



Real Python Pocket Reference

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Getting Started

Follow these guides to kickstart your Python journey:

- [realpython.com/what-can-i-do-with-python](#)
- [realpython.com/installing-python](#)
- [realpython.com/python-first-steps](#)

Start the Interactive Shell

```
$ python
```

Quit the Interactive Shell

```
>>> exit()
```

Run a Script

```
$ python my_script.py
```

Run a Script in Interactive Mode

```
$ python -i my_script.py
```

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Comments

- Always add a space after the #
- Use comments to explain “why” of your code

Write Comments

```
# This is a comment
# print("This code will not run.")
print("This will run.") # Comments are ignored by Python
```

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Data Types

- Python is dynamically typed
- Use **None** to represent missing or optional values
- Use **type()** to check object type
- Check for a specific type with **isinstance()**
- issubclass()** checks if a class is a subclass

Type Investigation

```
type(42)           # <class 'int'>
type(3.14)         # <class 'float'>
type("Hello")     # <class 'str'>
type(True)        # <class 'bool'>
type(None)        # <class 'NoneType'>

isinstance(3.14, float) # True
issubclass(int, object) # True - everything inherits from object
```

Type Conversion

```
int("42")           # 42
float("3.14")       # 3.14
str(42)             # "42"
bool(1)             # True
list("abc")         # ["a", "b", "c"]
```

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Variables & Assignment

- Variables are created when first assigned
- Use descriptive variable names
- Follow **snake_case** convention

Basic Assignment

```
name = "Leo"        # String
age = 7             # Integer
height = 5.6        # Float
is_cat = True       # Boolean
flaws = None        # None type
```

Parallel & Chained Assignments

```
x, y = 10, 20      # Assign multiple values
a = b = c = 0      # Give same value to multiple variables
```

Augmented Assignments

```
counter += 1
numbers += [4, 5]
permissions |= write
```

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Strings

- It's recommended to use double-quotes for strings
- Use `"\n"` to create a line break in a string
- To write a backslash in a normal string, write `"\\"`

Creating Strings

```
single = 'Hello'
double = "World"
multi = """Multiple
line string"""
```

String Operations

```
greeting = "me" + "ow!" # "meow!"
repeat = "Meow!" * 3     # "Meow!Meow!Meow!"
length = len("Python")  # 6
```

String Methods

```
"a".upper()           # "A"
"A".lower()           # "a"
" a ".strip()         # "a"
"abc".replace("bc", "ha") # "aha"
"a b".split()         # ["a", "b"]
"-".join(["a", "b"])  # "a-b"
```

String Indexing & Slicing

```
text = "Python"
text[0] # "P" (first)
text[-1] # "n" (last)
text[1:4] # "yth" (slice)
text[:3] # "Pyt" (from start)
text[3:] # "hon" (to end)
text[:2] # "Pt" (every 2nd)
text[::-1] # "nohtyP" (reverse)
```

String Formatting

```
# f-strings
name = "Aubrey"
age = 2
f"Hello, {name}!" # "Hello, Aubrey!"
f"{name} is {age} years old" # "Aubrey is 2 years old"
f"Debug: {age=}" # "Debug: age=2"

# Format method
template = "Hello, {name}! You're {age}."
template.format(name="Aubrey", age=2) # "Hello, Aubrey! You're 2."
```

Raw Strings

```
# Normal string with an escaped tab
"This is:\tCool." # "This is: Cool."

# Raw string with escape sequences
r"This is:\tCool." # "This is:\tCool."
```

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Numbers & Math

Arithmetic Operators

```
10 + 3 # 13
10 - 3 # 7
10 * 3 # 30
10 / 3 # 3.3333333333333335
10 // 3 # 3
10 % 3 # 1
2 ** 3 # 8
```

Useful Functions

```
abs(-5) # 5
round(3.7) # 4
round(3.14159, 2) # 3.14
min(3, 1, 2) # 1
max(3, 1, 2) # 3
sum([1, 2, 3]) # 6
```

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Conditionals

- Python uses indentation for code blocks
- Use 4 spaces per indentation level

If-Elif-Else

```
if age < 13:
    category = "child"
elif age < 20:
    category = "teenager"
else:
    category = "adult"
```

Comparison Operators

```
x == y # Equal to
x != y # Not equal to
x < y # Less than
x <= y # Less than or equal
x > y # Greater than
x >= y # Greater than or equal
```

Logical Operators

```
if age >= 18 and has_car:
    print("Roadtrip!")

if is_weekend or is_holiday:
    print("No work today.")

if not is_raining:
    print("You can go outside.")
```

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[conditional statements](#) · [operators](#) · [truthy falsy](#)

Loops

- `range(5)` generates 0 through 4
- Use `enumerate()` to get index and value
- `break` exits the loop, `continue` skips to next
- Be careful with `while` to not create an infinite loop

For Loops

```
# Loop through range
for i in range(5):    # 0, 1, 2, 3, 4
    print(i)
```

```
# Loop through collection
fruits = ["apple", "banana"]
for fruit in fruits:
    print(fruit)
```

```
# With enumerate for index
for i, fruit in enumerate(fruits):
    print(f'{i}: {fruit}')
```

While Loops

```
while True:
    user_input = input("Enter 'quit' to exit: ")
    if user_input == "quit":
        break
    print(f"You entered: {user_input}")
```

Loop Control

```
for i in range(10):
    if i == 3:
        continue # Skip this iteration
    if i == 7:
        break    # Exit loop
    print(i)
```

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[for loop](#) · [while loop](#) · [enumerate](#) · [control flow](#)

Functions

- Define functions with `def`
- Always use `()` to call a function
- Add `return` to send values back
- Create anonymous functions with the `lambda` keyword

Defining Functions

```
def greet():
    return "Hello!"

def greet_person(name):
    return f"Hello, {name}!"
```

```
def add(x, y=10):    # Default parameter
    return x + y
```

Calling Functions

```
greet()              # "Hello!"
greet_person("Bartosz") # "Hello, Bartosz"
add(5, 3)            # 8
add(7)               # 17
```

Return Values

```
def get_min_max(numbers):
    return min(numbers), max(numbers)

minimum, maximum = get_min_max([1, 5, 3])
```

Useful Built-in Functions

```
callable() # Checks if an object can be called as a function
dir()      # Lists attributes and methods
globals()  # Get a dictionary of the current global symbol table
hash()     # Get the hash value
id()       # Get the unique identifier
locals()   # Get a dictionary of the current local symbol table
repr()     # Get a string representation for debugging
```

Lambda Functions

```
square = lambda x: x**2
result = square(5) # 25

# With map and filter
numbers = [1, 2, 3, 4]
squared = list(map(lambda x: x**2, numbers))
evens = list(filter(lambda x: x % 2 == 0, numbers))
```

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[define functions](#) · [return multiple values](#) · [lambda](#)

Classes

- Classes are blueprints for objects
- You can create multiple instances of one class
- You commonly use classes to encapsulate data
- Inside a class, you provide methods for interacting with the data
- `__init__()` is the constructor method
- `self` refers to the instance

Defining Classes

```
class Dog:
    def __init__(self, name, age):
        self.name = name
        self.age = age

    def bark(self):
        return f'{self.name} says Woof!'

# Create instance
my_dog = Dog("Frieda", 3)
print(my_dog.bark()) # Frieda says Woof!
```

Class Attributes & Methods

```
class Cat:
    species = "Felis catus" # Class attribute

    def __init__(self, name):
        self.name = name    # Instance attribute

    def meow(self):
        return f'{self.name} says Meow!'

    @classmethod
    def create_kitten(cls, name):
        return cls(f'Baby {name}')
```

Inheritance

```
class Animal:
    def __init__(self, name):
        self.name = name

    def speak(self):
        pass

class Dog(Animal):
    def speak(self):
        return f'{self.name} barks!'
```

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[object oriented programming](#) · [classes](#)

Exceptions

- When Python runs and encounters an error, it creates an exception
- Use specific exception types when possible
- `else` runs if no exception occurred
- `finally` always runs, even after errors

Try-Except

```
try:
    number = int(input("Enter a number: "))
    result = 10 / number
except ValueError:
    print("That's not a valid number!")
except ZeroDivisionError:
    print("Cannot divide by zero!")
else:
    print(f"Result: {result}")
finally:
    print("Calculation attempted")
```

Common Exceptions

```
ValueError    # Invalid value
TypeError     # Wrong type
IndexError    # List index out of range
KeyError      # Dict key not found
FileNotFoundError # File doesn't exist
```

Raising Exceptions

```
def validate_age(age):
    if age < 0:
        raise ValueError("Age cannot be negative")
    return age
```

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[exceptions](#) · [errors](#) · [debugging](#)

Collections

- A collection is any container data structure that stores multiple items
- If an object is a collection, then you can loop through it
- Strings are collections, too
- Use `len()` to get the size of a collection
- You can check if an item is in a collection with the `in` keyword
- Some collections may look similar, but each data structure solves specific needs

Lists

```
# Creating lists
empty = []
nums = [5]
mixed = [1, "two", 3.0, True]
```

```
# List methods
nums.append("x") # Add to end
nums.insert(0, "y") # Insert at index 0
nums.extend(["z", 5]) # Extend with iterable
nums.remove("x") # Remove first "x"
last = nums.pop() # Pop returns last element
```

```
# List indexing and checks
fruits = ["banana", "apple", "orange"]
fruits[0] # "banana"
fruits[-1] # "orange"
"apple" in fruits # True
len(fruits) # 3
```

Tuples

```
# Creating tuples
point = (3, 4)
single = (1,) # Note the comma!
empty = ()
```

```
# Basic tuple unpacking
point = (3, 4)
x, y = point
x # 3
y # 4
```

```
# Extended unpacking
first, *rest = (1, 2, 3, 4)
first # 1
rest # [2, 3, 4]
```

Sets

```
# Creating Sets
a = {1, 2, 3}
b = set([3, 4, 4, 5])

# Set Operations
a | b      # {1, 2, 3, 4, 5}
a & b      # {3}
a - b      # {1, 2}
a ^ b      # {1, 2, 4, 5}
```

Dictionaries

```
# Creating Dictionaries
empty = {}
pet = {"name": "Leo", "age": 42}

# Dictionary Operations
pet["sound"] = "Purr!" # Add key and value
pet["age"] = 7         # Update value
age = pet.get("age", 0) # Get with default
del pet["sound"]       # Delete key
pet.pop("age")         # Remove and return

# Dictionary Methods
pet = {"name": "Frieda", "sound": "Bark!"}
pet.keys() # dict_keys(['name', 'sound'])
pet.values() # dict_values(['Frieda', 'Bark!'])
pet.items() # dict_items([('name', 'Frieda'), ('sound', 'Bark!')])
```

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list · tuple · set · dictionary · indexing · unpacking

Comprehensions

- You can think of comprehensions as condensed `for` loops
- Comprehensions are faster than equivalent loops

List Comprehensions

```
# Basic
squares = [x**2 for x in range(10)]

# With condition
evens = [x for x in range(20) if x % 2 == 0]

# Nested
matrix = [[i*j for j in range(3)] for i in range(3)]
```

Other Comprehensions

```
# Dictionary comprehension
word_lengths = {word: len(word) for word in ["hello", "world"]}

# Set comprehension
unique_lengths = {len(word) for word in ["who", "what", "why"]}

# Generator expression
sum_squares = sum(x**2 for x in range(1000))
```

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comprehensions · data structures · generators

File I/O

File Operations

```
# Read an entire file
with open("file.txt", mode="r", encoding="utf-8") as file:
    content = file.read()

# Read a file line by line
with open("file.txt", mode="r", encoding="utf-8") as file:
    for line in file:
        print(line.strip())

# Write a file
with open("output.txt", mode="w", encoding="utf-8") as file:
    file.write("Hello, World!\n")

# Append to a File
with open("log.txt", mode="a", encoding="utf-8") as file:
    file.write("New log entry\n")
```

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files · context manager · pathlib

Imports & Modules

- Prefer explicit imports over `import *`
- Use aliases for long module names
- Group imports: standard library, third-party libraries, user-defined modules

Import Styles

```
# Import entire module
import math
result = math.sqrt(16)

# Import specific function
from math import sqrt
result = sqrt(16)

# Import with alias
import numpy as np
array = np.array([1, 2, 3])

# Import all (not recommended)
from math import *
```

Package Imports

```
# Import from package
import package.module
from package import module
from package.subpackage import module

# Import specific items
from package.module import function, Class
from package.module import name as alias
```

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import · modules · packages

Virtual Environments

- Virtual Environments are often called “venv”
- Use venvs to isolate project packages from the system-wide Python packages

Create Virtual Environment

```
$ python -m venv .venv
```

Activate Virtual Environment (Windows)

```
PS> .venv\Scripts\activate
```

Activate Virtual Environment (Linux & macOS)

```
$ source .venv/bin/activate
```

Deactivate Virtual Environment

```
(.venv) $ deactivate
```

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virtual environment · venv

Packages

- The official third-party package repository is the Python Package Index (PyPI)

Install Packages

```
$ python -m pip install requests
```

Save Requirements & Install from File

```
$ python -m pip freeze > requirements.txt
$ python -m pip install -r requirements.txt
```

Related Tutorials

- Installing Python Packages
- Requirements Files in Python Projects

Miscellaneous	
Truthy	Falsy
-42	0
3.14	0.0
"John"	""
[1, 2, 3]	[]
("apple", "banana")	()
{"key": None}	{}
	None

Pythonic Constructions

```
# Swap variables
a, b = b, a

# Flatten a list of lists
matrix = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]
flat = [item for sublist in matrix for item in sublist]

# Remove duplicates
unique_unordered = list(set(my_list))

# Remove duplicates, preserve order
unique = list(dict.fromkeys(my_list))

# Count occurrences
from collections import Counter

counts = Counter(my_list)
```

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