Python collections tutorial w3schools

List items are indexed and you can access them by referring to the index number: Print the second item of the list: thislist = ["apple", "banana", "cherry"] print(thislist[1]) Try it Yourself » Note: The first item has index 0. Negative Indexing Negative indexing means start from the end -1 refers to the last item, -2 refers to the second last item etc. Print the last item of the list: thislist = ["apple", "banana", "cherry"] print(thislist[-1]) Try it Yourself » Range of Indexes You can specify a range of indexes by specifying where to start and where to end the range. When specifying a range, the return value will be a new list with the specified items. Return the third, fourth, and fifth item: thislist = ["apple", "banana", "cherry", "orange", "kiwi", "melon", "mango"] print(thislist[2:5]) Try it Yourself » Note: The search will start at index 2 (included) and end at index 5 (not included). Remember that the first item has index 0. By leaving out the start value, the range will start at the first item: This example returns the items from the beginning to, but NOT including, "kiwi": thislist = ["apple", "banana", "cherry", "orange", "kiwi", "melon", "mango"] print(thislist[:4]) Try it Yourself » By leaving out the end value, the range will go on to the end of the list: This example returns the items from "cherry" to the end: thislist = ["apple", "banana", "cherry", "orange", "kiwi", "melon", "mango"] print(thislist[2:]) Try it Yourself » Range of Negative Indexes Specify negative indexes if you want to start the search from the end of the list: This example returns the items from "orange" (-4) to, but NOT including "mango" (-1): thislist = ["apple", "banana", "cherry", "orange", "kiwi", "melon", "mango"] print(thislist[-4:-1]) Try it Yourself » Check if Item Exists To determine if a specified item is present in a list use the in keyword: Check if "apple" is present in the list: thislist = ["apple", "banana", "cherry"] if "apple" in thislist: print("Yes, 'apple' is in the fruits list") Try it Yourself » mylist = ["apple", "banana", "cherry"] Lists are used to store multiple items in a single variable. Lists are one of 4 built-in data types in Python used to store collections of data, the other 3 are Tuple, Set, and Dictionary, all with different qualities and usage. Lists are created using square brackets: Create a List: thislist = ["apple", "banana", "cherry"] print(thislist) Try it Yourself » List Items List items are ordered, changeable, and allow duplicate values. List items are indexed, the first item has index [0], the second item has index [1] etc. Ordered When we say that lists are ordered, it means that the items have a defined order, and that order will not change. If you add new items to a list, the new items will be placed at the end of the list. Note: There are some list methods that will change the order, but in general: the order of the items will not change. Changeable The list is changeable, meaning that we can change, add, and remove items in a list after it has been created. Allow Duplicates Since lists are indexed, lists can have items with the same value: Lists allow duplicate values: thislist = ["apple", "banana", "cherry", "apple", "cherry"] print(thislist) Try it Yourself » List Length To determine how many items a list has, use the len() function: Print the number of items in the list: thislist = ["apple", "banana", "cherry"] print(len(thislist)) Try it Yourself » List Items - Data Types List items can be of any data type: String, int and boolean data types: list1 = ["apple", "banana", "cherry"] list2 = [1, 5, 7, 9, 3] list3 = [True, False, False] Try it Yourself » A list can contain different data types: A list with strings, integers and boolean values: list1 = ["abc", 34, True, 40, "male"] Try it Yourself » type() From Python's perspective, lists are defined as objects with the data type 'list': What is the data type of a list? mylist = ["apple", "banana", "cherry"] print(type(mylist)) Try it Yourself » It is also possible to use the list() constructor when creating a new list. Using the list() constructor to make a List: thislist = list(("apple", "banana", "cherry")) # note the double round-brackets print(thislist) Try it Yourself » Python Collections (Arrays) There are four collection data types in the Python programming language: List is a collection which is ordered and changeable. Allows duplicate members. Tuple is a collection which is ordered and unchangeable. Allows duplicate members. Set is a collection which is unordered and unindexed. No duplicate members. Dictionary is a collection which is ordered* and changeable. No duplicate members. *As of Python version 3.7, dictionaries are ordered. In Python 3.6 and earlier, dictionaries are unordered. When choosing a collection type, it is useful to understand the properties of that type. Choosing the right type for a particular data set could mean retention of meaning, and, it could mean an increase in efficiency or security. Python collections module comes with with a number of container data types. These data types have different capabilities, as we will learn in this post. Let's study about python collections module and it's most important and widely used data types.Python Collections ModuleThe collections which we will study in python collections module are:OrderedDictdefaultdictcounternamedtupledequeLet's get started.1. OrderedDictWith an OrderedDict, the order of insertion is maintained when key and values are inserted into the dictionary. If we try to insert a key again, this will overwrite the previous value for that key.Here is a sample program to demonstrate the usage of an OrderedDict: from collections import OrderedDict roll_no = OrderedDict([(11, 'Shubham'), (9, 'Pankaj'), (17, 'JournalDev'),]) for key, value in roll_no.items(): print(key, value) Let's see the output for this program: Notice that the output order was exactly the same as the order of insertion.2. Default DictThe default dictionary can contain duplicate keys. The advantage of using the default dictionary is that we can collect items which belong to the same key. Let's look at a code snippet which demonstrates the same: from collections import defaultdict marks = [('Shubham', 89), ('Pankaj', 92), ('JournalDev', 99), ('JournalDev', 98)] dict_marks = defaultdict(list) for key, value in marks: dict_marks[key].append(value) print(list(dict_marks.items())) Let's see the output for this program: The key JournalDev was used two times and values for the same was collected once we printed the dictionary.3. CounterThe Counter collections allow us to keep a count of all the items which are inserted into the collection with the keys. Here is a sample program to show how it works: from collections import Counter marks_list = [('Shubham', 89), ('Pankaj', 92), ('JournalDev', 99), ('JournalDev', 98)] count = Counter(name for name, marks in marks_list) print(count) Let's see the output for this program: This way, we were able to count the number of times a key appeared in the list.4. Named TupleAs we already know, Python Tuples are immutable lists. This means that a value cannot be given to a key which aready exists in the tuple. First, let's see how a Tuple can be made in Python: shubham = ('Shubham', 23, 'M') print(shubham) Let's see the output for this program: We can convert this Tuple to a Named tuple by assigning a name to all values present in this tuple. This will give a lot more context to the data present as well: import collections User = collections.namedtuple('User', 'name age gender') shubham = User(name='Shubham', age=23, gender='M') print(shubham) print('Name of User: {0}'.format(shubham.name)) Output for this program will be: See how we can access properties of a named tuple with the name we provide. Also, remember that the key names cannot be Python keywords.5. DequeA Deque is a double-ended queue which allows us to add and remove elements from both the ends. This enhances the capabilities of a stack or a queue. Here is a sample program: import collections name = collections.deque('Shubham') print('Deque :', name) print('Queue Length:', len(name)) print('Left part :', name[0]) print('Right part :', name[-1]) name.remove('b') print('remove(b):', name) Let's see the output for this program: So, the dequeueing of the elements was done automatically. We can also insert elements in a Dequeue on a specific end. Let's try it: import collections name = collections.deque('Shubham') print('Deque :', name) name.extendleft('...') name.append('-') print('Deque :', name) Let's see the output for this program: ConclusionIn this post, we learned how we can manage data in Python and can use the collections module to make a lot of our operations easy.Reference: API Doc Python Counter is a container that will hold the count of each of the elements present in the container. The counter is a sub-class available inside the dictionary class. The counter is a sub-class available inside the dictionary class. Using the Python Counter tool, you can count the key-value pairs in an object, also called a hash table object. Why use Python Counter? Here, are major reasons for using Python 3 Counter: The Counter holds the data in an unordered collection, just like hashtable objects. The elements here represent the keys and the count as values. It allows you to count the items in an iterable list.Arithmetic operations like addition, subtraction, intersection, and union can be easily performed on a Counter.A Counter can also count elements from another counterIn this Python tutorial you will learn: Introduction to Python CounterPython Counter takes in input a list, tuple, dictionary, string, which are all iterable objects, and it will give you output that will have the count of each element.Syntax: Counter(list) Consider you have a following list : list1 = ['x','y','z','x','x','x','y', 'z'] The list has elements x , y and z.When you use Counter on this list , it will count how many times x , y and z is present. The output if counter is used on list1 should be something like : Counter({'x': 4, 'y': 2, 'z': 2}) So we have the count of x as 4, y as 2 and z as 2. To make use of Counter we need to import it first as shown in the below given example: from collections import Counter Here is a simple example , that shows the working of Counter module. from collections import Counter list1 = ['x','y','z','x','x','x','y', 'z'] print(Counter(list1)) Output: Counter({'x': 4, 'y': 2, 'z': 2}) Counter with StringIn Python, everything is an object and string is an object too. Python string can be created simply by enclosing characters in the double quote. Python does not support a character type. These are treated as strings of length one, also considered as a substring. In the example below, a string is passed to Counter. It returns dictionary format, with key/value pair where the key is the element and value is the count. It also considers space as an element and gives the count of spaces in the string. Example: from collections import Counter my_str = "Welcome to Guru99 Tutorials!" print(Counter(my_str))Output: Counter({'o': 3, ' ': 3, 'u': 3, 'e': 2, 'l': 2, 't': 2, 'r': 2, '9': 2, 'W': 1, 'c': 1, 'm': 1, 'G': 1, 'T': 1, 'i': 1, 'a': 1, 's': 1, '!': 1}) Counter with ListA list is an iterable object that has its elements inside square brackets. The elements in the list when given to the Counter will be converted to a hashtable objects wherein the elements will become keys and the values will be the count of the elements from the list given. For example ['x','y','z','x','x','x','y','z']. Once you give the list the Counter, it will give you the count of each element in the list. from collections import Counter list1 = ['x','y','z','x','x','x','y','z'] print(Counter(list1)) Output: Counter({'x': 4, 'y': 2, 'z': 2}) Counter with DictionaryA dictionary has elements as key/value pair, and they are written inside curly brackets. Once the dictionary is given to the Counter, it will be converted to a hashtable objects wherein the elements will become keys, and the values will be the count of the elements from the dictionary given. For example : {'x': 4, 'y': 2, 'z': 2, 'z': 2}. The Counter function will try to find the count of each of the key in the given dictionary. from collections import Counter dict1 = {'x': 4, 'y': 2, 'z': 2, 'z': 2} print(Counter(dict1)) Output: Counter({'x': 4, 'y': 2, 'z': 2}) Counter with TupleTuple is a collection of objects separated by commas inside round brackets. Counter will give you the count of each of the elements in the tuple given. Once the tuple is given to the Counter, it will be converted to a hashtable object wherein the elements will become keys and the values will be the count of the elements from the tuple given. from collections import Counter tuple1 = ('x','y','z','x','x','x','y','z') print(Counter(tuple1)) Output: Counter({'x': 4, 'y': 2, 'z': 2}) Accessing, Initializing and Updating CountersInitializing CounterA Counter can be initialized by passing string value, list, dictionary, or tuple as shown below: from collections import Counter print(Counter("Welcome to Guru99 Tutorials!")) #using string print(Counter(['x','y','z','x','x','x','y', 'z'])) #using list print(Counter({'x': 4, 'y': 2, 'z': 2})) #using dictionary print(Counter(('x','y','z','x','x','x','y','z'))) #using tuple You can also initialize a empty Counter as shown below: from collections import Counter _count = Counter() Updating CounterYou can add values to the Counter by using update() method. _count.update('Welcome to Guru99 Tutorials!') The final code is : from collections import Counter _count = Counter() _count.update('Welcome to Guru99 Tutorials!') print(_count) The output is: Counter({'o': 3, ' ': 3, 'u': 3, 'e': 2, 'l': 2, 't': 2, 'r': 2, '9': 2, 'W': 1, 'c': 1, 'm': 1, 'G': 1, 'T': 1, 'i': 1, 'a': 1, 's': 1, '!': 1}) Accessing CounterTo get the values from the Counter, you can do as follows: from collections import Counter _count = Counter() _count.update('Welcome to Guru99 Tutorials!') print('%s : %d' % ('u', _count['u'])) print('') for char in 'Guru': print('%s : %d' % (char, _count[char])) Output: u : 3 G : 1 u : 3 r : 2 u : 3 Deleting an Element from CounterTo delete an element from Counter you can make use of del , as shown in the example below: Example: from collections import Counter dict1 = {'x': 4, 'y': 2, 'z': 2} del dict1["x"] print(Counter(dict1)) Output: Counter({'y': 2, 'z': 2}) Arithmetic operation on Python CounterArithmetic operation like addition, subtraction, intersection and union can be done on a Counter as shown in the example below: Example: from collections import Counter counter1 = Counter({'x': 4, 'y': 2, 'z': -2}) counter2 = Counter({'x1': -12, 'y': 5, 'z':4 }) #Addition counter3 = counter1 + counter2 # only the values that are positive will be returned. print(counter3) #Subtraction counter4 = counter1 - counter2 # all -ve numbers are excluded.For example z will be z = -2-4=-6, since it is -ve value it is not shown in the output print(counter4) #Intersection counter5 = counter1 & counter2 # it will give all common positive minimum values from counter1 and counter2 print(counter5) #Union counter6 = counter1 | counter2 # it will give positive max values from counter1 and counter2 print(counter6) Output: Counter({'y': 7, 'x': 4, 'z': 2}) Counter({'x1': 12, 'x': 4}) Counter({'y': 2}) Counter({'y': 5, 'x': 4, 'z': 4}) Methods Available on Python CounterThere are some important methods available with Counter, here is the list of same: elements() : This method will return you all the elements with count >0. Elements with 0 or -1 count will not be returned.most_common(value): This method will return you the most common elements from Counter list.subtract(): This method is used to deduct the elements from another Counter.update(): This method is used to update the elements from another Counter.Example : elements() from collections import Counter counter1 = Counter({'x': 5, 'y': 2, 'z': -2, 'x1':0}) _elements = counter1.elements() # will give you all elements with positive value and count>0 for a in _elements: print(a) Output: x x x x x y y Example: most_common(value) from collections import Counter counter1 = Counter({'x': 5, 'y': 12, 'z': -2, 'x1':0}) common_element = counter1.most_common(2) # The dictionary will be sorted as per the most common element first followed by next. print(common_element) common_element1 = counter1.most_common() # if the value is not given to most_common , it will sort the dictionary and give the most common elements from the start.The last element will be the least common element. print(common_element1) Output: [('y', 12), ('x', 5)] [('y', 12), ('x', 5), ('x1', 0), ('z', -2)] Example:subtract() from collections import Counter counter1 = Counter({'x': 5, 'y': 12, 'z': -2, 'x1':0}) counter2 = Counter({'x': 2, 'y':5}) counter1.subtract(counter2) print(counter1) Output: Counter({'y': 7, 'x': 3, 'x1': 0, 'z': -2}) Example:update() from collections import Counter counter1 = Counter({'x': 5, 'y': 12, 'z': -2, 'x1':0}) counter2 = Counter({'x': 2, 'y':5}) counter1.update(counter2) print(counter1) Output: Counter({'y': 17, 'x': 7, 'x1': 0, 'z': -2}) Reassigning Counts in PythonYou can re-assign counts of Counter as shown below: Consider you have a dictionary as : {'x': 5, 'y': 12, 'z': -2, 'x1':0} You can change the count of the element as shown below: from collections import Counter counter1 = Counter({'x': 5, 'y': 12, 'z': -2, 'x1':0}) counter1['y'] = 20 print(counter1) Output: After executing you will see that y count is changed from 12 to 20 Counter({'y': 20, 'x': 5, 'x1': 0, 'z': -2}) Get and set the count of Elements using CounterTo get the count of an element using Counter you can do as follows: from collections import Counter counter1 = Counter({'x': 5, 'y': 12, 'z': -2, 'x1':0}) print(counter1['y']) # this will give you the count of element 'y' Output: 12 To set the count of the element you can do as follows: from collections import Counter counter1 = Counter({'x': 5, 'y': 12, 'z': -2, 'x1':0}) print(counter1['y']) counter1['y'] = 20 counter1['y1'] = 10 print(counter1) Output: 12 Counter({'y': 20, 'y1': 10, 'x': 5, 'x1': 0, 'z': -2}) Summary:Counter is a container that will hold the count of each of the elements present in the container. Counter is a sub-class available inside the dictionary class. Using the Python Counter tool, you can count the key-value pairs in an object, also called a hashtable object.The Counter holds the data in an unordered collection, just like hashtable objects. The elements here represent the keys and the count as values. It allows you to count the items in an iterable list.Arithmetic operations like addition, subtraction, intersection, and union can be easily performed on a Counter.A Counter can also count elements from another counter.The important methods available on a Counter are elements() , most_common(value), subtract() and update().A counter can be used on a string, list, dictionary, and tuple.Page 2Python Enumerate() is a built-in function available with the Python library. It takes the given input as a collection or tuples and returns it as an enumerate object. The Python Enumerate() command adds a counter to each item of the iterable object and returns an enumerate object as an output string. In this Enumerate Python tutorial, you will learn: Syntax of Python enumerate() enumerate(iterable, startIndex) ParametersThree parameters are: Iterable: an object that can be looped.StartIndex: (optional) The count will start with the value given in the startIndex for the first item in the loop and increment it for the nextitem till it reaches the end of the loop. However, If startIndex is not specified, the count will start from 0. ReturnValue: It will return an iterableobject, with countvalue to each of the items to the iteratorobject given as input. Enumerate() in Python ExampleEnumerate method comes with an automatic counter/index to each of the items present in the Enumerate list in Python. The firstindex value will start from 0. You can also specify the startindex by using the optional parameter startIndex in enumerate. ExampleIn the code below, mylist is the list given to Enumerate function in Python. The list() function is used to display the Enumerate Python output. Note: There is no startIndex used hence the index for the firstitem will start from 0. The output from enumerate will be in the following manner: (0, item_1), (1, item_2), (2, item_3), … (n, item_n) File: python_enumerate.py mylist = ['A', 'B' ,'C', 'D'] e_list = enumerate(mylist) print(list(e_list)) Output: [(0, 'A'), (1, 'B'), (2, 'C'), (3, 'D')] UsingEnumerate() on a list with startIndex In the below example, the startindex given as 2.The index of the firstitem will start from the given startindex. Example: In the example below, mylist is the list given to enumerate. The list() function is used to display the enumerate output. mylist = ['A', 'B' ,'C', 'D'] e_list = enumerate(mylist,2) print(list(e_list)) Output: [(2, 'A'), (3, 'B'), (4, 'C'), (5, 'D')] Looping Over an Enumerate object The example shows enumerating over an object with and without startIndex. The first for-loop does not have startIndex, so the index starts from 0. The second for-loop has startIndex as 10, so the index is starting from 10. Example: mylist = ['A', 'B' ,'C', 'D'] for i in enumerate(mylist): print(i) print("") print("Using startIndex as 10") for i in enumerate(mylist, 10): print(i) print("") Output: (0, 'A') (1, 'B') (2, 'C') (3, 'D') Using startIndex as 10 (10, 'A') (11, 'B') (12, 'C') (13, 'D') Enumerating a TupleIn the below example, you can use a tuple inside an enumerate. You can also use a startIndex, and the key to each item will start from the startIndexgiven. By default, the startIndex is 0. There, hence you see key as 0 for items A and 1 for B and so on. Example: my_tuple = ("A", "B", "C", "D", "E") for i in enumerate(my_tuple): print(i) Output: (0, 'A') (1, 'B') (2, 'C') (3, 'D') (4, 'E') Enumerating a StringIn Python, the string is an array, and hence you can loop over it. If you pass a string to enumerate(), the output will show you the index and value for each character of the string. Example: my_str = "Guru99 " for i in enumerate(my_str): print(i) Output: (0, 'G') (1, 'u') (2, 'r') (3, 'u') (4, '9') (5, '9') Enumerate a dictionaryIn Python, a dictionary is listed in curly brackets, inside these curly brackets, the values are declared. Each element is a key/value pair and separated by commas. You can use a dictionary inside a enumerate() and see the output. my_dict = {"a": "PHP", "b":"JAVA", "c":"PYTHON", "d":"NODEJS"} for i in enumerate(my_dict): print(i) Output: (0, 'a') (1, 'b') (2, 'c') (3, 'd') Advantages of using EnumerateHere, are pros/benefits of using Enumerate in Python: Enumerate allows you to loop through a list, tuple, dictionary, string, and gives the values along with the index.To get index value using for-loop, you can make use of list.index(n). However, list.index(n) is very expensive as it will traverse the for-loop twice. Enumerate is very helpful in such a case as it gives the index and items at one go.SummaryEnumerate() function is a built-in function available with python. Enumerate() function adds a counter to each item of the iterable object and returns an enumerate object.In Enumeration in Python, you can specify the startIndex, i.e., the counter you want the values to start from.Enumerate can be used to loop over a list, tuple, dictionary, and string.Enumerate is very helpful when you want the index and the value when looping over list, tuple, dictionary, etc.Enumerate comes with an automatic counter/index to each of the items present in the list. The first index value will start from 0. You can also specify the startindex by using the optional parameter startIndex in enumerate.If you pass a string to enumerate(), the output will show you the index and value for each character of the string.Page 3Python sleep() is a function used to delay the execution of code for the number of seconds given as input to sleep(). The sleep() command is a part of the time module. You can use the sleep() function to temporarily halt the execution of your code. For example, you are waiting for a process to complete or a file upload. In this tutorial, you will learn: time.sleep() Syntax import time time.sleep(seconds) Parameters:seconds: The number of seconds you want the execution of your code to be halted.Example: Using sleep() function in Python Follow the steps given below to add sleep() in your python script. Step 1: import time Step 2: Add time.sleep() The number 5 given as input to sleep(), is the number of seconds you want the code execution to halt when it is executed. time.sleep(5) Here is a working code along with messages inside print(), to show the delay of message display on the terminal when executed. import time print("Welcome to guru99 Python Tutorials") time.sleep(5) print("This message will be printed after a wait of 5 seconds") Output: Welcome to guru99 Python Tutorials This message will be printed after a wait of 5 seconds How to delay the execution of function using sleep()?The example shown below has a function defined called display(). The display() function prints a message "Welcome to Guru99 Tutorials". When the function is called, it will execute and display the message inside the terminal. To add delay to the execution of the function, let us add the time.sleep in Python before making a call to the function. During the execution, Python time.sleep will halt there for the number of seconds given, and later the function display() will be called. Example: import time print('Code Execution Started') def display(): print('Welcome to Guru99 Tutorials') time.sleep(5) display() print('Function Execution Delayed') Output: Code Execution Started Welcome to Guru99 Tutorials Function Execution DelayedWhat are the different ways to add a delay in Python Script?Using sleep() functionWe have seen a few examples earlier on how to use time.sleep(). Let us try a different example here using time.sleep(). Example: The code has a for loop that will take the string variable and print each character with a delay of 1 seconds. import time my_message = "Guru99" for i in my_message: print(i) time.sleep(1) Output: G u r u 9 9 Using asyncio.sleep function available from (Python 3.4 or higher)You can make use of asyncio.sleep with python version 3.4 and higher. To make use of the asyncio sleep method, you need to add async and await to the function, as shown in the example below: Example: The script has a function call display() that prints a message "Welcome to Guru99 tutorials". There are two keywords used in the function async and await. The async keyword is added at the start of the function definition, and await is added just before the asyncio.sleep(). Both the keywords async / await are meant to handle the asynchronous task. When the function display() is called, and it encounters await asyncio.sleep(5), the code will sleep or halt at that point for 5 seconds and, once done, will print the message. import asyncio print('Code Execution Started') async def display(): await asyncio.sleep(5) print('Welcome to Guru99 Tutorials') asyncio.run(display()) Output: Code Execution Started Welcome to Guru99 Tutorials Using Event().waitThe Event().wait method comes from the threading module. Event.wait() method will halt the execution of any process for the number of seconds it takes as an argument. The working of Event is shown in the example below:Example: The code is using Event().wait(5).The number 5 is the number of seconds the code will delay to go to the next line that calls the function display(). Once the 5 seconds are done, the function display() will be called, and the message will be printed inside in the terminal. from threading import Event print('Code Execution Started') def display(): print('Welcome to Guru99 Tutorials') Event().wait(5) display() Output: Code Execution Started Welcome to Guru99 Tutorials Using Timer The Timer is another method available with Threading, and it helps to get the same functionality as Python time sleep. The working of the Timer is shown in the example below: Example: A Timer takes in input as the delay time in Python in seconds, along with a task that needs to be started. To make a timer working, you need to call the start() method. In the code, the Timer is given 5 seconds, and the function display that has to be called when 5 seconds are done. The timer will start working when the Timer.start() method is called. from threading import Timer print('Code Execution Started') def display(): print('Welcome to Guru99 Tutorials') t = Timer(5, display) t.start() Output: Code Execution Started Welcome to Guru99 Tutorials Summary:Python sleep() function will pause Python code or delay the execution of program for the number of seconds given as input to sleep(). The sleep() function is part of the Python time module.You can make use of Python sleep function when you want to temporarily halt the execution of your code. For example, in case you are waiting for another process to complete, or a file upload, etc.There are many ways to add Python delay function to code besides sleep, and they are using asyncio.sleep , Event().wait and Timer.Similar to sleep() method, there is asyncio.sleep() method with python version 3.4 and higher. To make use of the asyncio sleep method, you need to add async and await to the functionThe Event().wait method comes from the threading module. Event.wait() method will halt the execution of any process for the number of seconds it takes as an argument.The Timer is another method available with Threading, and it helps to get the same functionality as sleepPage 4Python has a built-in function called type() that helps you find the class type of the variable given as input. For example, if the input is a string, you will get the output as , for the list, it will be , etc. Using type() command, you can pass a single argument, and the return value will be the class type of the argument given, example: type(object). It is also possible to pass three arguments to type(), i.e., type(name, bases, dict), in such case, it will return you a new type object. In this tutorial, you will learn: Syntax for type():type() can be used in two ways as shown below: type(object) type(namr, bases, dict) Parameters: type(object) object: This is a mandatory parameter. If this is only parameter passed to type(), than it will return you the type of the parameter.Parameters: type(name, bases, dict) name:name of the class.bases: (optional). This is an optional parameter, and it is the base class dict: (optional). This is an optional parameter, and it is a namespace that has the definition of the class.Return Value:If the object is the only parameter passed to type() then it will return you the type of the object. If the params passed to type is a type(object, bases, dict), in such case, it will return a new type of object. Example of type()In this, example we have a string value, number , float value, a complex number, list, tuple , dict and set. We will use the variables with type to see the output for each of them. str_list = "Welcome to Guru99" age = 50 pi = 3.14 c_num = 3j+10 my_list = ["A", "B", "C", "D"] my_tuple = ("A", "B", "C", "D") my_dict = {"A":"a", "B":"b", "C":"c", "D":"d"} my_set = {'A', 'B', 'C', 'D'} print("The type is : ",type(str_list)) print("The type is : ",type(age)) print("The type is : ",type(pi)) print("The type is : ",type(c_num)) print("The type is : ",type(my_list)) print("The type is : ",type(my_tuple)) print("The type is : ",type(my_dict)) print("The type is : ",type(my_set)) Output: The type is : The type is : The type is : The type is : The type is : The type is : The type is : The type is : Example: Using type() for class object.When you check the object created from a class using type(), it returns the class type along with the name of the class. In this example, we will create a class and check the object type created from the class test. class test: s = 'testing' t = test() print(type(t)) Output: Example: Using the name, bases, and dict in type()The type can be also called using the syntax: type(name, bases, dict). The three parameters passed to type()i.e., name, bases and dict are the components that make up a class definition. The name represents the class name, the bases is the base class, and dict is the dictionary of base class attributes. In this example, we are going to make use of all three params i.e name, bases, and dict in type(). Example: class MyClass: x = 'Hello World' y = 50 t1 = type('NewClass', (MyClass,), dict(x='Hello World', y=50)) print(type(t1)) print(vars(t1)) Output: {'x': 'Hello World', 'y': 50, '__module__': '__main__', '__doc__': None} When you pass all three arguments to type() , it helps you to initialize new class with base class attributes. What is isinstance() in Python?Python isinstance is part of python built-in functions. Python isinstance() takes in two arguments, and it returns true if the first argument is an instance of the classinfo given as the second argument. Syntax isinstance() isinstance(object, classtype) Parametersobject: An object whose instance you are comparing with classtype. It will return true if the type matches otherwise false.class type: A type or a class or a tuple of types and/or classes.Return value:It will return true if the object is an instance of classtype and false if not. Examples of isinstance()In this section, we will study various examples to learn isinstance() Example : isinstance() Integer checkThe code below compares integer value 51 with type int. It will return true it the type of 51 matches with int otherwise false. age = isinstance(51,int) print("age is an integer:", age) Output: age is an integer: True Example : isinstance() Float checkIn this example we are going to compare the float value with type float i.e. 3.14 value will be compare with type float. pi = isinstance(3.14,float) print("pi is a float:", pi) Output: pi is a float: True Example: isinstance() String check message = isinstance("Hello World",str) print("message is a string:", message) Output: message is a string: True Example : isinstance() Tuple checkThe code checks for a tuple (1,2,3,4,5) with type tuple. It will return true if the input given is of type tuple and false if not. my_tuple = isinstance((1,2,3,4,5),tuple) print("my_tuple is a tuple:", my_tuple) Output: my_tuple is a tuple: True Example : isinstance() Set checkThe code checks for a set ({1,2,3,4,5},with type set. It will return true if the input given is of type set and false if not. my_set = isinstance({1,2,3,4,5},set) print("my_set is a set:", my_set) Output: my_set is a set: True Example: isinstance() list checkThe code checks for a list [1,2,3,4,5],with type list. It will return true if the input given is of type list and false if not. my_list = isinstance([1,2,3,4,5],list) print("my_list is a list:", my_list) Output: my_list is a list: True Example: isinstance() dict checkThe code checks for a dict({"A":"a", "B":"b", "C":"c", "D":"d"},with type dict. It will return true if the input given is of type dict and false if not. my_dict = isinstance({"A":"a", "B":"b", "C":"c", "D":"d"},dict) print("my_dict is a dict:", my_dict) Output: my_dict is a dict: True Example: isinstance() test on a classThe code shows the type check of class with isinstance() . The object of the class is compared with the name of the class inside isinstance(). It returns true if the object belongs to the class and false otherwise. class MyClass: _message = "Hello World" _class = MyClass() print("_class is a instance of MyClass() : ", isinstance(_class,MyClass)) Output: _class is a instance of MyClass() True Difference Between type() and isinstance() in Pythontype() isinstance() Python has a built-in function called type() that helps you find the class type of the variable given as input. Python has a built-in function called isinstance() that compares the value with the type given. If the value and type given matches it will return true otherwise false. The return value is a type object The return value is a Boolean i.e true or false. class A: my_listA = [1,2,3] class B(A): my_listB = [1,2,3] print(type(A()) == A) print(type(B()) == A) Output: True False In case of type the subclass check gives back false. class A: my_listA = [1,2,3] class B(A): my_listB = [1,2,3] print(isinstance(A(), A)) print(isinstance(B(), A)) Output: True True isinstance() gives a truthy value when checked with a subclass. Summary:Python has a built-in function called type() that helps you find the class type of the variable given as input. For example, if the input is a string, you will get the output as , for the list, it will be , etc. For type(), you can pass a single argument, and the return value will be the class type of the argument given, e.g., type(object). It is also possible to pass three arguments to type(), i.e., type(name, bases, dict), in such case, it will return you a new type object. Python has a built-in function called instance() that compares the value with the type given. It the value and type given matches it will return true otherwise false. Using isinstance(), you can test for string, float, int, list, tuple, dict, set, class, etc. Using isinstance() method, you can test for string, float, int, list, tuple, dict, set, class, etc.

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