

Module 1: Python Basics



Keyword	Description	Code example
<code>False, True</code>	Data values from the data type Boolean	<code>False == (1 > 2), True == (2 > 1)</code>
<code>and, or, not</code>	Logical operators: (<code>x and y</code>) → both x and y must be True (<code>x or y</code>) → either x or y must be True (<code>not x</code>) → x must be false	<code>x, y = True, False</code> <code>(x or y) == True</code> # True <code>(x and y) == False</code> # True <code>(not y) == True</code> # True
<code>break</code>	Ends loop prematurely	<code>while(True):</code> <code>break</code> # no infinite loop <code>print("hello world!")</code>
<code>continue</code>	Finishes current loop iteration	<code>while(True):</code> <code>continue</code> <code>print("49")</code> # this code will be skipped.
<code>class</code> <code>def</code>	Defines a new class → a real-world concept (object oriented programming) Defines a new function or class method. For latter, first parameter ("self") points to the class object. When calling class method, first parameter is implicit.	<code>class Coffee:</code> <code>def __init__(self):</code> <code>self.content = 1.0</code> <code>def drink(self):</code> <code>self.content = 0.0</code> <code>becks=Coffee()</code> # constructor - create class <code>becks.drink()</code> # coffee empty: <code>b.content == 0</code>
<code>if, elif, else</code>	Conditional program execution: program starts with "if" branch, tries the "elif" branches, and finishes with "else" branch (until one branch evaluates to True).	<code>x = int(input("your value: "))</code> <code>if x > 3: print("Big")</code> <code>elif x == 3: print("Medium")</code> <code>else: print("Small")</code>
<code>for, while</code>	<code># For loop declaration</code> <code>for i in [0,1,2]:</code> <code>print(i)</code>	<code># While loop - same semantics</code> <code>j = 0</code> <code>while j < 3:</code> <code>print(j)</code> <code>j = j + 1</code>
<code>in</code>	Checks whether element is in sequence	<code>42 in [2, 39, 42]</code> # Returns True
<code>is</code>	Checks whether both elements point to the same object	<code>y = x = 3</code> <code>x is y</code> # True <code>[3] is [3]</code> # False
<code>None</code>	Empty value constant	<code>def f():</code> <code>x = 2</code> <code>f() is None</code> # True
<code>lambda</code>	Function with no name (anonymous function)	<code>(lambda x: x + 3)(3)</code> # returns 6
<code>return</code>	Terminates execution of the function and passes the flow of execution to the caller. An optional value after the return keyword specifies the function result.	<code>def incrementor(x):</code> <code>return x + 1</code> <code>incrementor(4)</code> # returns 5

Basic Data Types

	Description	Example
Boolean	<p>The Boolean data type is a truth value, either True or False.</p> <p>The Boolean operators ordered by priority: not x → "if x is False, then x, else y" x and y → "if x is False, then x, else y" x or y → "if x is False, then y, else x"</p> <p>These comparison operators evaluate to True: 1 < 2 and 0 <= 1 and 3 > 2 and 2 >= 2 and 1 == 1 and 1 != 0 # True</p>	<pre>## 1. Boolean Operations x, y = True, False print(x and not y) # True print(not x and y or x) # True ## 2. If condition evaluates to False if None or 0 or 0.0 or '' or [] or {} or set(): # None, 0, 0.0, empty strings, or empty # container types are evaluated to False print("Dead code") # Not reached</pre>
Integer, Float	<p>An integer is a positive or negative number without floating point (e.g. 3). A float is a positive or negative number with floating point precision (e.g. 3.14159265359).</p> <p>The <code>//</code> operator performs integer division. The result is an integer value that is rounded towards the smaller integer number (e.g. <code>3 // 2 == 1</code>).</p>	<pre>## 3. Arithmetic Operations x, y = 3, 2 print(x + y) # = 5 print(x - y) # = 1 print(x * y) # = 6 print(x / y) # = 1.5 print(x // y) # = 1 print(x % y) # = 1s print(-x) # = -3 print(abs(-x)) # = 3 print(int(3.9)) # = 3 print(float(3)) # = 3.0 print(x ** y) # = 9</pre>
String	<p>Python Strings are sequences of characters.</p> <p>The four main ways to create strings are the following.</p> <ol style="list-style-type: none">1. Single quotes <code>'Yes'</code>2. Double quotes <code>"Yes"</code>3. Triple quotes (multi-line) <code>"""Yes We Can"""</code>4. String method <code>str(5) == '5' # True</code>5. Concatenation <code>"Ma" + "hatma" # 'Mahatma'</code> <p>These are whitespace characters in strings.</p> <ul style="list-style-type: none">• Newline \n• Space \s• Tab \t	<pre>## 4. Indexing and Slicing s = "The youngest pope was 11 years old" print(s[0]) # 'T' print(s[1:3]) # 'he' print(s[-3:-1]) # 'ol' print(s[-3:]) # 'old' x = s.split() # creates string array of words print(x[-3] + " " + x[-1] + " " + x[2] + "s") # '11 old popes' ## 5. Most Important String Methods y = " This is lazy\t\n " print(y.strip()) # Remove Whitespace: 'This is lazy' print("DrDre".lower()) # Lowercase: 'drdre' print("attention".upper()) # Uppercase: 'ATTENTION' print("smartphone".startswith("smart")) # True print("smartphone".endswith("phone")) # True print("another".find("other")) # Match index: 2 print("cheat".replace("ch", "m")) # 'meat' print(', '.join(["F", "B", "I"])) # 'F,B,I' print(len("Rumpelstiltskin")) # String length: 15 print("ear" in "earth") # Contains: True</pre>

Structural Data Types

	Description	Example
List	A container data type that stores a sequence of elements. Unlike strings, lists are mutable: modification possible.	<pre>l = [1, 2, 2] print(len(l)) # 3</pre>
Adding elements	Add elements to a list with (i) append, (ii) insert, or (iii) list concatenation. The append operation is very fast.	<pre>[1, 2, 2].append(4) # [1, 2, 2, 4] [1, 2, 4].insert(2,2) # [1, 2, 2, 4] [1, 2, 2] + [4] # [1, 2, 2, 4]</pre>
Removal	Removing an element can be slower.	<pre>[1, 2, 2, 4].remove(1) # [2, 2, 4]</pre>
Reversing	This reverses the order of list elements.	<pre>[1, 2, 3].reverse() # [3, 2, 1]</pre>
Sorting	Sorts a list. The computational complexity of sorting is $O(n \log n)$ for n list elements.	<pre>[2, 4, 2].sort() # [2, 2, 4]</pre>
Indexing	Finds the first occurrence of an element in the list & returns its index. Can be slow as the whole list is traversed.	<pre>[2, 2, 4].index(2) # index of element 4 is "0" [2, 2, 4].index(2,1) # index of element 2 after pos 1 is "1"</pre>
Stack	Python lists can be used intuitively as stack via the two list operations <code>append()</code> and <code>pop()</code> .	<pre>stack = [3] stack.append(42) # [3, 42] stack.pop() # 42 (stack: [3]) stack.pop() # 3 (stack: [])</pre>
Set	A set is an unordered collection of elements. Each can exist only once.	<pre>basket = {'apple', 'eggs', 'banana', 'orange'} same = set(['apple', 'eggs', 'banana', 'orange'])</pre>
Dictionary	The dictionary is a useful data structure for storing (key, value) pairs.	<pre>calories = {'apple' : 52, 'banana' : 89, 'choco' : 546}</pre>
Reading and writing elements	Read and write elements by specifying the key within the brackets. Use the <code>keys()</code> and <code>values()</code> functions to access all keys and values of the dictionary.	<pre>print(calories['apple'] < calories['choco']) # True calories['cappu'] = 74 print(calories['banana'] < calories['cappu']) # False print('apple' in calories.keys()) # True print(52 in calories.values()) # True</pre>
Dictionary Looping	You can loop over the (key, value) pairs of a dictionary with the <code>items()</code> method.	<pre>for k, v in calories.items(): print(k) if v > 500 else None # 'chocolate'</pre>
Membership operator	Check with the 'in' keyword whether the set, list, or dictionary contains an element. Set containment is faster than list containment.	<pre>basket = {'apple', 'eggs', 'banana', 'orange'} print('eggs' in basket) # True print('mushroom' in basket) # False</pre>
List and Set Comprehension	List comprehension is the concise Python way to create lists. Use brackets plus an expression, followed by a for clause. Close with zero or more for or if clauses. Set comprehension is similar to list comprehension.	<pre># List comprehension l = [('Hi' + x) for x in ['Alice', 'Bob', 'Pete']] print(l) # ['Hi Alice', 'Hi Bob', 'Hi Pete'] l2 = [x * y for x in range(3) for y in range(3) if x>y] print(l2) # [0, 0, 2] # Set comprehension squares = { x**2 for x in [0,2,4] if x < 4 } # {0, 4}</pre>

List Methods

Method	Description	Example
<code>lst.append(x)</code>	Appends element <code>x</code> to the list <code>lst</code> .	<pre>>>> l = [] >>> l.append(42) >>> l.append(21) [42, 21]</pre>
<code>lst.clear()</code>	Removes all elements from the list <code>lst</code> —which becomes empty.	<pre>>>> lst = [1, 2, 3, 4, 5] >>> lst.clear() []</pre>
<code>lst.copy()</code>	Returns a copy of the list <code>lst</code> . Copies only the list, not the elements in the list (shallow copy).	<pre>>>> lst = [1, 2, 3] >>> lst.copy() [1, 2, 3]</pre>
<code>lst.count(x)</code>	Counts the number of occurrences of element <code>x</code> in the list <code>lst</code> .	<pre>>>> lst = [1, 2, 42, 2, 1, 42, 42] >>> lst.count(42) 3 >>> lst.count(2) 2</pre>
<code>lst.extend(iter)</code>	Adds all elements of an iterable <code>iter</code> (e.g. another list) to the list <code>lst</code> .	<pre>>>> lst = [1, 2, 3] >>> lst.extend([4, 5, 6]) [1, 2, 3, 4, 5, 6]</pre>
<code>lst.index(x)</code>	Returns the position (index) of the first occurrence of value <code>x</code> in the list <code>lst</code> .	<pre>>>> lst = ["Alice", 42, "Bob", 99] >>> lst.index("Alice") 0 >>> lst.index(99, 1, 3) ValueError: 99 is not in list</pre>
<code>lst.insert(i, x)</code>	Inserts element <code>x</code> at position (index) <code>i</code> in the list <code>lst</code> .	<pre>>>> lst = [1, 2, 3, 4] >>> lst.insert(3, 99) [1, 2, 3, 99, 4]</pre>
<code>lst.pop()</code>	Removes and returns the final element of the list <code>lst</code> .	<pre>>>> lst = [1, 2, 3] >>> lst.pop() 3 >>> lst [1, 2]</pre>
<code>lst.remove(x)</code>	Removes and returns the first occurrence of element <code>x</code> in the list <code>lst</code> .	<pre>>>> lst = [1, 2, 99, 4, 99] >>> lst.remove(99) >>> lst [1, 2, 4, 99]</pre>
<code>lst.reverse()</code>	Reverses the order of elements in the list <code>lst</code> .	<pre>>>> lst = [1, 2, 3, 4] >>> lst.reverse() >>> lst [4, 3, 2, 1]</pre>
<code>lst.sort()</code>	Sorts the elements in the list <code>lst</code> in ascending order.	<pre>>>> lst = [88, 12, 42, 11, 2] >>> lst.sort() # [2, 11, 12, 42, 88] >>> lst.sort(key=lambda x: str(x)[0]) # [11, 12, 2, 42, 88]</pre>

Functions and Tricks

		Description	Example	Result
ADVANCED FUNCTIONS	map(func, iter)	Executes the function on all elements of the iterable	list(map(lambda x: x[0], ['red', 'green', 'blue']))	['r', 'g', 'b']
	map(func, i1, ..., ik)	Executes the function on all k elements of the k iterables	list(map(lambda x, y: str(x) + ' ' + y + 's', [0, 2, 2], ['apple', 'orange', 'banana']))	['0 apples', '2 oranges', '2 bananas']
	string.join(iter)	Concatenates iterable elements separated by string	'marries'.join(list(['Alice', 'Bob']))	'Alice marries Bob'
	filter(func, iterable)	Filters out elements in iterable for which function returns False (or 0)	list(filter(lambda x: True if x>17 else False, [1, 15, 17, 18]))	[18]
	string.strip()	Removes leading and trailing whitespaces of string	print("\n\t42\t".strip())	42
	sorted(iter)	Sorts iterable in ascending order	sorted([8, 3, 2, 42, 5])	[2, 3, 5, 8, 42]
	sorted(iter, key=key)	Sorts according to the key function in ascending order	sorted([8, 3, 2, 42, 5], key=lambda x: 0 if x==42 else x)	[42, 2, 3, 5, 8]
	help(func)	Returns documentation of func	help(str.upper())	'... to uppercase.'
	zip(i1, i2, ...)	Groups the i-th elements of iterators i1, i2, ... together	list(zip(['Alice', 'Anna'], ['Bob', 'Jon', 'Frank']))	[('Alice', 'Bob'), ('Anna', 'Jon')]
	Unzip	Equal to: 1) unpack the zipped list, 2) zip the result	list(zip(*(['Alice', 'Bob'], ('Anna', 'Jon')))	[('Alice', 'Anna'), ('Bob', 'Jon')]
	enumerate(iter)	Assigns a counter value to each element of the iterable	list(enumerate(['Alice', 'Bob', 'Jon']))	[(0, 'Alice'), (1, 'Bob'), (2, 'Jon')]
TRICKS	python -m http.server <P>	Share files between PC and phone? Run command in PC's shell. <P> is any port number 0–65535. Type < IP address of PC>:<P> in the phone's browser. You can now browse the files in the PC directory.		
	Read comic	import antigravity	Open the comic series xkcd in your web browser	
	Zen of Python	import this	'...Beautiful is better than ugly. Explicit is ...'	
	Swapping numbers	Swapping variables is a breeze in Python. No offense, Java!	a, b = 'Jane', 'Alice' a, b = b, a	a = 'Alice' b = 'Jane'
	Unpacking arguments	Use a sequence as function arguments via asterisk operator *. Use a dictionary (key, value) via double asterisk operator **	def f(x, y, z): return x + y * z f(*[1, 3, 4]) f(**{'z': 4, 'x': 1, 'y': 3})	13 13
	Extended Unpacking	Use unpacking for multiple assignment feature in Python	a, *b = [1, 2, 3, 4, 5]	a = 1 b = [2, 3, 4, 5]
	Merge two dictionaries	Use unpacking to merge two dictionaries into a single one	x={'Alice': 18} y={'Bob': 27, 'Ann': 22} z = {**x, **y}	z = {'Alice': 18, 'Bob': 27, 'Ann': 22}

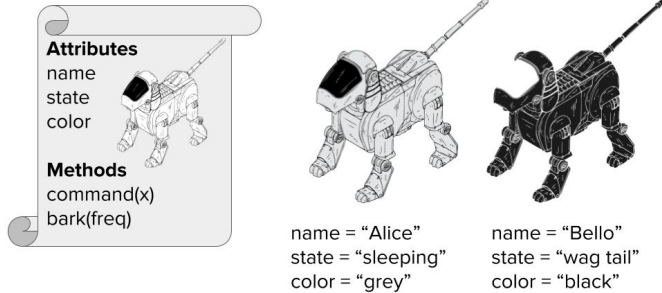
NumPy

Name	Description	Example
<code>a.shape</code>	The shape attribute of NumPy array <code>a</code> keeps a tuple of integers. Each integer describes the number of elements of the axis.	<pre>a = np.array([[1,2],[1,1],[0,0]]) print(np.shape(a))</pre> <code># (3, 2)</code>
<code>a.ndim</code>	The <code>ndim</code> attribute is equal to the length of the shape tuple.	<pre>print(np.ndim(a))</pre> <code># 2</code>
<code>*</code>	The asterisk (star) operator performs the Hadamard product, i.e., multiplies two matrices with equal shape element-wise.	<pre>a = np.array([[2, 0], [0, 2]]) b = np.array([[1, 1], [1, 1]]) print(a*b)</pre> <code># [[2 0] [0 2]]</code>
<code>np.matmul(a,b)</code> , <code>a@b</code>	The standard matrix multiplication operator. Equivalent to the <code>@</code> operator.	<pre>print(np.matmul(a,b))</pre> <code># [[2 2] [2 2]]</code>
<code>np.arange([start,]stop, [step,])</code>	Creates a new 1D numpy array with evenly spaced values	<pre>print(np.arange(0,10,2))</pre> <code># [0 2 4 6 8]</code>
<code>np.linspace(start, stop, num=50)</code>	Creates a new 1D numpy array with evenly spread elements within the given interval	<pre>print(np.linspace(0,10,3))</pre> <code># [0. 5. 10.]</code>
<code>np.average(a)</code>	Averages over all the values in the numpy array	<pre>a = np.array([[2, 0], [0, 2]]) print(np.average(a))</pre> <code># 1.0</code>
<code><slice> = <val></code>	Replace the <code><slice></code> as selected by the slicing operator with the value <code><val></code> .	<pre>a = np.array([0, 1, 0, 0, 0]) a[:2] = 2 print(a)</pre> <code># [2 1 2 0 2]</code>
<code>np.var(a)</code>	Calculates the variance of a numpy array.	<pre>a = np.array([2, 6]) print(np.var(a))</pre> <code># 4.0</code>
<code>np.std(a)</code>	Calculates the standard deviation of a numpy array	<pre>print(np.std(a))</pre> <code># 2.0</code>
<code>np.diff(a)</code>	Calculates the difference between subsequent values in NumPy array <code>a</code>	<pre>fibs = np.array([0, 1, 1, 2, 3, 5]) print(np.diff(fibs, n=1))</pre> <code># [1 0 1 1 2]</code>
<code>np.cumsum(a)</code>	Calculates the cumulative sum of the elements in NumPy array <code>a</code> .	<pre>print(np.cumsum(np.arange(5)))</pre> <code># [0 1 3 6 10]</code>
<code>np.sort(a)</code>	Creates a new NumPy array with the values from <code>a</code> (ascending).	<pre>a = np.array([10,3,7,1,0]) print(np.sort(a))</pre> <code># [0 1 3 7 10]</code>
<code>np.argsort(a)</code>	Returns the indices of a NumPy array so that the indexed values would be sorted.	<pre>a = np.array([10,3,7,1,0]) print(np.argsort(a))</pre> <code># [4 3 1 2 0]</code>
<code>np.max(a)</code>	Returns the maximal value of NumPy array <code>a</code> .	<pre>a = np.array([10,3,7,1,0]) print(np.max(a))</pre> <code># 10</code>
<code>np.argmax(a)</code>	Returns the index of the element with maximal value in the NumPy array <code>a</code> .	<pre>a = np.array([10,3,7,1,0]) print(np.argmax(a))</pre> <code># 0</code>
<code>np.nonzero(a)</code>	Returns the indices of the nonzero elements in NumPy array <code>a</code> .	<pre>a = np.array([10,3,7,1,0]) print(np.nonzero(a))</pre> <code># [0 1 2 3]</code>

Object Orientation Terms (*Optional*)

	Description	Example
Class	A blueprint to create objects . It defines the data (attributes) and functionality (methods) of the objects. You can access both attributes and methods via the dot notation.	<pre>class Dog: # class attribute is_hairy = True # constructor def __init__(self, name): # instance attribute self.name = name # method def bark(self): print("Wuff") bello = Dog("bello") paris = Dog("paris") print(bello.name) "bello" print(paris.name) "paris" class Cat: # method overloading def miau(self, times=1): print("miau " * times) fifi = Cat() fifi.miau() "miau " fifi.miau(5) "miau miau miau miau miau " # Dynamic attribute fifi.likes = "mice" print(fifi.likes) "mice" # Inheritance class Persian_Cat(Cat): classification = "Persian" mimi = Persian_Cat() print(mimi.miau(3)) "miau miau miau " print(mimi.classification)</pre>
Object (=instance)	A piece of encapsulated data with functionality in your Python program that is built according to a class definition. Often, an object corresponds to a thing in the real world. An example is the object "Obama" that is created according to the class definition "Person". An object consists of an arbitrary number of attributes and methods , encapsulated within a single unit.	
Instantiation	The process of creating an object of a class . This is done with the constructor method <code>__init__(self, ...)</code> .	
Method	A subset of the overall functionality of an object . The method is defined similarly to a function (using the keyword "def") in the class definition. An object can have an arbitrary number of methods.	
Self	The first argument when defining any method is always the self argument. This argument specifies the instance on which you call the method . self gives the Python interpreter the information about the concrete instance. To <i>define</i> a method, you use self to modify the instance attributes. But to <i>call</i> an instance method, you do not need to specify self .	
Encapsulation	Binding together data and functionality that manipulates the data.	
Attribute	A variable defined for a class (class attribute) or for an object (instance attribute). You use attributes to package data into enclosed units (class or instance).	
Class attribute	(=class variable, static variable, static attribute) A variable that is created statically in the class definition and that is shared by all class objects .	
Instance attribute (=instance variable)	A variable that holds data that belongs only to a single instance. Other instances do not share this variable (in contrast to class attributes). In most cases, you create an instance attribute x in the constructor when creating the instance itself using the self keywords (e.g. <code>self.x = <val></code>).	
Dynamic attribute	An instance attribute that is defined dynamically during the execution of the program and that is not defined within any method . For example, you can simply add a new attribute neew to any object o by calling <code>o.neew = <val></code> .	
Method overloading	You may want to define a method in a way so that there are multiple options to call it. For example for class X, you define a method <code>f(...)</code> that can be called in three ways: <code>f(a)</code> , <code>f(a,b)</code> , or <code>f(a,b,c)</code> . To this end, you can define the method with default parameters (e.g. <code>f(a, b=None, c=None)</code>).	
Inheritance	Class A can inherit certain characteristics (like attributes or methods) from class B . For example, the class "Dog" may inherit the attribute "number_of_legs" from the class "Animal". In this case, you would define the inherited class "Dog" as follows: <code>"class Dog(Animal): ..."</code>	

Python - Classes (Optional)




	Description	Example
Classes	<p>A class encapsulates data and functionality - data as attributes, and functionality as methods. It is a blueprint to create concrete instances in the memory.</p> <p>Class</p> <p>Instances</p>  <p>name = "Alice" state = "sleeping" color = "grey"</p> <p>name = "Bello" state = "wag tail" color = "black"</p>	<pre>class Dog: """ Blueprint of a dog """ # class variable shared by all instances species = ["canis lupus"] def __init__(self, name, color): self.name = name self.state = "sleeping" self.color = color def command(self, x): if x == self.name: self.bark(2) elif x == "sit": self.state = "sit" else: self.state = "wag tail" def bark(self, freq): for i in range(freq): print "[" + self.name + ": Woof!" bello = Dog("bello", "black") alice = Dog("alice", "white") print(bello.color) # black print(alice.color) # white bello.bark(1) # [bello]: Woof! alice.command("sit") print("[alice]: " + alice.state) # [alice]: sit bello.command("no") print("[bello]: " + bello.state) # [bello]: wag tail alice.command("alice") # [alice]: Woof! # [alice]: Woof! bello.species += ["wulf"] print(len(bello.species) == len(alice.species)) # True (!)</pre>
Instance	<p>You are an instance of the class human. An instance is a concrete implementation of a class: all attributes of an instance have a fixed value. Your hair is blond, brown, or black - but never unspecified.</p> <p>Each instance has its own attributes independent of other instances. Yet, class variables are different. These are data values associated with the class, not the instances. Hence, all instance share the same class variable species in the example.</p>	
Self	<p>The first argument when defining any method is always the self argument. This argument specifies the instance on which you call the method.</p> <p>self gives the Python interpreter the information about the concrete instance. To <i>define</i> a method, you use self to modify the instance attributes. But to <i>call</i> an instance method, you do not need to specify self.</p>	
Creation	<p>You can create classes "on the fly" and use them as logical units to store complex data types.</p> <pre>class Employee(): pass employee = Employee() employee.salary = 122000 employee.firstname = "alice" employee.lastname = "wonderland" print(employee.firstname + " " + employee.lastname + " " + str(employee.salary) + "\$") # alice wonderland 122000\$</pre>	

14 Interview Questions



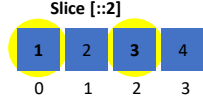
Question	Code	Question	Code
Check if list contains integer x	<pre>l = [3, 3, 4, 5, 2, 111, 5] print(111 in l) # True</pre>	Get missing number in [1...100]	<pre>def get_missing_number(lst): return set(range(lst[len(lst)-1])[1:]) - set(l) l = list(range(1,100)) l.remove(50) print(get_missing_number(l)) # 50</pre>
Find duplicate number in integer list	<pre>def find_duplicates(elements): duplicates, seen = set(), set() for element in elements: if element in seen: duplicates.add(element) seen.add(element) return list(duplicates)</pre>	Compute the intersection of two lists	<pre>def intersect(lst1, lst2): res, lst2_copy = [], lst2[:] for el in lst1: if el in lst2_copy: res.append(el) lst2_copy.remove(el) return res</pre>
Check if two strings are anagrams	<pre>def is_anagram(s1, s2): return set(s1) == set(s2) print(is_anagram("elvis", "lives")) # True</pre>	Find max and min in unsorted list	<pre>l = [4, 3, 6, 3, 4, 888, 1, -11, 22, 3] print(max(l)) # 888 print(min(l)) # -11</pre>
Remove all duplicates from list	<pre>lst = list(range(10)) + list(range(10)) lst = list(set(lst)) print(lst) # [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]</pre>	Reverse string using recursion	<pre>def reverse(string): if len(string)<=1: return string return reverse(string[1:])+string[0] print(reverse("hello")) # olleh</pre>
Find pairs of integers in list so that their sum is equal to integer x	<pre>def find_pairs(l, x): pairs = [] for (i, el_1) in enumerate(l): for (j, el_2) in enumerate(l[i+1:]): if el_1 + el_2 == x: pairs.append((el_1, el_2)) return pairs</pre>	Compute the first n Fibonacci numbers	<pre>a, b = 0, 1 n = 10 for i in range(n): print(b) a, b = b, a+b # 1, 1, 2, 3, 5, 8, ...</pre>
Check if a string is a palindrome	<pre>def is_palindrome(phrase): return phrase == phrase[::-1] print(is_palindrome("anna")) # True</pre>	Sort list with Quicksort algorithm	<pre>def qsort(L): if L == []: return [] return qsort([x for x in L[1:] if x< L[0]]) + L[0:1] + qsort([x for x in L[1:] if x>=L[0]]) lst = [44, 33, 22, 5, 77, 55, 999] print(qsort(lst)) # [5, 22, 33, 44, 55, 77, 999]</pre>
Use list as stack, array, and queue	<pre># as a list ... l = [3, 4] l += [5, 6] # l = [3, 4, 5, 6] # ... as a stack ... l.append(10) # l = [4, 5, 6, 10] l.pop() # l = [4, 5, 6] # ... and as a queue l.insert(0, 5) # l = [5, 4, 5, 6] l.pop() # l = [5, 4, 5]</pre>	Find all permutations of string	<pre>def get_permutations(w): if len(w)<=1: return set(w) smaller = get_permutations(w[1:]) perms = set() for x in smaller: for pos in range(0,len(x)+1): perm = x[:pos] + w[0] + x[pos:] perms.add(perm) return perms print(get_permutations("nan")) # {'nna', 'ann', 'nan'}</pre>

Python Cheat Sheet


Keywords

Keyword	Description	Code Examples
<code>False</code> , <code>True</code>	Boolean data type	<code>False == (1 > 2)</code> <code>True == (2 > 1)</code> 
<code>and</code> , <code>or</code> , <code>not</code>	Logical operators → Both are true → Either is true → Flips Boolean	<code>True and True</code> # True <code>True or False</code> # True <code>not False</code> # True
<code>break</code>	Ends loop prematurely	<code>while True:</code> <code>break</code> # finite loop
<code>continue</code>	Finishes current loop iteration	<code>while True:</code> <code>continue</code> <code>print("42")</code> # dead code
<code>class</code>	Defines new class	<code>class Coffee:</code> # Define your class
<code>def</code>	Defines a new function or class method.	<code>def say_hi():</code> <code>print('hi')</code>
<code>if</code> , <code>elif</code> , <code>else</code>	Conditional execution: - "if" condition == True? - "elif" condition == True? - Fallback: else branch	<code>x = int(input("ur val:"))</code> <code>if x > 3: print("Big")</code> <code>elif x == 3: print("3")</code> <code>else: print("Small")</code>
<code>for</code> , <code>while</code>	# For loop <code>for i in [0,1,2]:</code> <code>print(i)</code>	# While loop does same <code>j = 0</code> <code>while j < 3:</code> <code>print(j); j = j + 1</code> 
<code>in</code>	Sequence membership	<code>42 in [2, 39, 42]</code> # True
<code>is</code>	Same object memory location	<code>y = x = 3</code> <code>x is y</code> # True <code>[3] is [3]</code> # False
<code>None</code>	Empty value constant	<code>print() is None</code> # True
<code>lambda</code>	Anonymous function	<code>(lambda x: x+3)(3)</code> # 6 
<code>return</code>	Terminates function. Optional return value defines function result.	<code>def increment(x):</code> <code>return x + 1</code> <code>increment(4)</code> # returns 5

Basic Data Structures

Type	Description	Code Examples
Boolean	The Boolean data type is either <code>True</code> or <code>False</code> . Boolean operators are ordered by priority: <code>not</code> → <code>and</code> → <code>or</code> <code>{}</code> →  <code>{1, 2, 3}</code> → 	<code>## Evaluates to True:</code> <code>1<2 and 0<=1 and 3>2 and 2>=2 and 1==1 and 1!=0</code> <code>## Evaluates to False:</code> <code>bool(None or 0 or 0.0 or '' or [] or {} or set())</code> Rule: <code>None</code> , <code>0</code> , <code>0.0</code> , empty strings, or empty container types evaluate to <code>False</code>
Integer, Float	An integer is a positive or negative number without decimal point such as 3. A float is a positive or negative number with floating point precision such as 3.1415926. Integer division rounds toward the smaller integer (example: <code>3//2==1</code>).	<code>## Arithmetic Operations</code> <code>x, y = 3, 2</code> <code>print(x + y)</code> # = 5 <code>print(x - y)</code> # = 1 <code>print(x * y)</code> # = 6 <code>print(x / y)</code> # = 1.5 <code>print(x // y)</code> # = 1 <code>print(x % y)</code> # = 1 <code>print(-x)</code> # = -3 <code>print(abs(-x))</code> # = 3 <code>print(int(3.9))</code> # = 3 <code>print(float(3))</code> # = 3.0 <code>print(x ** y)</code> # = 9
String	Python Strings are sequences of characters. String Creation Methods: 1. Single quotes <code>>>> 'Yes'</code> 2. Double quotes <code>>>> "Yes"</code> 3. Triple quotes (multi-line) <code>>>> """Yes</code> We Can""" 4. String method <code>>>> str(5) == '5'</code> <code>True</code> 5. Concatenation <code>>>> "Ma" + "hatma"</code> <code>'Mahatma'</code> Whitespace chars: Newline <code>\n</code> , Space <code>\s</code> , Tab <code>\t</code>	<code>## Indexing and Slicing</code> <code>s = "The youngest pope was 11 years"</code> <code>s[0]</code> # 'T' <code>s[1:3]</code> # 'he' <code>s[-3:-1]</code> # 'ar' <code>s[-3:]</code> # 'ars'  <code>x = s.split()</code> <code>x[-2] + " " + x[2] + "s" # '11 popes'</code> <code>## String Methods</code> <code>y = " Hello world\t\n "</code> <code>y.strip()</code> # Remove Whitespace <code>"HI".lower()</code> # Lowercase: 'hi' <code>"hi".upper()</code> # Uppercase: 'HI' <code>"hello".startswith("he")</code> # True <code>"hello".endswith("lo")</code> # True <code>"hello".find("ll")</code> # Match at 2 <code>"cheat".replace("ch", "m")</code> # 'meat' <code>''.join(["F", "B", "I"])</code> # 'FBI' <code>len("hello world")</code> # Length: 15 <code>"ear" in "earth"</code> # True

Complex Data Structures

Type	Description	Example
List	Stores a sequence of elements. Unlike strings, you can modify list objects (they're <i>mutable</i>).	<code>l = [1, 2, 2]</code> <code>print(len(l))</code> # 3 
Adding elements	Add elements to a list with (i) <code>append</code> , (ii) <code>insert</code> , or (iii) list concatenation.	<code>[1, 2].append(4)</code> # [1, 2, 4] <code>[1, 4].insert(1,9)</code> # [1, 9, 4] <code>[1, 2] + [4]</code> # [1, 2, 4]
Removal	Slow for lists	<code>[1, 2, 2, 4].remove(1)</code> # [2, 2, 4]
Reversing	Reverses list order	<code>[1, 2, 3].reverse()</code> # [3, 2, 1]
Sorting	Sorts list using fast Timsort	<code>[2, 4, 2].sort()</code> # [2, 2, 4]
Indexing	Finds the first occurrence of an element & returns index. Slow worst case for whole list traversal.	<code>[2, 2, 4].index(2)</code> # index of item 2 is 0 <code>[2, 2, 4].index(2,1)</code> # index of item 2 after pos 1 is 1
Stack	Use Python lists via the list operations <code>append()</code> and <code>pop()</code>	<code>stack = [3]</code> <code>stack.append(42)</code> # [3, 42] <code>stack.pop()</code> # 42 (stack: [3]) <code>stack.pop()</code> # 3 (stack: [])
Set	An unordered collection of unique elements (<i>at-most-once</i>) → fast membership <i>O(1)</i>	<code>basket = {'apple', 'eggs', 'banana', 'orange'}</code> <code>same = set(['apple', 'eggs', 'banana', 'orange'])</code>

Type	Description	Example
Dictionary	Useful data structure for storing (key, value) pairs	<code>cal = {'apple': 52, 'banana': 89, 'choco': 546}</code> # calories
Reading and writing elements	Read and write elements by specifying the key within the brackets. Use the keys() and values() functions to access all keys and values of the dictionary	<code>print(cal['apple'] < cal['choco'])</code> # True <code>cal['cappu'] = 74</code> <code>print(cal['banana'] < cal['cappu'])</code> # False <code>print('apple' in cal.keys())</code> # True <code>print(52 in cal.values())</code> # True
Dictionary Iteration	You can access the (key, value) pairs of a dictionary with the items() method.	<code>for k, v in cal.items():</code> <code>print(k) if v > 500 else ''</code> # 'choco'
Membership operator	Check with the in keyword if set, list, or dictionary contains an element. Set membership is faster than list membership.	<code>basket = {'apple', 'eggs', 'banana', 'orange'}</code> <code>print('eggs' in basket)</code> # True <code>print('mushroom' in basket)</code> # False
List & set comprehension	List comprehension is the concise Python way to create lists. Use brackets plus an expression, followed by a <i>for</i> clause. Close with zero or more <i>for</i> or <i>if</i> clauses. Set comprehension works similar to list comprehension.	<code>l = ['hi' + x for x in ['Alice', 'Bob', 'Pete']]</code> # ['Hi Alice', 'Hi Bob', 'Hi Pete'] <code>l2 = [x * y for x in range(3) for y in range(3) if x>y]</code> # [0, 0, 2] <code>squares = {x**2 for x in [0,2,4] if x < 4}</code> # {0, 4}