Python CLI Interpreter and -m tools

CONCEPTS

python3 -m <module> runs a module from the import path, so tools like venv, pip and pytest always match the interpreter you called.

python3 <file> script, -m or -c
↓ compile
Bytecode cached in __pycache__
↓ run
Interpreter sys.path finds imports
↓ exit
Exit code 0 = success

On Debian and Ubuntu use python3; plain python may not exist. Inside an activated venv, python works.

RUN CODE

python3 *<script.py> <args>*
Run a script

python3 -c "*<code>*"
Run code from a string

python3 -m *<module> <args>*
Run a module as a script

python3 -V
Print the version

INTERACTIVE

python3
Start the REPL

python3 -i *<script.py>*
Run script, then stay in the REPL

_
Last result in the REPL

help(*<obj>***)**
Show docs for an object

dir(*<obj>***)**
List attributes of an object

Ctrl+D
Leave the REPL (Ctrl+Z Enter on Windows)

PYTHONSTARTUP=*<file>*
Run a file at each REPL start

F2
History browser in the REPL (3.13+)

F3
Paste mode in the REPL (3.13+)

VIRTUAL ENVS AND PACKAGES

python3 -m venv .venv
Create a virtual environment

source .venv/bin/activate
Activate it (Linux, macOS)

.venv\Scripts\activate
Activate it (Windows)

deactivate
Leave the environment

.venv/bin/python *<script.py>*
Use a venv without activating

python3 -m pip install *<pkg>*
Install a package

python3 -m pip install -r requirements.txt
Install from a list

python3 -m pip install -e .
Editable install of this project

DEV SERVERS AND TOOLS

python3 -m http.server
Serve current dir on port 8000

python3 -m http.server *<port>*
Serve on another port

python3 -m http.server -b 127.0.0.1
Listen on localhost only

python3 -m json.tool *<file>*
Validate and pretty-print JSON

TEST AND DEBUG

python3 -m pdb *<script.py>*
Debug a script from the first line

python3 -m pdb -c continue *<script.py>*
Debug, stopping on a crash

breakpoint()
Drop into the debugger from code

n / s / c / q
pdb: next, step, continue, quit

l / ll / w
pdb: list code, whole function, stack

python3 -m unittest
Discover and run unittest tests

TEST AND DEBUG (cont.)

python3 -X faulthandler *<script.py>*
Dump traceback on a crash

python3 -X dev *<script.py>*
Development mode: extra checks

MEASURE

python3 -m timeit "*<stmt>***"**
Time a small statement

python3 -m timeit -s "*<setup>***" "***<stmt>***"**
Time with a setup step

python3 -m cProfile -s cumtime *<script.py>*
Profile, sorted by cumulative time

python3 -X importtime *<script.py>*
Show time spent on each import

FLAGS AND BEHAVIOUR

python3 -u *<script.py>*
Unbuffered stdout and stderr

python3 -O *<script.py>*
Strip assert statements

python3 --help-env
List environment variables

ENVIRONMENT VARIABLES

PYTHONPATH=*<dir>***[:***<dir>***]**
Extra module search directories

PYTHONUNBUFFERED=1
Same as -u, good for logs and containers

Where imports are found

Order	Source
1	Script dir (or cwd with -c / -m)
2	PYTHONPATH entries
3	Standard library
4	site-packages

RECIPES

Fresh project environment

```
python3 -m venv .venv
source .venv/bin/activate
python -m pip install -r
requirements.txt
python -m pytest
```