**Python**

Use two asterisks and a question mark like np.\*load\*? To get an overview of all functions that contain that word:

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If you have a = [1, 2, 3] and then write b = a, then you are not *copying* a to b, but *creating a second reference* to [1, 2, 3]. Like here:

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Use isinstance(a, int) to check whether an object is of a specific object type:  
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Use iter() to check whether an object is iterable (e.g. you can perform a loop on it):

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**Importing parts of a module**

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**Binary operations**

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**Note that == is not the same as is**

Take a = 2, b = a, and c = list(a). Both a == b and a == c will return True, because all of the objects are equal to value 2. But only a is b will return True, because b refers to a and is not a *separate copy* like c. The list() function always creates a separate copy (a new list).

**Python scalar types (data types)**

A screenshot of a computer

Description automatically generated None, str, bytes, float, bool, int

**Working with dates**

Use from datetime to import types like datetime, date or time.

Use datetime() to create a date with time:

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Use date() to return date and time() to return time:

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The strftime method formats a datetime as a string:

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**Replace parts of dates with 0, e.g. minutes and/or seconds:**

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**for loops with continue and break**

Use continue to continue the iteration (skip the value)

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To stop the iteration use break:

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The break keyword only terminates the innermost for loop; any outer for loops will continue to run:

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A while loop:

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Use pass in a loop in blocks where no action is to be taken:

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**Built-In Data Structures, Functions, and Files**

Tuple, list, and dictionary are some of the most frequently used sequence types.

**Tuples**

If you have a tuple like values = 1, 2, 3, 4, 5 and want to assign only the first two values a name and other values are not important you can make use of \*rest or \*\_. Name after asterisk can be rest or \_ or anything else.

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Count the number of occurrences in a tuple using a.count():

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**Lists**

The list() function can be used to materialize an iterator or a generator:

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**List concatenation** can be done using + or .extend(). Using .extend() is preferable due to computational efficiency.

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**Slicing in Python example:**

A diagram of numbers and letters

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Use [::2] to select every second value or [::-1] to inverse a list:

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**Dictionary**

Use .pop to delete a value in a dictionary and return it as a variable:

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Use functions .keys(), .values(), and .items() to iterate (or select) over keys, values, and both keys & values in a dictionary:

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Update a dictionary using .update():

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Iterating over a dictionary (create a dictionary from two lists):

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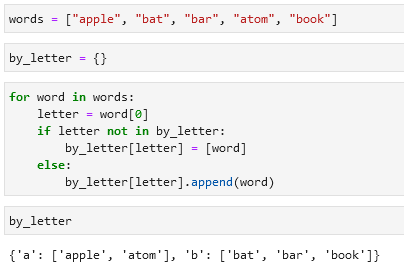
Create a dictionary from a dict():

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**To sort a list of values by e.g. its first letter:**

Option 1: Option 2 (preferred):

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Or option 3 (preferred):

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**Valid keys and values in dictionaries**

* Values can be any Python object.
* Keys have to be immutable objects like scalar types (int, float, string) or tuples (all the objects in the tuple need to be immutable).

To check whether a value can be used as a key use hash() (check for hashability):

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**Set**

A set is an unordered collection of unique elements.

Two ways to create a set:

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Set operations:

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A screenshot of a chat

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**Sequence functions**

**Enumerate**

A close up of words

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**zip**

zip “pairs” up the elements of a number of lists, tuples, or other sequences to create a list of tuples:

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The number of elements it produces is determined by the shortest sequence:

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A common use of zip() is simultaneously iterating over multiple sequences:

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**reversed**

Iterates over the elements of a sequence in reverse order:

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**List, Set, and Dictionary Comprehensions**



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**Example of a list comprehension:**

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**Dictionary comprehension:**

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**Set comprehension:**



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Alternative to set comprehension is the map() function:

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**Dictionary comprehension:**

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**Nested list comprehension:**

Example 1:

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Example 2:

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**Functions**

Example of a function:

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**Cleaning text in a list:**

re, .strip(), .sub(), .title()

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**Lambda functions**

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**Generators**

Generator example:

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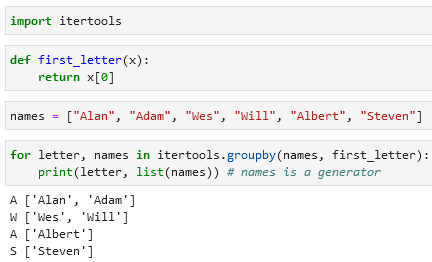
**Generator expressions**

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**intertools module**

Example with a intertools.groupby() function:



Some useful functions from the itertools module:

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chain(\*iterables), combinations(iterable, k), permutations(iterable, k), groupby(iterable[,keyfunc]), product(\*iterables, repeat = 1)

**Files and the operating system**

Open a file:

A close-up of a computer code

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Two possibilities to close a file:

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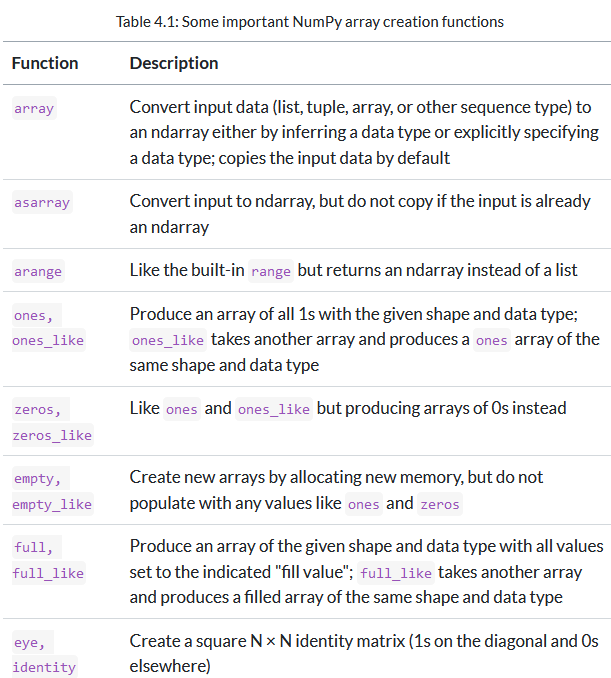
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**Numpy**

Functions for creating an NumPy array:



np.array, np.asarray, np.arange, np.ones, np.ones\_like, np.zeros, np.zeros\_like, np.empty, np.empty\_like, np.full, np.full\_like, np.eye, np.identity

If not specified, the data type will be float64 (in many cases).

**NumPy slicing**

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**Boolean indexing**

Imagine every value in the *names* array is a representative of the *data* array. So value in *names* with *index 0* is a value in *data* with *index 0* and so on. If we want to select all of the values in *data* that correspond to *“Bob”* in *names* you can do it this way:

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Note that both arrays should be of the same lengths (e.g. in this example both arrays have 7 values).

If you want to select everything but except a specific value you can use != or ~():

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To select AND / OR use & for AND and | for OR:

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**Fancy indexing**

To select specific rows in a particular order use a list:

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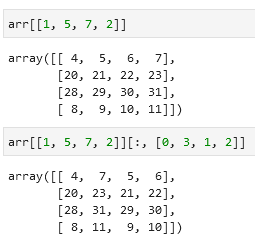
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Using two lists for index will return values that are found using these “coordinates”. In the example below 4 is returned after coordinate 1, 0 and 23 is returned after coordinate 5 and 3 etc.

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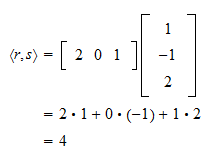
Another example:



**Transposing arrays**

Calculating inner matrix product using np.dot():

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@ is an alternative to np.dot():

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Also an option df.swapaxes(0, 1):

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**Pseudorandom number generation**

Use the np.random.standard\_normal() function and module (random) to generate pseudorandom numbers:

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**Universal functions**

Use np.modf(df) to return the fraction and the number separately:

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**Conditional logic as array operations**

You can make a loop to select values from *xarr* when a value is True in *cond* and select values from *yarr* when it is False. A more efficient alternative is the np.where(condition, df1, df2) function:

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Or you can replace all positive values with a certain number (in the example below with 2) and all negative values with a different number (below -2):

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**Basic array statistical methods**

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sum, mean, std, var, min, max, argmin, argmax, cumsum, cumprod

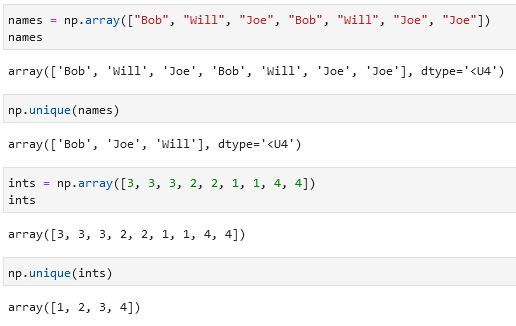
Examples like cumsum():

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**Unique and other set logic**

Remove duplicates and sort them using np.unique(df):



Python alternative (which is more inefficient):

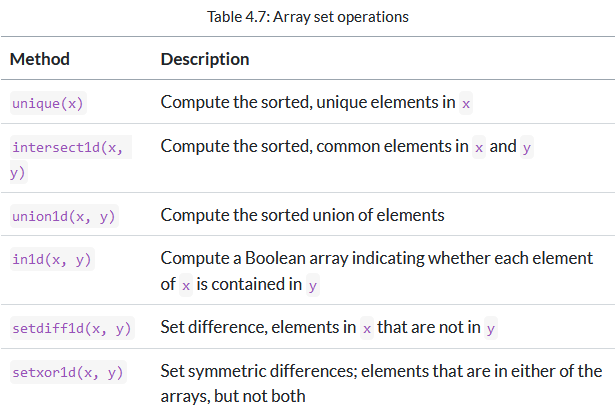
A close-up of a computer screen

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Check whether some values are in an array using np.in1d():

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Unique, intersect1d, union1d, in1d, setdiff1d, setxor1d

**Saving and loading files in NumPy**

Use np.save(), np.load(), np.savez(), np.savez\_compressed() to save and load files.

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Same with comments:

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**Linear algebra functions**

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Diag, dot, trace, det, eig, inv, pinv, qr, svd, solve, lstsq

**Pandas**

Transform a DataFrame into a NumPy array using df.to\_numpy():

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**Some index methods and properties**

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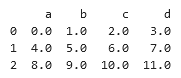
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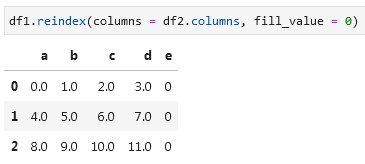
**The .reindex() function will perform a join of values present in your Series based on the current and the new indexes:**

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Example with fill\_value:

df1:  A screenshot of a table

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**Create a DataFrame using np.arange() and .reshape():**

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**The .reindex() function arguments:**

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**If you want to change the position of index/columns of a DataFrame you can use df.loc:**

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**Difference between df.loc and df.iloc:** df.iloc selects on the index *(0, 1, 2, 3 etc.)* while df.loc selects numerical values in the index like *1, 3, 2* will look for rows with these indexes:

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**Indexing with DataFrame**

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**Adding two DataFrames**

Use df1.add(df2, fill\_value = 0) to add one DataFrame to the second:

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**Flexible arithmetic methods between two DataFrames:**

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**Function application and mapping**

Apply format to a DataFrame using frame.applymap():

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**Sorting and ranking**

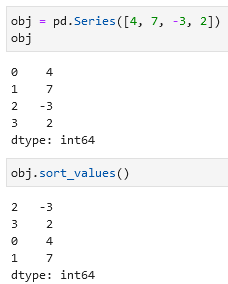
To sort an index use df.sort\_index():

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To sort a Series by its values use obj.sort\_values():



To sort a DataFrame pass a column name(s) which should be used to sort:

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**Tie-breaking methods with rank:**

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**Summarizing and computing descriptive statistics**

Options for reduction methods:

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Return the index of the maximum/minimum value using df.indxmax() or df.indxmin():

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Cumulative sum by rows using df.cumsum():

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A screenshot of a math test

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**A full list of summary statistics and related methods:**

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**Unique values, value counts, and membership methods**

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**Data loading, storage, and file formats**

Text and binary data loading functions in pandas:

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Import a csv using pd.read\_csv() with different settings:

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Some pd.read\_csv() function arguments:

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**Reading Excel files**

Use pd.read\_excel() or pd.ExcelFile() to open (read) Excel files:



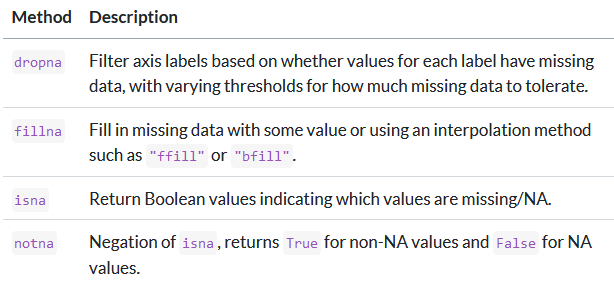
**Reading SQL**

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**Data cleaning and preparation**

**Handling missing data**

dropna, fillna, isna, notna

Examples with df.fillna():

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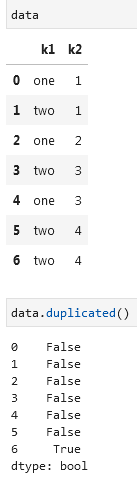
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Function arguments of df.fillna():

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Removing duplicates using df.duplicated() and df.drop\_duplicates():

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**Perform a LEFT JOIN on a column (add a column, merge two tables) using .map():**

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**Replace values using df.replace():**

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**Renaming axis indexes**

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**Binning, grouping, categorization**

You can bin using pd.cut(df, bins) and then get a GROUP BY using df.value\_counts():

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pd.qcut(df, bin).value\_counts():

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**Working with outliers**

If you want to get values that are more than a certain positive number and less than a certain negative number you can use .abs() > 3:

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**To select all rows having a value exceeding 3 or –3, you can use the any method:**

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Replace all values above 3 and below -3 with a 3/-3:

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Example of np.sign() (it returns 1 for positive values, -1 for negative, and 0 for 0):

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**To randomly reorder columns/rows in a DataFrame use np.random.permutation():**

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Permutation of columns:

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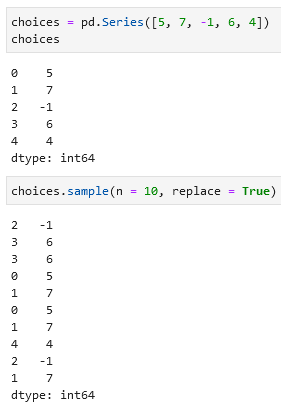
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Select a certain number of random rows using df.sample(n = ):

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If you want to select more random rows than there are in a Series/DataFrame, you can add replace = True, it will allow returning duplicate rows:



**Computing indicator/dummy variables**

You have a column named *City* with 3 variables: *London, Paris, Berlin.* You can unpivot this column into columns like *London?, Paris?, Berlin?* where in each column a 0 will mean *No* and 1 will mean *Yes.* To do so use pd.get\_dummies(df[“column\_name”]):

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Merge these column back with the rest of the table:

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Unpivoting using str.get\_dummies():

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Combining pd.get\_dummies() and pd.cut():

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**String manipulation (text manipulation/edition)**

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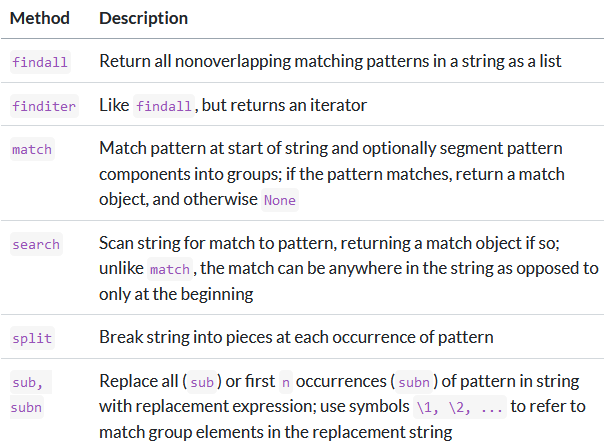
Some examples with .split(), .index(), .find(), .count(), .replace():

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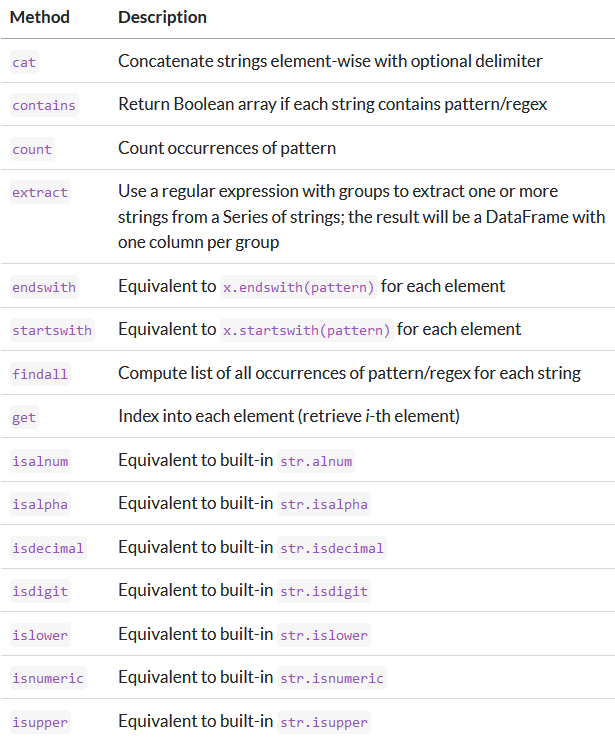
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**Regular expressions (regexs) methods**



**String functions in pandas**



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**Categorical methods (save memory and computation time)**

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**Data wrangling: JOIN, combine, and reshape**

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To index this Series:

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You can also unpivot a table using df.unstack() or pivot a table using df.stack():

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Hierarchical indexing for DataFrames:

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Check how many levels does an index have with df.index.nlevels:



Creating a MultiIndex:

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To rearrange an index use df.swaplevel(index1, index2):

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To sort an index use df.sort\_index() (with df.sort\_index() or df.sort\_index(level = 0) performance is much better):

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Take a column/two columns and create an index out of them using df.set\_index(column1, column2). Columns will be removed from the DataFrame, but you can keep them by adding drop = False:

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To move the hierarchical index levels into the columns use df.reset\_index():

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**Combining and merging datasets**

Merge two DataFrames using df.merge(df1, df2, on = “column\_name”):

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Perform an inner-join:

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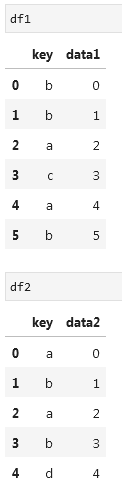
Perform a full-join / outer join:

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Example of a left-join:

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Types of joins in the how = argument:

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Join on two columns:

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When you're joining columns on columns, the indexes on the passed DataFrame objects are discarded. If you need to preserve the index values, you can use reset\_index to append the index to the columns.

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df.merge() function arguments:

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