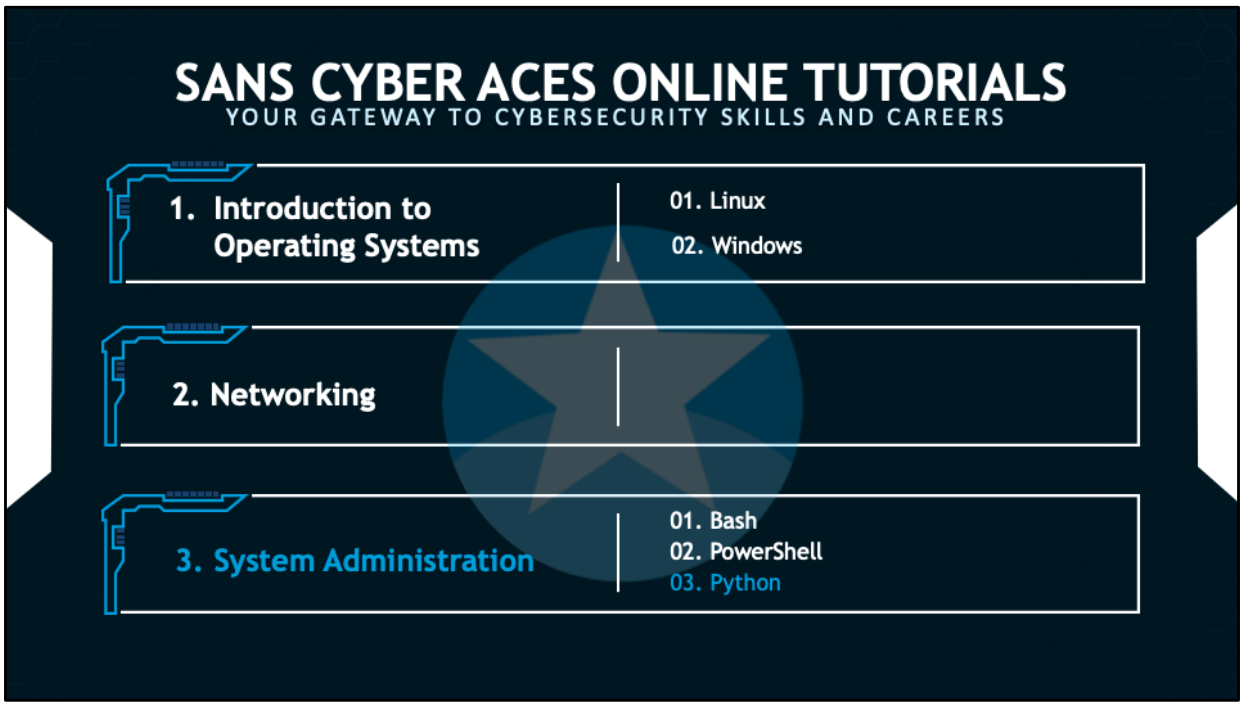


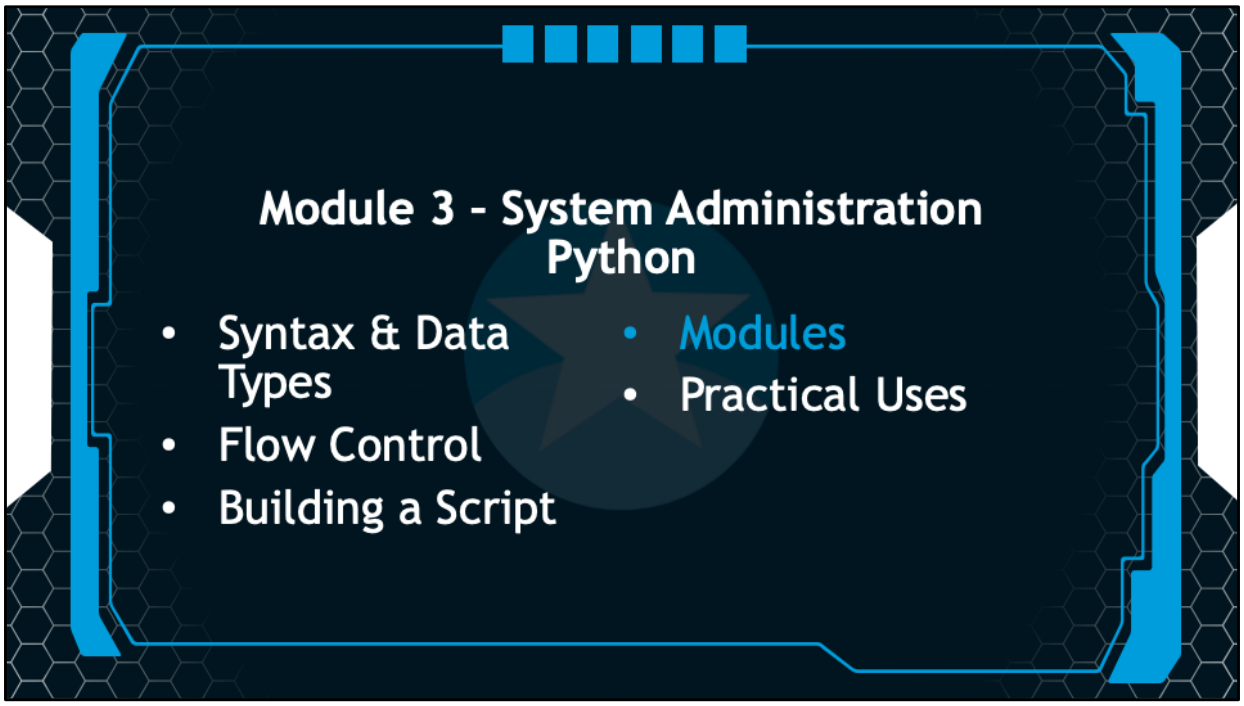

Welcome to the Module 3, System Administration. In this sub-section we'll be discussing Python. First, let's get you introduced to this scripting and programming language.



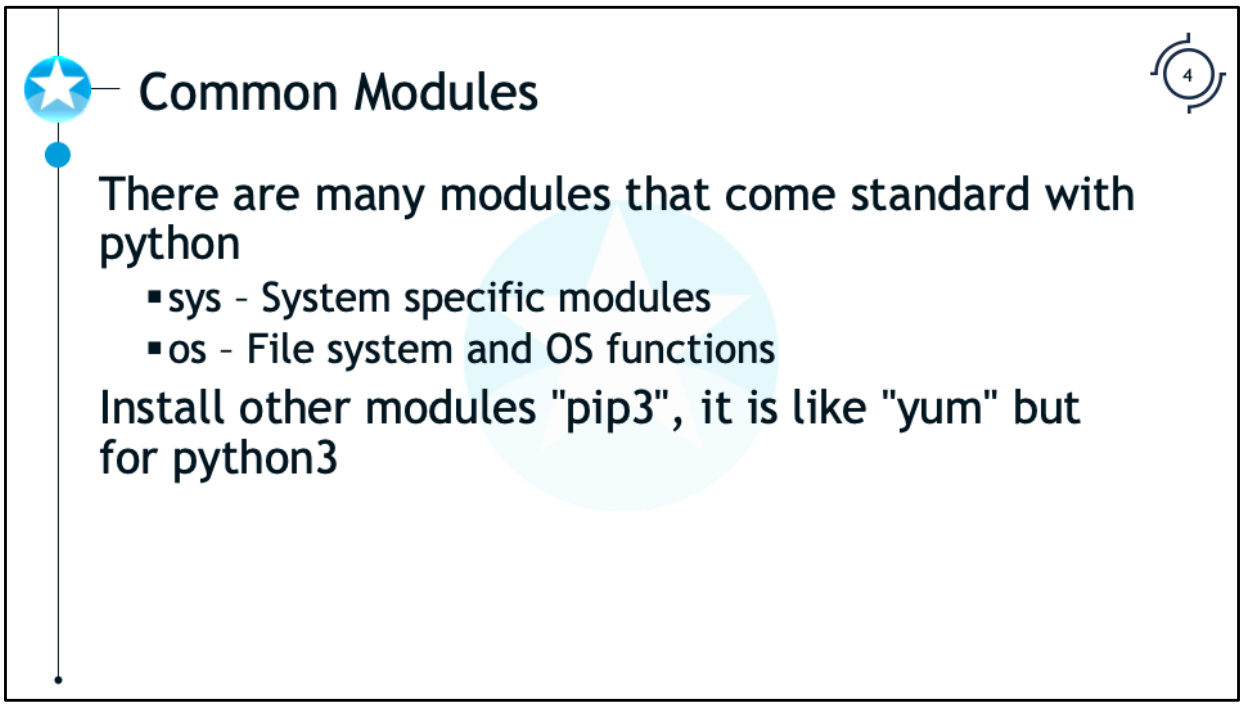

This training material was originally developed to help students, teachers, and mentors prepare for the Cyber Aces Online Competition. This module focuses on the basics of system administration and scripting. . This session is part of Module 3, System Administration. This module is split into three sections, Bash, PowerShell, and Python. In this session, we will continue our examination of Python.

The three modules of Cyber Aces Online are Operating Systems, Networking, and System Administration.

For more information about the Cyber Aces program, please visit the Cyber Aces website at https://CyberAces.org/.

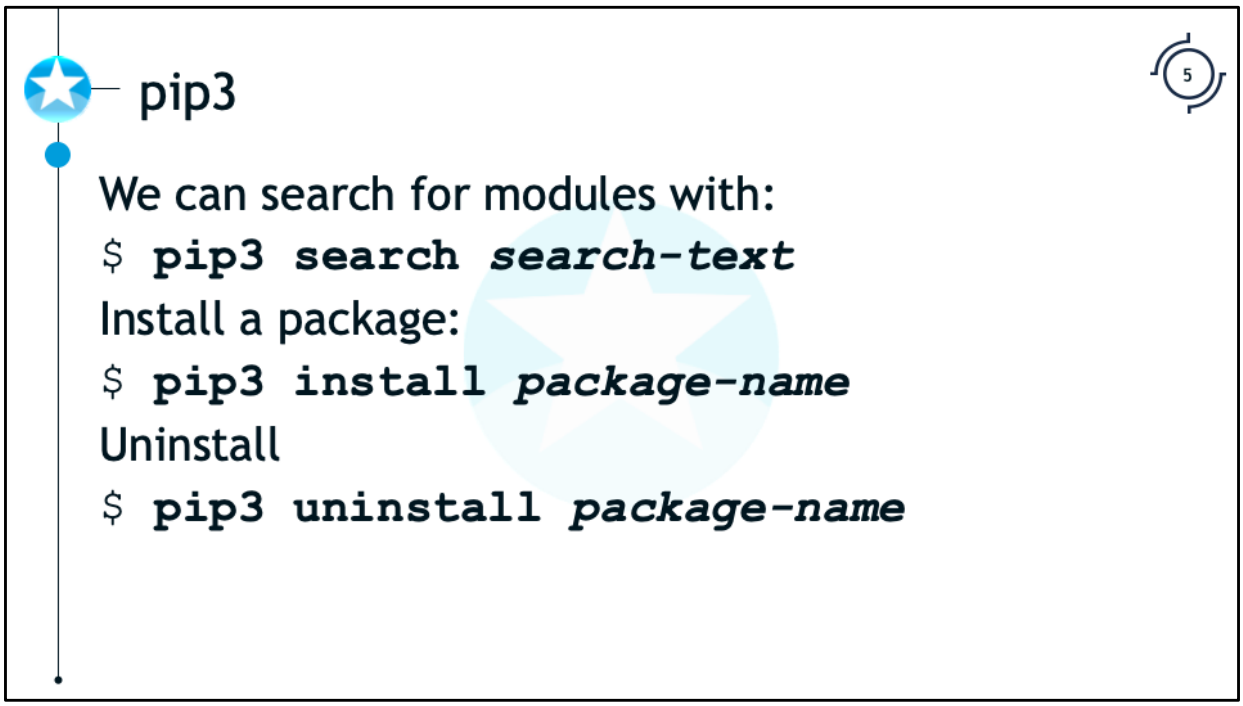



In this session, you learn how to use modules in Python.




There are a number of useful modules that come preinstalled with python3. We've already used the "sys" module to access arguments in our scripts, but the module does a lot more. We'll look at it deeper shortly.

We can install other modules using "pip3". This functions much the same way as "yum", but this is specific to python3.




We can use pip3 to search for packages using "search".

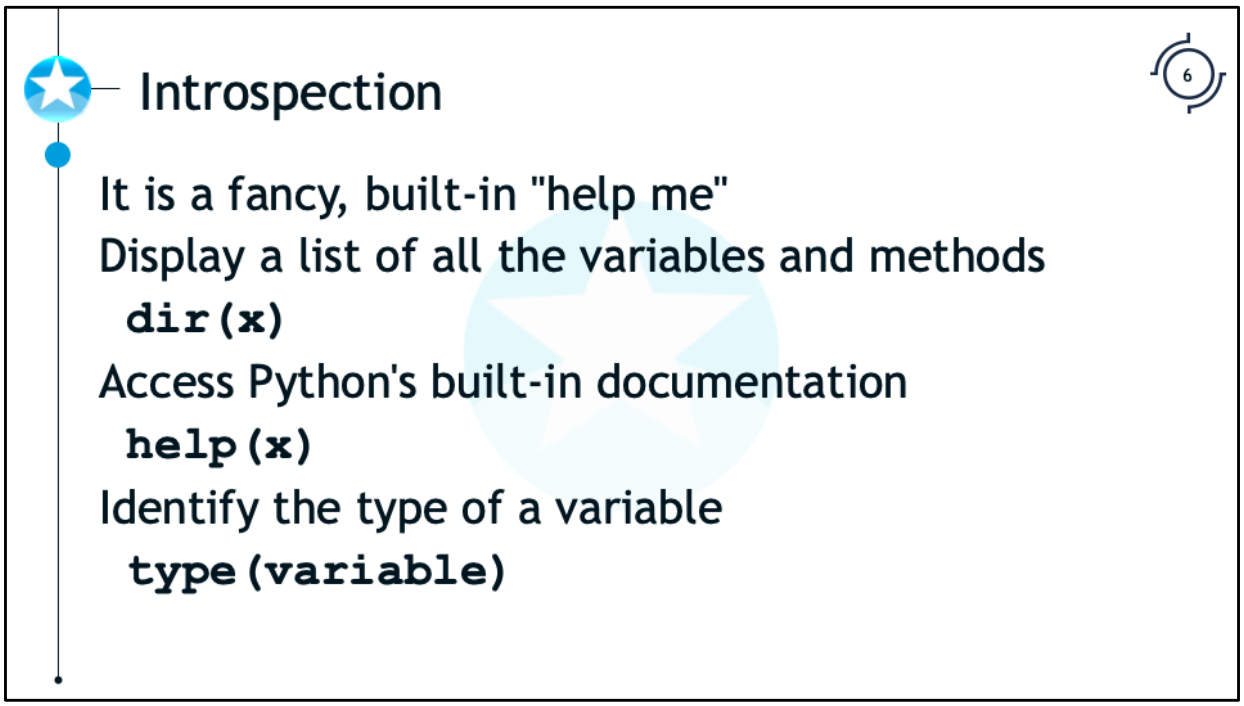
```
$ pip3 search search-text
```

Install a package:

```
$ pip3 install package-name
```

Uninstall

```
$ pip3 uninstall package-name
```




Introspection is a way to use python to learn how to use python. It is a fancy, built-in "help me". We can display a list of all the variables and methods with "dir":

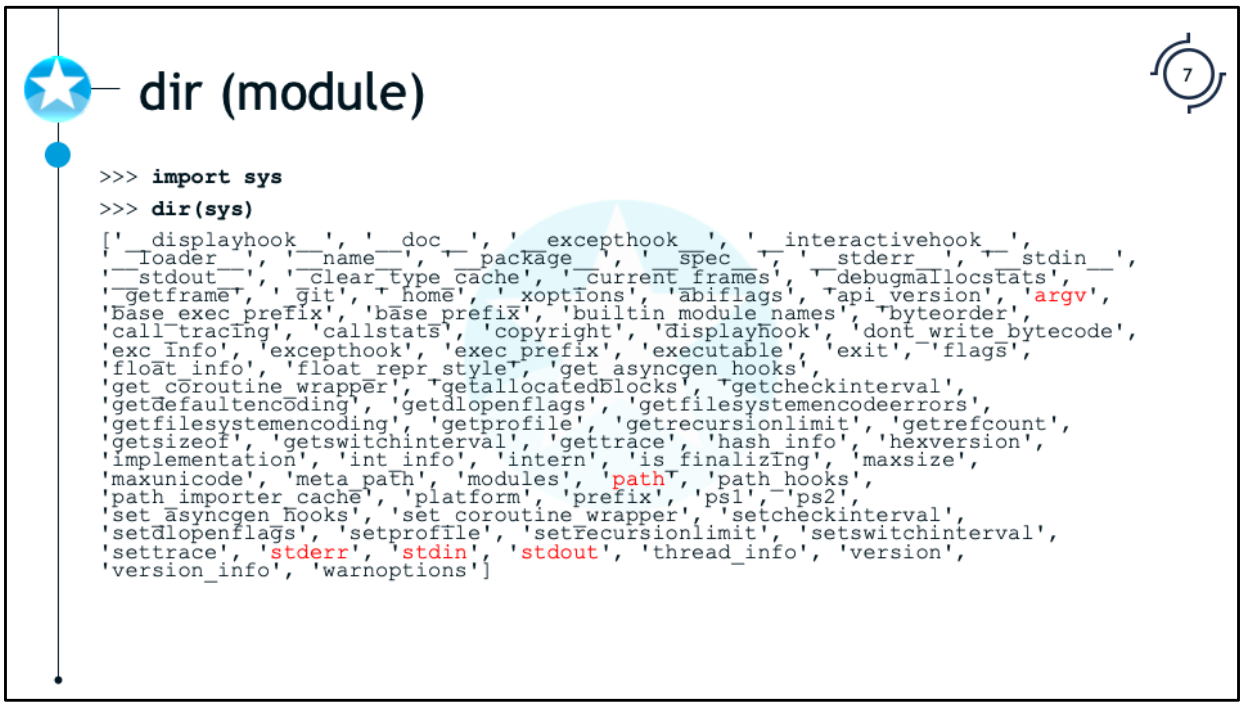
```
dir(x)
```

Or use "help" to access Python's built-in documentation:

```
help(x)
```

Or identify the type of a variable:

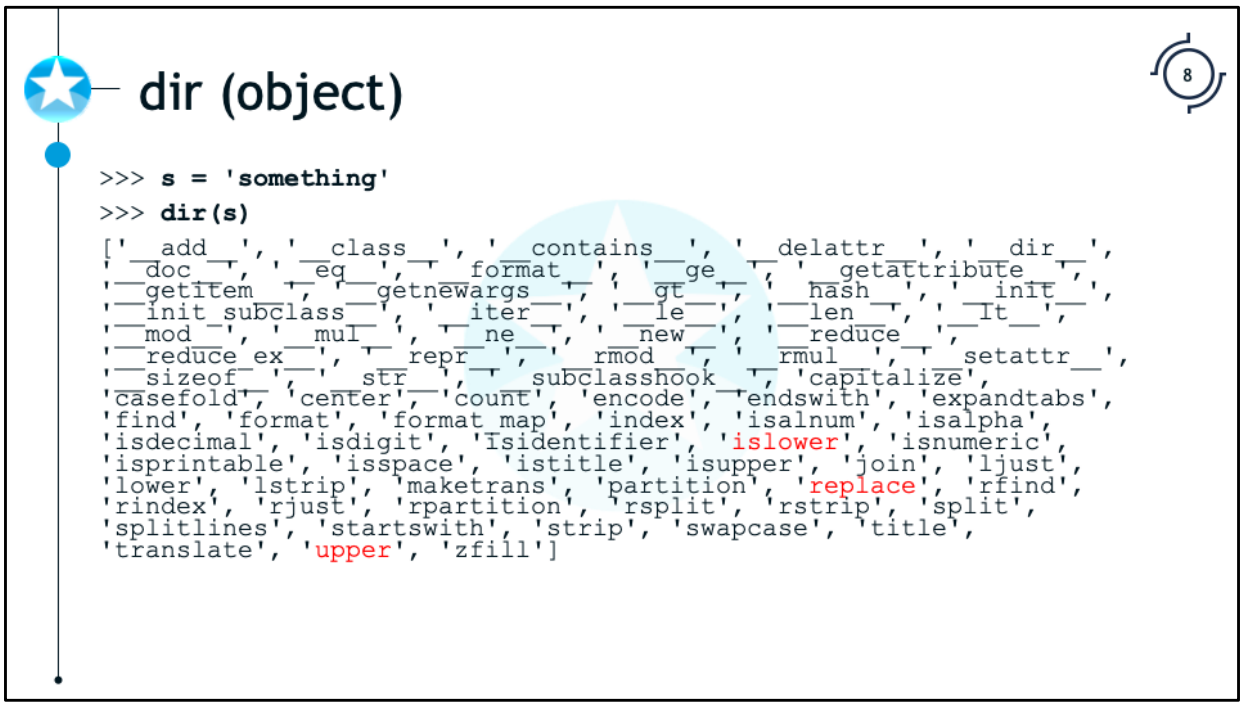
```
type(variable)
```




We can use dir on a module or an object (such as a string) to see the properties and methods we have available.

```
>>> import sys
>>> dir(sys)
['__displayhook__', '__doc__', '__excepthook__',
'__interactivehook__', '__loader__', '__name__', '__package__',
'__spec__', '__stderr__', '__stdin__', '__stdout__',
'_clear_type_cache', '_current_frames', '_debugmallocstats',
'_getframe', '_git', '_home', '_xoptions', 'abiflags', 'api_version',
'argv', 'base_exec_prefix', 'base_prefix', 'builtin_module_names',
'byteorder', 'call_tracing', 'callstats', 'copyright', 'displayhook',
'dont_write_bytecode', 'exc_info', 'excepthook', 'exec_prefix',
'executable', 'exit', 'flags', 'float_info', 'float_repr_style',
'get_asyncgen_hooks', 'get_coroutine_wrapper', 'getallocatedblocks',
'getcheckinterval', 'getdefaultencoding', 'getdlopenflags',
'getfilesystemencodeerrors', 'getfilesystemencoding', 'getprofile',
'getrecursionlimit', 'getrefcount', 'getsizeof', 'getswitchinterval',
'gettrace', 'hash_info', 'hexversion', 'implementation', 'int_info',
'intern', 'is_finalizing', 'maxsize', 'maxunicode', 'meta_path',
'modules', 'path', 'path_hooks', 'path_importer_cache', 'platform',
'prefix', 'ps1', 'ps2', 'set_asyncgen_hooks',
'set_coroutine_wrapper', 'setcheckinterval', 'setdlopenflags',
'setprofile', 'setrecursionlimit', 'setswitchinterval', 'settrace',
'stderr', 'stdin', 'stdout', 'thread_info', 'version',
'version_info', 'warnoptions']
```

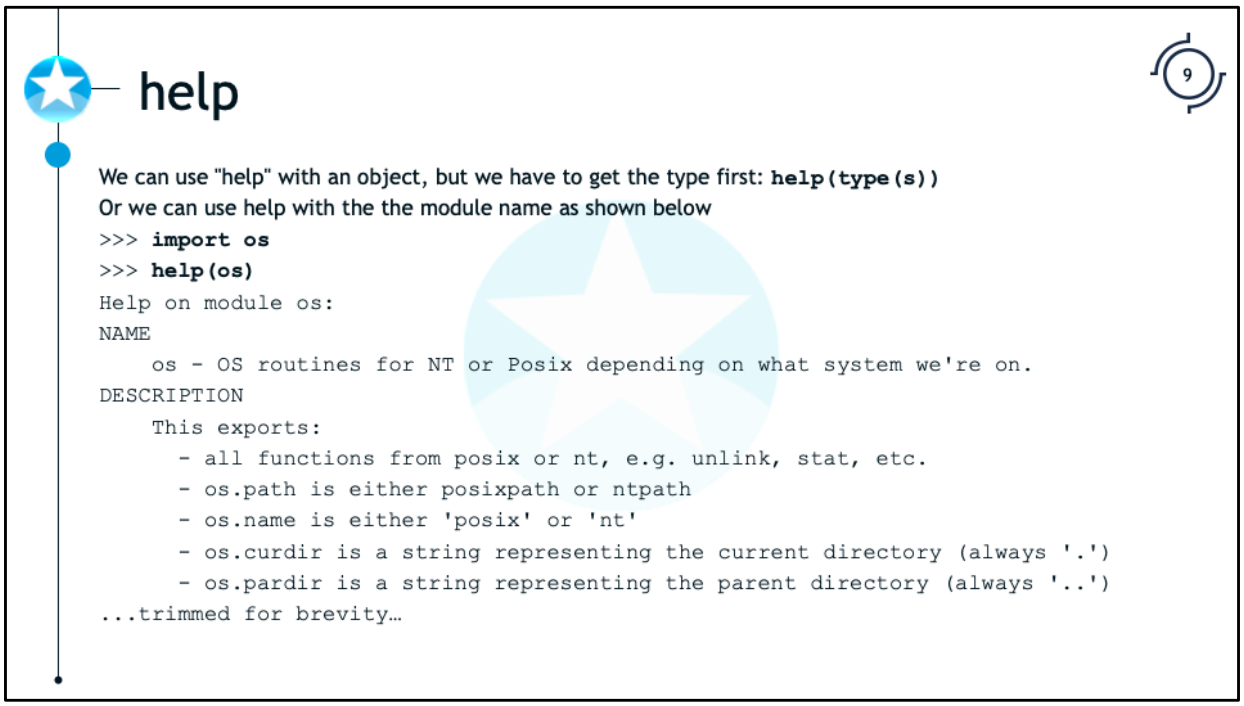
This output can be a little difficult to read, but each item is in quotes. We can see a number of interesting methods, including "argv" that we used before.




We can use "dir" on objects too so we can see what actions we can take on or with the object.

```
>>> s = 'something'
>>> dir(s)
['__add__', '__class__', '__contains__', '__delattr__',
'__dir__', '__doc__', '__eq__', '__format__', '__ge__',
'__getattribute__', '__getitem__', '__getnewargs__',
'__gt__', '__hash__', '__init__', '__init_subclass__',
'__iter__', '__le__', '__len__', '__lt__', '__mod__',
'__mul__', '__ne__', '__new__', '__reduce__',
'__reduce_ex__', '__repr__', '__rmod__', '__rmul__',
'__setattr__', '__sizeof__', '__str__',
'__subclasshook__', 'capitalize', 'casefold', 'center',
'count', 'encode', 'endswith', 'expandtabs', 'find',
'format', 'format_map', 'index', 'isalnum', 'isalpha',
'isdecimal', 'isdigit', 'isidentifier', 'islower',
'isnumeric', 'isprintable', 'isspace', 'istitle',
'isupper', 'join', 'ljust', 'lower', 'lstrip',
'maketrans', 'partition', 'replace', 'rfind', 'rindex',
'rjust', 'rpartition', 'rsplit', 'rstrip', 'split',
'splitlines', 'startswith', 'strip', 'swapcase', 'title',
'translate', 'upper', 'zfill']
```

For example, we can see the "upper" method to convert the string to upper case.




We can use help to get a better understanding of how to use an object or module. To get help on an object, we need to get the type first.

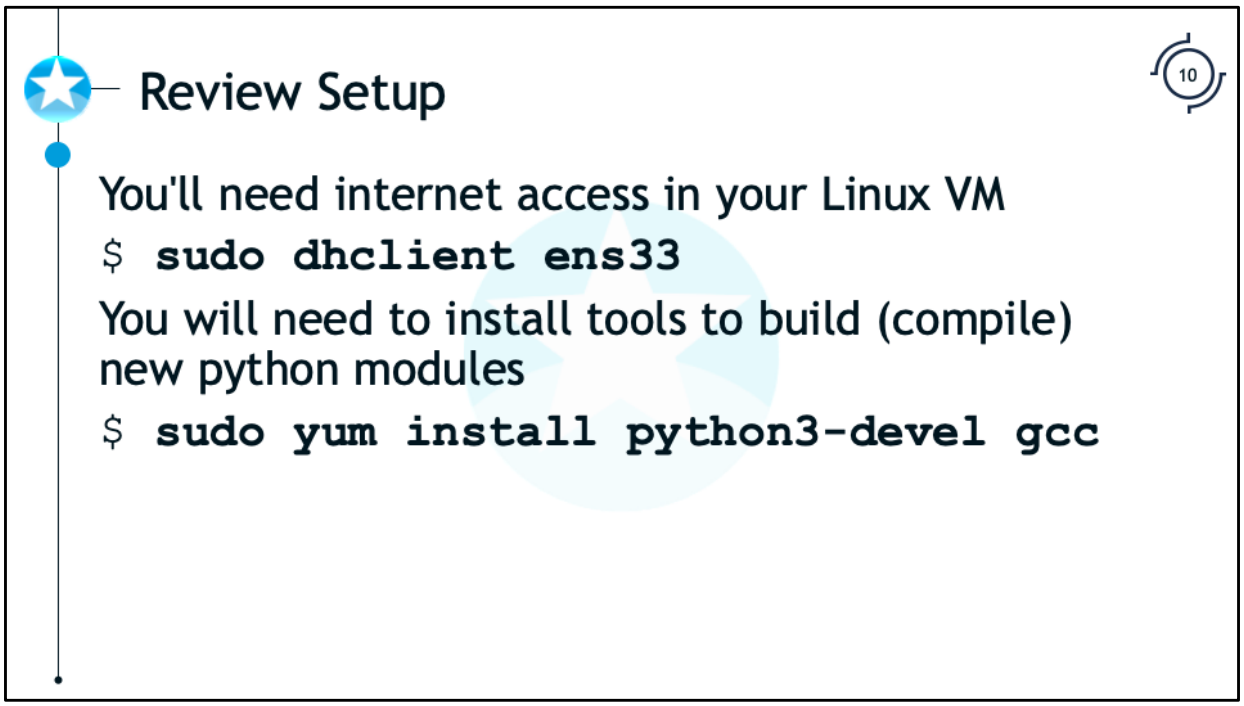
```
>>> s = 'something'
>>> help(type(s))
```

However, with a module we can simply provide the module name.

```
>>> import os
>>> help(os)
Help on module os:


NAME
    os - OS routines for NT or Posix depending on what
system we're on.


DESCRIPTION
    This exports:
      - all functions from posix or nt, e.g. unlink,
stat, etc.
      - os.path is either posixpath or ntpath
      - os.name is either 'posix' or 'nt'
```

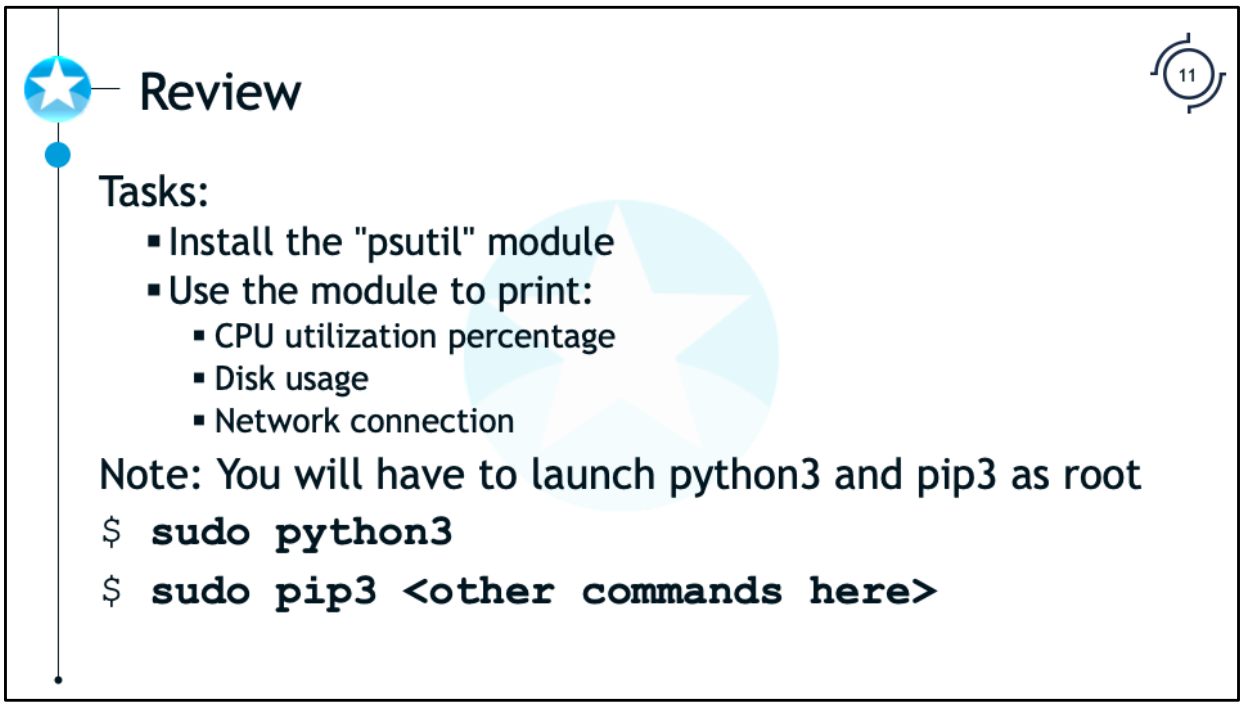



You'll need internet access in your Linux VM. You will need to obtain an IP address for you VM with the command below.

```
$ sudo dhclient ens33
```

You will then need to install some additional tools with this command:

```
$ sudo yum install python3-devel gcc
```

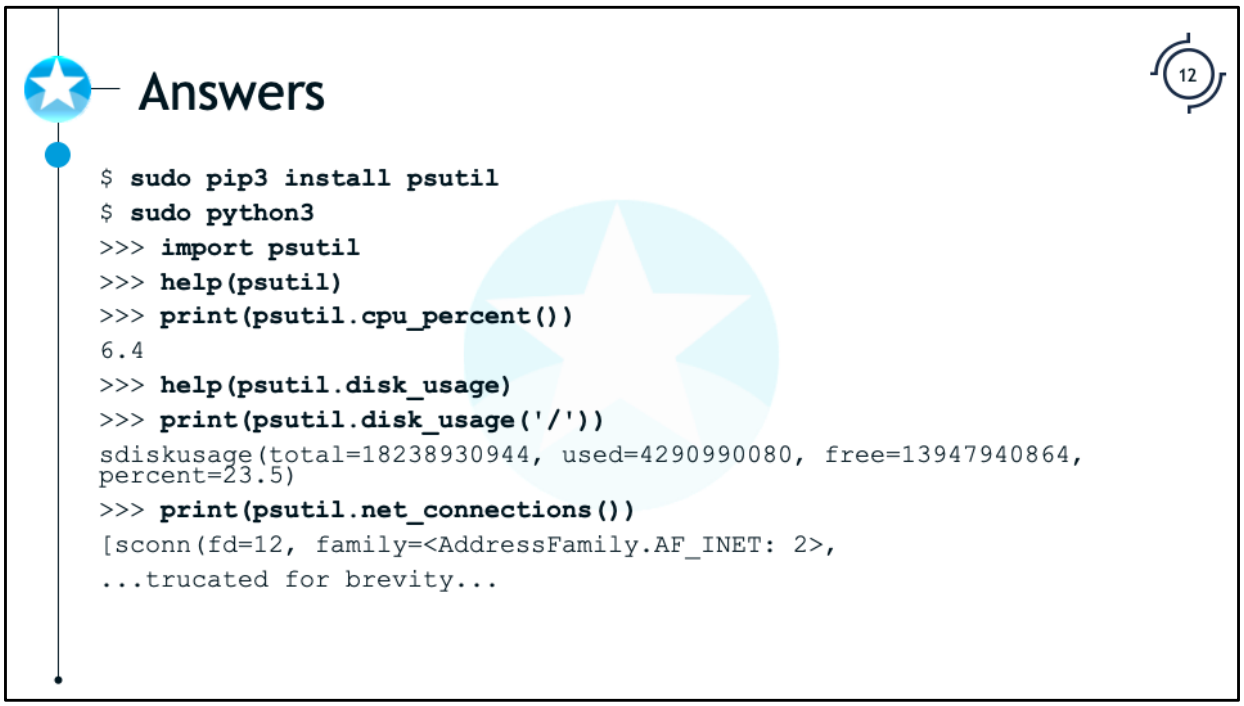



Your tasks are to do the following:

- Install the "psutil" module
- Use the module to print the following:
  - CPU utilization percentage
  - Disk usage
  - Network connections

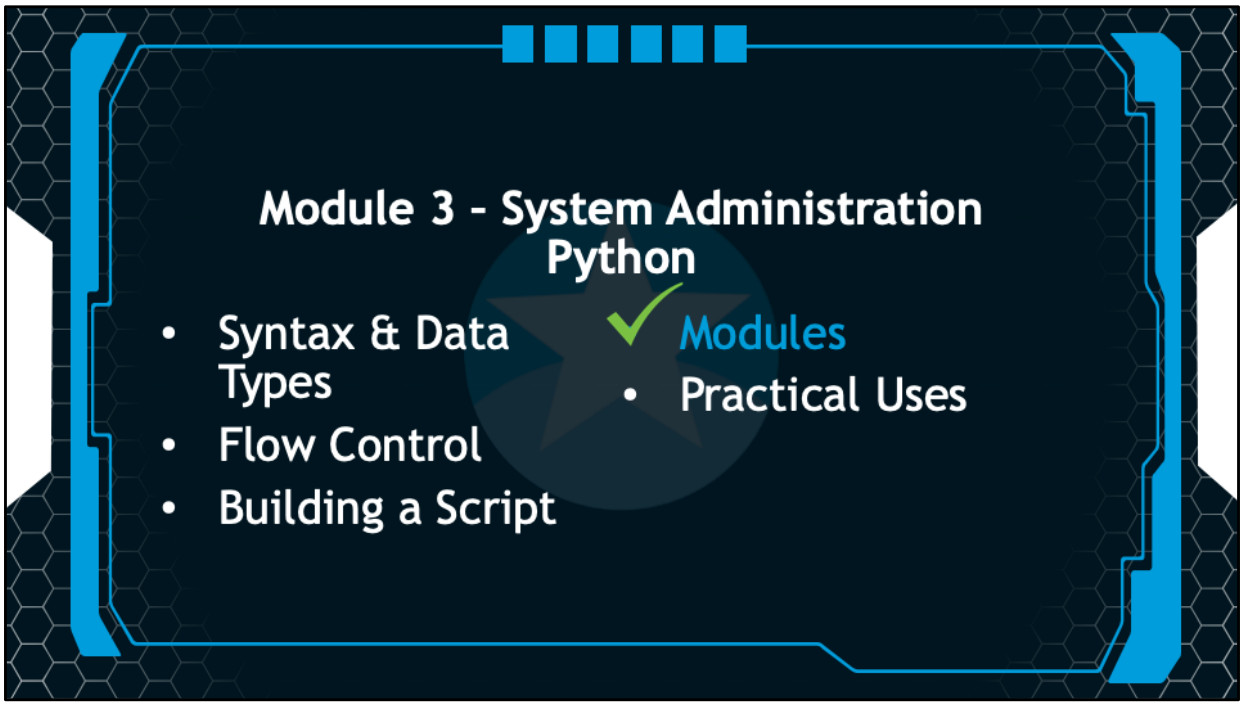
Note: You will have to launch python3 and pip3 as root

```
$ sudo python3
$ sudo pip3 <other commands here>
```




You will need to dig through the help on the module to find the methods used here. You'll also need to look a the help to see how to use the "disk_usage" method.

```
>>> import psutil
>>> help(psutil)
>>> print(psutil.cpu_percent())
6.4
>>> help(psutil.disk_usage)
>>> print(psutil.disk_usage('/'))
sdiskusage(total=18238930944, used=4290990080,
free=13947940864, percent=23.5)
>>> print(psutil.net_connections())
[sconn(fd=12, family=<AddressFamily.AF_INET: 2>,
...trucated for brevity...
```




You've just learned how to use modules in Python. In the next module, we will conclude this module with practical uses in Python.