1.2 Sets

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A set, in mathematics, is defined as a collection of distinct objects. Set is one of 4 built-in data types in Python used to store collections of data. Sets are used to store multiple items in a single variable. A set is a collection that is unordered, iterable, mutable*, unindexed, and duplicate elements are not allowed. The elements in a set are heterogeneous and therefore need not be of the same data type.

* Note: Set elements are unique and Immutable, but a set is mutable.

When to use sets?

▪When the order of the elements does not matter.
▪When you need to have a collection of unique elements.

Creating sets in python

A set is created by placing all the items (elements) inside curly braces {}, separated by commas, or by using the built-in set() function.

Example:

Empty curly braces {} will make an empty dictionary** in Python. To make a set without any elements, we use the set() function without any argument.

**Dictionary is also a built-in data structure in python. It will be covered in the next lesson.

Example:

Set Operations

Finding length using len() function

The cardinality of a set is the number of elements in the set, which can be obtained with built-in function len()

len() function Return the length (the number of items) of an object. The argument may be a sequence (such as a string, bytes, tuple, list, or range) or a collection (such as a dictionary, set, or frozen set).

Accessing elements of a list

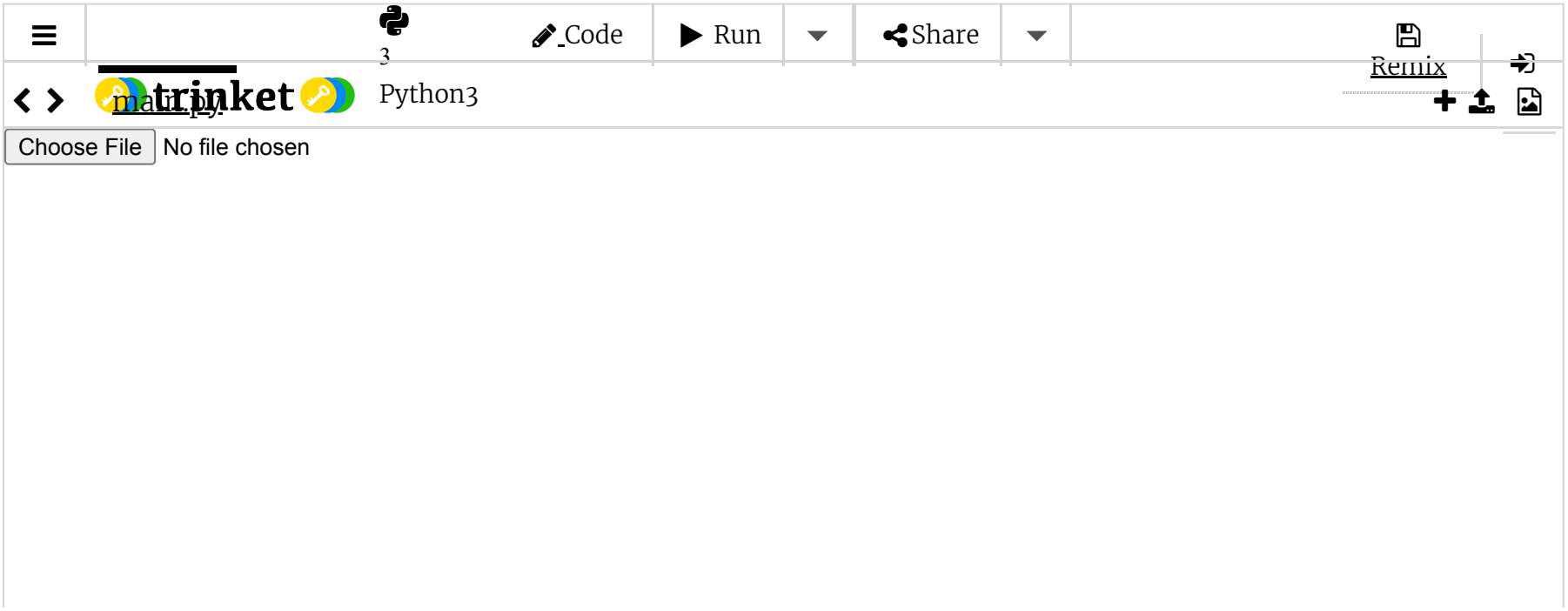
Set items cannot be accessed by referring to an index, since sets are unordered and the items have no index. But you can loop through the set items using a for loop, or ask if a specified value is present in a set, by using the in keyword.

Adding elements to a set

1. Using add() method

Elements can be added to the Set by using built-in add() function. Only one element at a time can be added to the set by using add() method, loops are used to add multiple elements at a time with the use of add() method.

Note – Lists cannot be added to a set as elements because Lists are not hashable whereas Tuples can be added because tuples are immutable and hence Hashable.



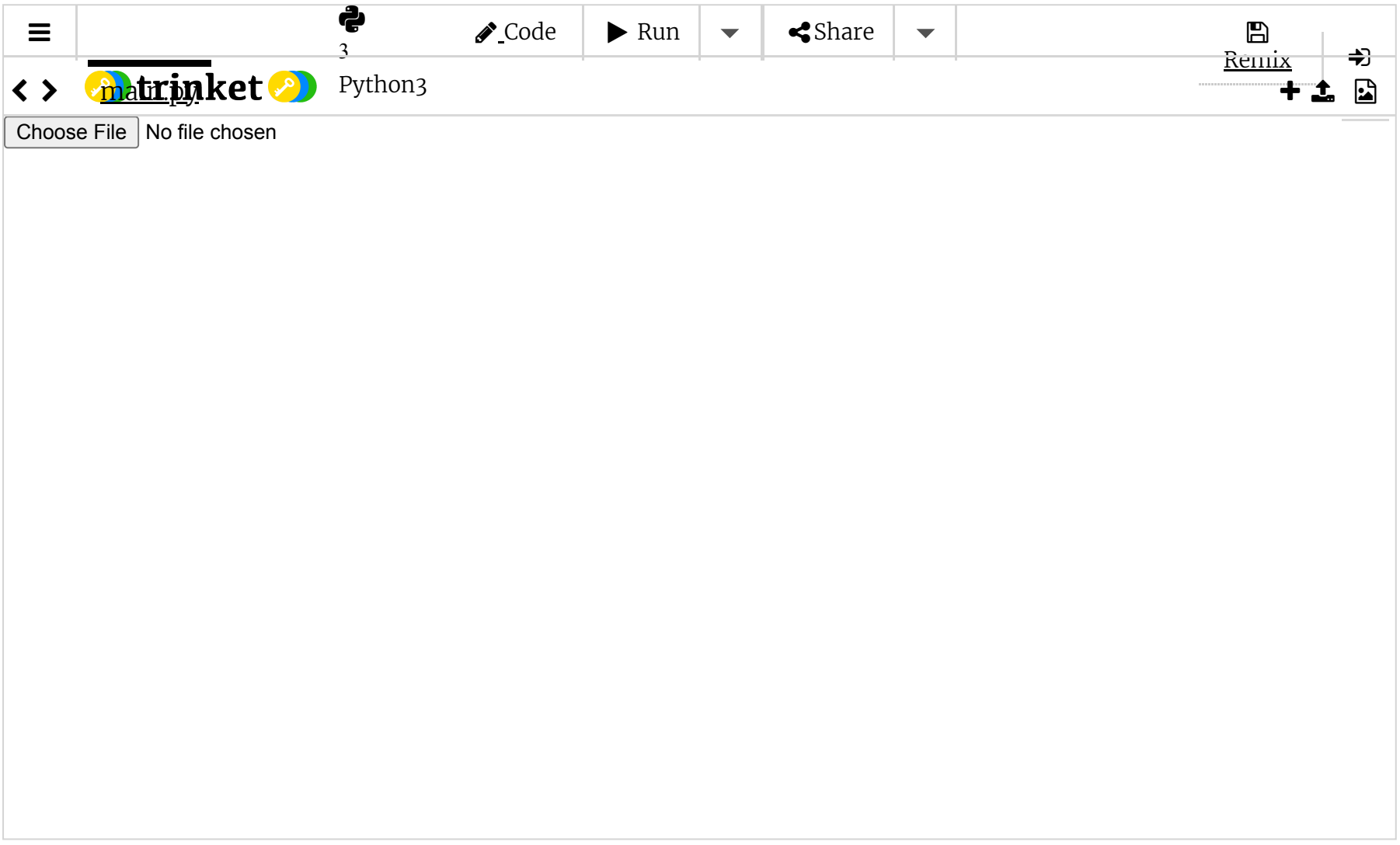
2. Using update() method

For addition of two or more elements the Update() method is used. The update() method accepts lists, strings, tuples as well as other sets as its arguments. In all of these cases, duplicate elements are avoided.

Remove elements from a set

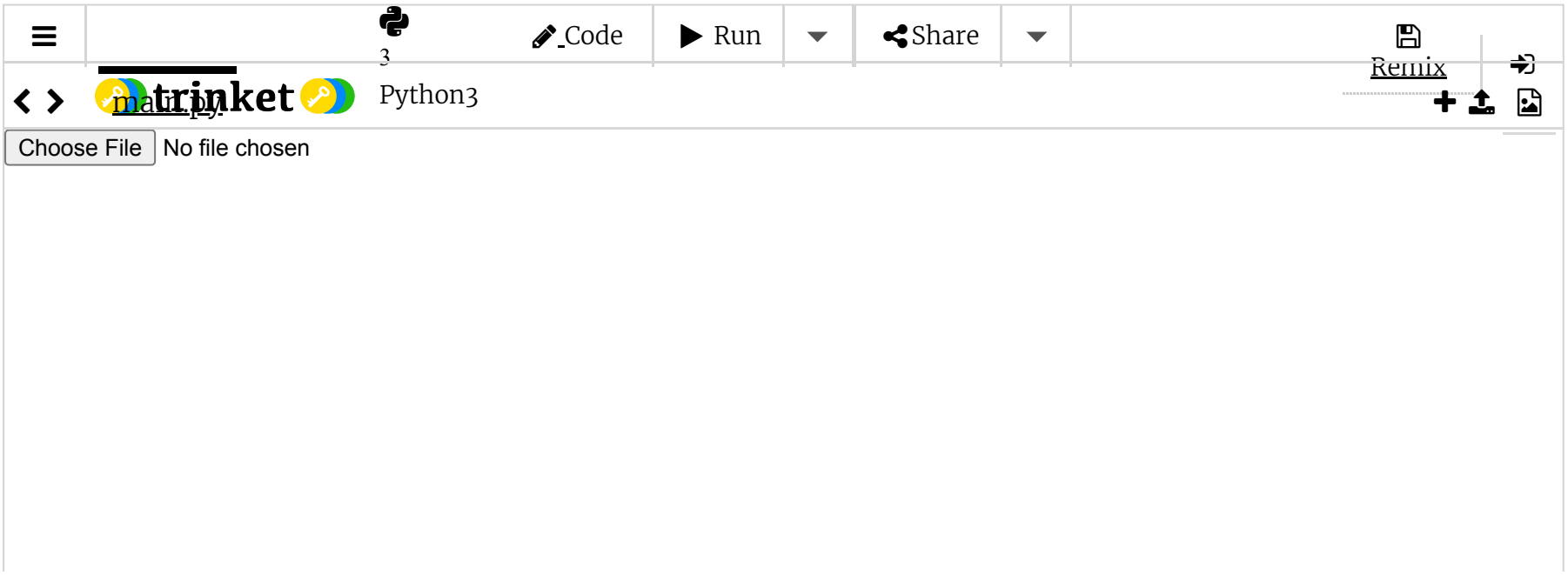
1. Using remove() method or discard() method

Elements can be removed from the Set by using built-in remove() function but a KeyError arises if element doesn't exist in the set. To remove elements from a set without KeyError, use discard(), if the element doesn't exist in the set, it remains unchanged.



2. Using pop() method

Pop() function can also be used to remove and return an element from the set, but it removes only the last element of the set.
Note – If the set is unordered then there's no such way to determine which element is popped by using the pop() function.



Set Union

The union() method returns a set that contains all items from the original set, and all items from the specified set(s). You can specify as many sets you want, separated by commas. It does not have to be a set, it can be any iterable object. If an item is present in more than one set, the result will contain only one appearance of this item.

Furthermore, Python provides you with the set union operator | that allows you to union two sets.

Set Intersection

The intersection() method returns a set that contains the similarity between two or more sets.

Meaning: The returned set contains only items that exist in both sets, or in all sets if the comparison is done with more than two sets.

Python also provides you with the set intersection operator (&) that allows you to intersect two or more sets.

Set Difference

The difference() method returns a set that contains the difference between two sets.

Meaning: The returned set contains items that exist only in the first set, and not in both sets.

You can also find the set difference using - operator in Python.

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Data retention summary