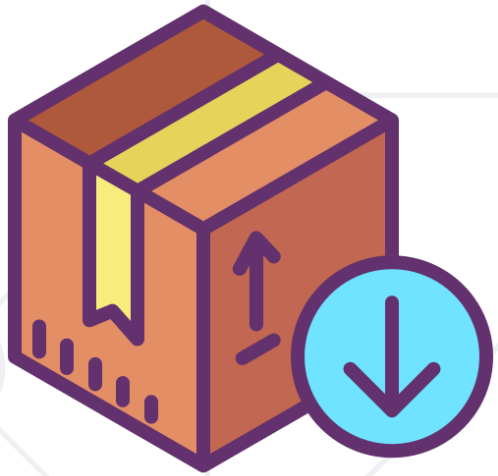
Modules

Python packages



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What are modules?

Definition and Usage

- Simply put, a **module** is a file consisting of Python code
  - They are stored in **packages**
  - A **package** is a collection of Python modules
- Why use modules ?
  - Keep Python files short and simple
  - Reuse code across multiple files by importing

Built-in Modules

Definition

- The Python interpreter has a number of **built-in** modules
- They are pre-installed and we can call them at any given time
- In order to call them we use the keyword - **import**

```
import random
fruits = ["apple", "banana", "cherry"]

random.choice(fruits)
random.shuffle(fruits)
```

Different Ways to Import

```
import random as module_name
module_name.randint(1, 10)
```

```
from random import choice as gimme_one, shuffle as mix
gimme_one(["coke", "steak", "chips"])
mix(["coke", "steak", "chips"])
```

```
from math import *
sqrt(pi)
```

Problem: Calculate Logarithm

- Write a program that prints the calculated logarithm of any given number
- You will receive **2** inputs
  - The number (integer)
  - The base (if it is the word "natural" find the natural logarithm)
- Format the result up to the 2nd decimal digit and print it

```
10
natural
```

```
2.30
```

Solution: Calculate Logarithm

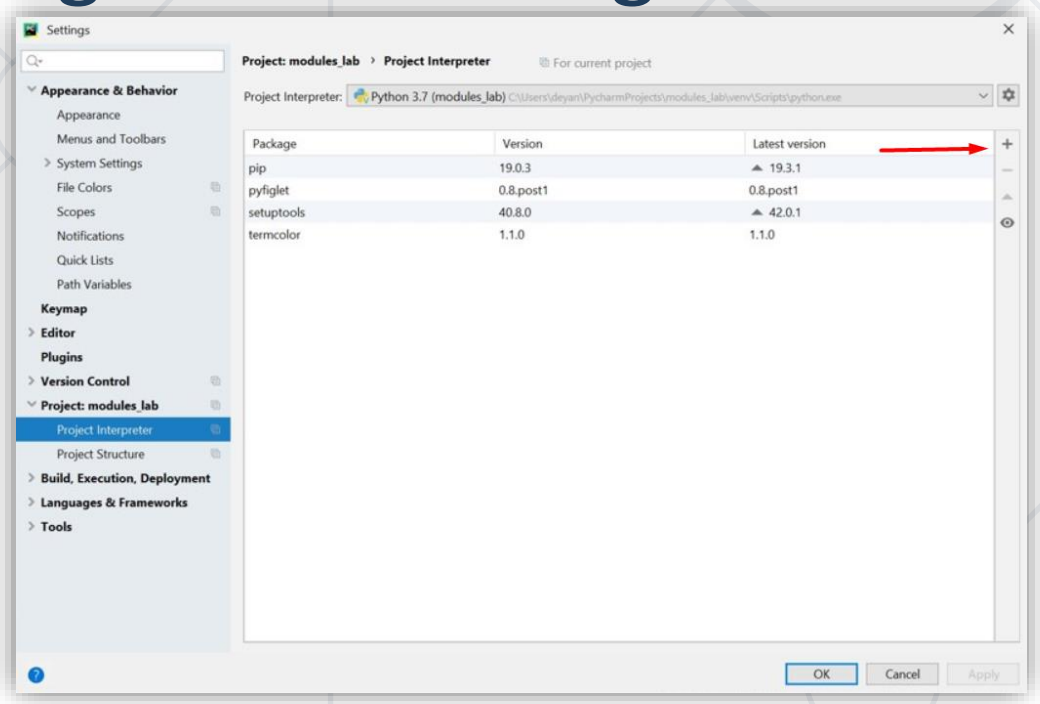
```
from math import log
number = int(input())
base = input()
if base == "natural":
    print(f"{log(number):.2f}")
else:
    print(f"{log(number, int(base)):.2f}")
```

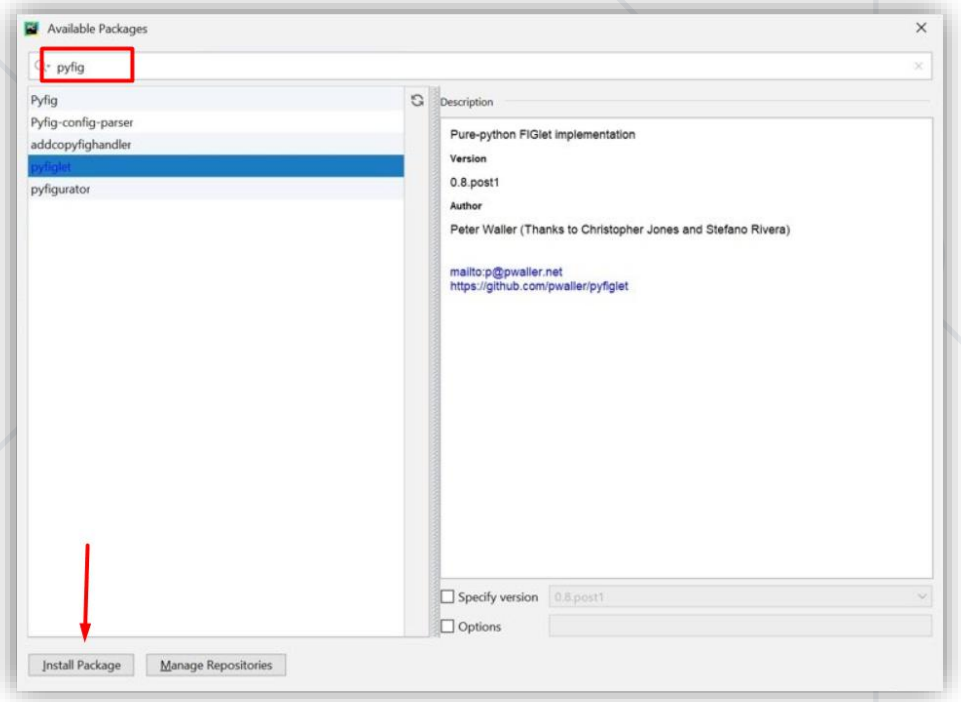
External Modules

PIP

Package Management System (PIP)

- External modules are downloaded from the internet by using **pip**
- In PyCharm you have **pip** already installed, so you can jump straight to installing them





Requirements files

- A **Requirements file** is just a list of pip install arguments placed in a file
- You should **not rely** on the items in the file being **installed** by pip in **any particular order**

```
### example-requirements.txt ###
numpy
matplotlib
django == 3.0.1

# Refer to other requirements files #
-r other-requirements.txt
```

Requirements files – common uses

- There are **4 common uses** of Requirements files:
  - hold the result from pip freeze
  - force pip to properly resolve dependencies
  - force pip to install an alternate version of a sub-dependency
  - override a dependency with a local patch that lives in version control

Some External Modules

- Termcolor

```
from termcolor import colored
text = colored('Hello World!', 'red', attrs=['bold', 'underline'])
print(text)   # Hello World!
```

- PyFiglet

```
from pyfiglet import figlet_format
text =figlet_format("Python",font="isometric1")
print(text)
```

Problem: ASCII Art

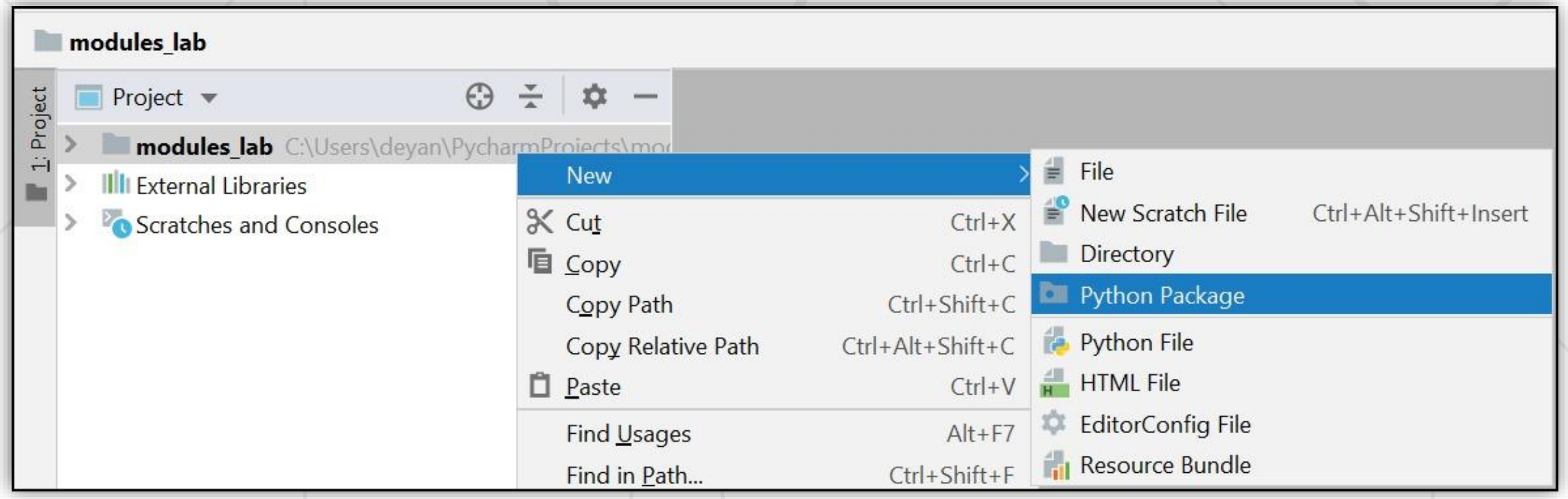
- Using the **pyfiglet** package, write a program that **encrypts given words** by using the characters: "-|_/\()" to structure the word

```
from pyfiglet import figlet_format

def print_art(msg):
    ascii_art = figlet_format(msg)
    print(ascii_art)

msg = input("What would you like to print? ")
print_art(msg)
```

Custom Modules

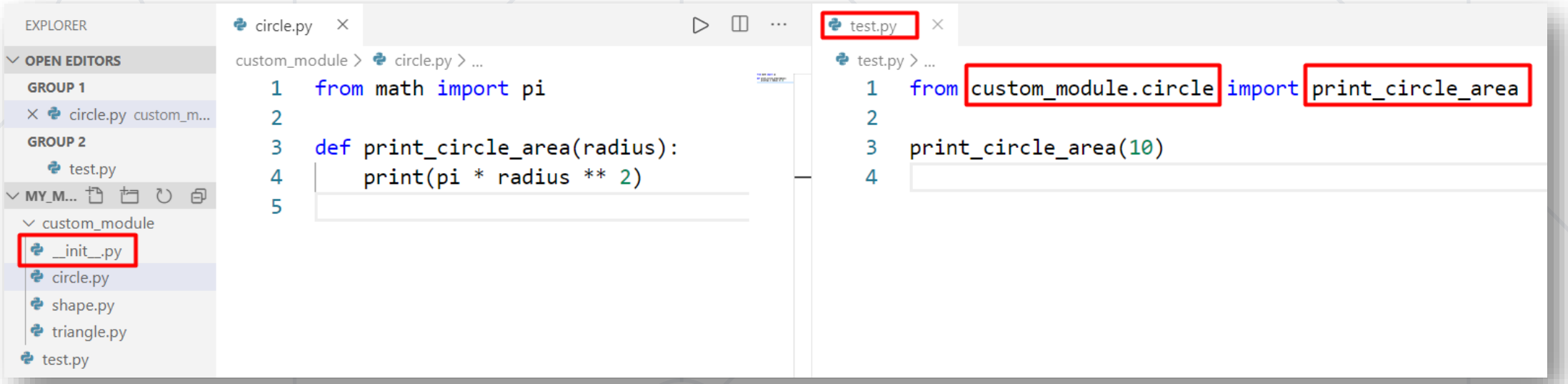
Creating a module (Through PyCharm)

- Any **.py** file can be imported and used as a module
- In PyCharm there is a separate option to create a package(module)



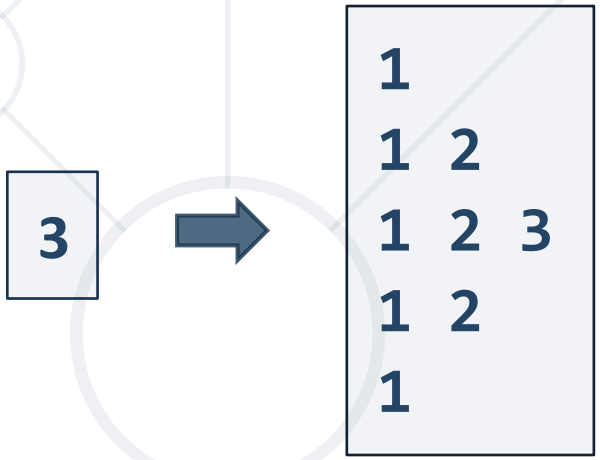
The __init__ file in a module

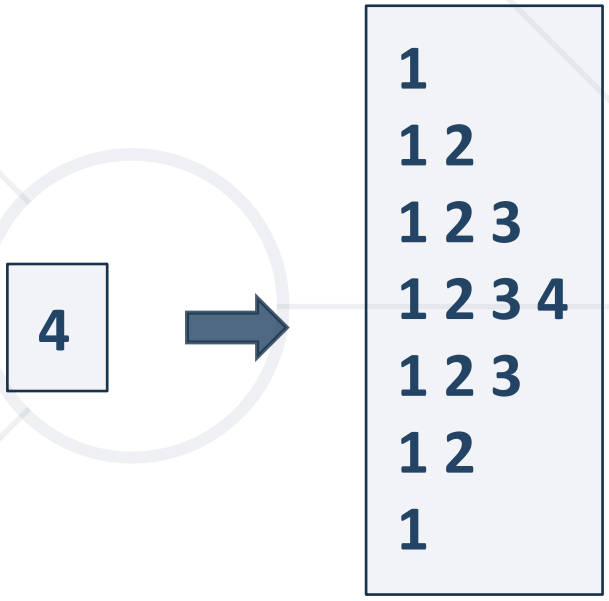
- You can make **any folder** a **module** by just adding an `__init__` file in the folder
- The file **can be empty**



Problem: Triangle

- Create a module for printing a triangle
- You will receive an integer number which is the size of the triangle





Solution: Triangle

```
def print_triangle(size):
    for row in range(1, size + 2):
        print(*[col for col in range(1, row)])
    for row in range(size, 0, -1):
        print(*[col for col in range(1, row)])
```

```
from triangle import *

size = int(input())
print_triangle(size)
```

Practice

Live Exercise in Class (Lab)

Summary

- A **module** is a file consisting of Python code
- There are a couple of ways to **import** a module:

```
import <module_name>
from <module_name> import <module_attribute>
import <module_name> as <custom_name>
```

- Modules make our code short, simple and reusable

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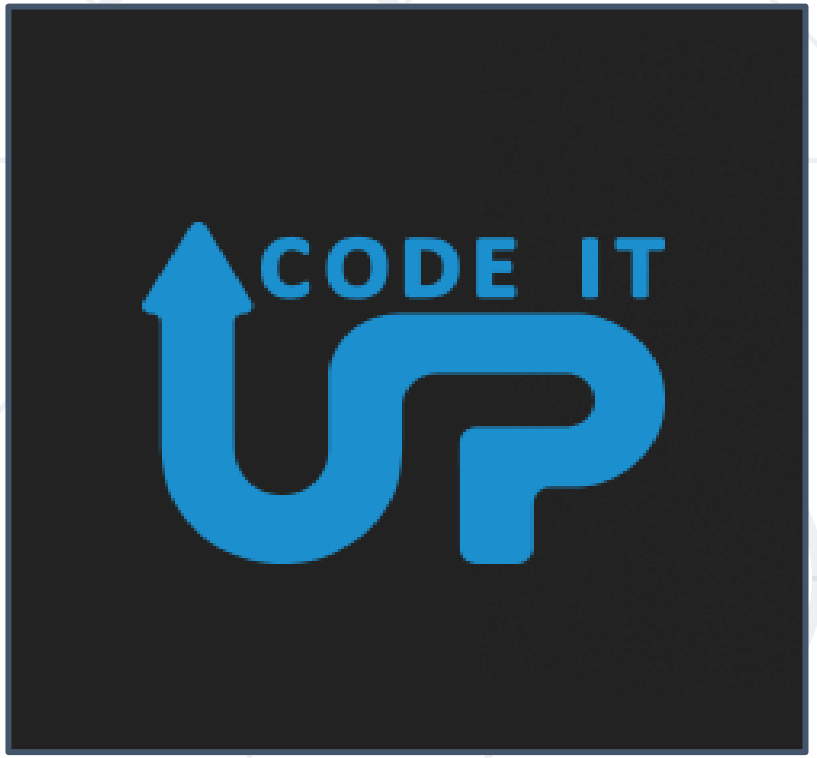

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