### pandas.DataFrame.rdiv

DataFrame.**rdiv**(*self*, *other*, *axis='columns'*, *level=None*, *fill_value=None*)

Get Floating division of dataframe and other, element-wise (binary operator *rtruediv*).

Equivalent to `other / dataframe`, but with support to substitute a fill_value for missing data in one of the inputs. With reverse version, *truediv*.

Among flexible wrappers (*add*, *sub*, *mul*, *div*, *mod*, *pow*) to arithmetic operators: +, -, *, /, //, %, **.

**Parameters**

**other** [scalar, sequence, Series, or DataFrame] Any single or multiple element data structure, or list-like object.

**axis** [{0 or 'index', 1 or 'columns'}] Whether to compare by the index (0 or 'index') or columns (1 or 'columns'). For Series input, axis to match Series index on.

**level** [int or label] Broadcast across a level, matching Index values on the passed MultiIndex level.

**fill_value** [float or None, default None] Fill existing missing (NaN) values, and any new element needed for successful DataFrame alignment, with this value before computation. If data in both corresponding DataFrame locations is missing the result will be missing.

**Returns**

**DataFrame** Result of the arithmetic operation.

**See also:**

***DataFrame.add*** Add DataFrames.

***DataFrame.sub*** Subtract DataFrames.

***DataFrame.mul*** Multiply DataFrames.

***DataFrame.div*** Divide DataFrames (float division).

***DataFrame.truediv*** Divide DataFrames (float division).

***DataFrame.floordiv*** Divide DataFrames (integer division).

***DataFrame.mod*** Calculate modulo (remainder after division).

***DataFrame.pow*** Calculate exponential power.

#### Notes

Mismatched indices will be unioned together.

### Examples

```
>>> df = pd.DataFrame({'angles': [0, 3, 4],
...                    'degrees': [360, 180, 360]},
...                   index=['circle', 'triangle', 'rectangle'])
>>> df
           angles  degrees
circle          0      360
triangle        3      180
rectangle       4      360
```

Add a scalar with operator version which return the same results.

```
>>> df + 1
           angles  degrees
circle          1      361
triangle        4      181
rectangle       5      361
```

```
>>> df.add(1)
           angles  degrees
circle          1      361
triangle        4      181
rectangle       5      361
```

Divide by constant with reverse version.

```
>>> df.div(10)
           angles  degrees
circle        0.0     36.0
triangle      0.3     18.0
rectangle     0.4     36.0
```

```
>>> df.rdiv(10)
             angles   degrees
circle          inf  0.027778
triangle   3.333333  0.055556
rectangle  2.500000  0.027778
```

Subtract a list and Series by axis with operator version.

```
>>> df - [1, 2]
           angles  degrees
circle         -1      358
triangle        2      178
rectangle       3      358
```

```
>>> df.sub([1, 2], axis='columns')
           angles  degrees
circle         -1      358
triangle        2      178
rectangle       3      358
```

```
>>> df.sub(pd.Series([1, 1, 1], index=['circle', 'triangle', 'rectangle']),
...        axis='index')
           angles  degrees
```

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```
circle         -1      359
triangle        2      179
rectangle       3      359
```

Multiply a DataFrame of different shape with operator version.

```
>>> other = pd.DataFrame({'angles': [0, 3, 4]},
...                      index=['circle', 'triangle', 'rectangle'])
>>> other
           angles
circle          0
triangle        3
rectangle       4
```

```
>>> df * other
           angles  degrees
circle          0      NaN
triangle        9      NaN
rectangle      16      NaN
```

```
>>> df.mul(other, fill_value=0)
           angles  degrees
circle          0      0.0
triangle        9      0.0
rectangle      16      0.0
```

Divide by a MultiIndex by level.

```
>>> df_multindex = pd.DataFrame({'angles': [0, 3, 4, 4, 5, 6],
...                              'degrees': [360, 180, 360, 360, 540, 720]},
...                             index=[['A', 'A', 'A', 'B', 'B', 'B'],
...                                    ['circle', 'triangle', 'rectangle',
...                                     'square', 'pentagon', 'hexagon']])
>>> df_multindex
             angles  degrees
A circle          0      360
  triangle        3      180
  rectangle       4      360
B square          4      360
  pentagon        5      540
  hexagon         6      720
```

```
>>> df.div(df_multindex, level=1, fill_value=0)
             angles  degrees
A circle        NaN      1.0
  triangle      1.0      1.0
  rectangle     1.0      1.0
B square        0.0      0.0
  pentagon      0.0      0.0
  hexagon       0.0      0.0
```

### pandas.DataFrame.reindex

DataFrame.**reindex**(*self*, *labels=None*, *index=None*, *columns=None*, *axis=None*, *method=None*, *copy=True*, *level=None*, *fill_value=nan*, *limit=None*, *tolerance=None*)

Conform DataFrame to new index with optional filling logic.

Places NA/NaN in locations having no value in the previous index. A new object is produced unless the new index is equivalent to the current one and `copy=False`.

**Parameters**

**labels** [array-like, optional] New labels / index to conform the axis specified by 'axis' to.

**index, columns** [array-like, optional] New labels / index to conform to, should be specified using keywords. Preferably an Index object to avoid duplicating data.

**axis** [int or str, optional] Axis to target. Can be either the axis name ('index', 'columns') or number (0, 1).

**method** [{None, 'backfill'/'bfill', 'pad'/'ffill', 'nearest'}] Method to use for filling holes in reindexed DataFrame. Please note: this is only applicable to DataFrames/Series with a monotonically increasing/decreasing index.

- None (default): don't fill gaps
- pad / ffill: Propagate last valid observation forward to next valid.
- backfill / bfill: Use next valid observation to fill gap.
- nearest: Use nearest valid observations to fill gap.

**copy** [bool, default True] Return a new object, even if the passed indexes are the same.

**level** [int or name] Broadcast across a level, matching Index values on the passed MultiIndex level.

**fill_value** [scalar, default np.NaN] Value to use for missing values. Defaults to NaN, but can be any "compatible" value.

**limit** [int, default None] Maximum number of consecutive elements to forward or backward fill.

**tolerance** [optional] Maximum distance between original and new labels for inexact matches. The values of the index at the matching locations most satisfy the equation `abs(index[indexer] - target) <= tolerance`.

Tolerance may be a scalar value, which applies the same tolerance to all values, or list-like, which applies variable tolerance per element. List-like includes list, tuple, array, Series, and must be the same size as the index and its dtype must exactly match the index's type.

New in version 0.21.0: (list-like tolerance)

**Returns**

**DataFrame with changed index.**

**See also:**

***DataFrame.set_index*** Set row labels.

***DataFrame.reset_index*** Remove row labels or move them to new columns.

***DataFrame.reindex_like*** Change to same indices as other DataFrame.

### Examples

`DataFrame.reindex` supports two calling conventions

- `(index=index_labels, columns=column_labels, ...)`
- `(labels, axis={'index', 'columns'}, ...)`

We *highly* recommend using keyword arguments to clarify your intent.

Create a dataframe with some fictional data.

```
>>> index = ['Firefox', 'Chrome', 'Safari', 'IE10', 'Konqueror']
>>> df = pd.DataFrame({'http_status': [200, 200, 404, 404, 301],
...                    'response_time': [0.04, 0.02, 0.07, 0.08, 1.0]},
...                    index=index)
>>> df
           http_status  response_time
Firefox            200           0.04
Chrome             200           0.02
Safari             404           0.07
IE10               404           0.08
Konqueror          301           1.00
```

Create a new index and reindex the dataframe. By default values in the new index that do not have corresponding records in the dataframe are assigned `NaN`.

```
>>> new_index = ['Safari', 'Iceweasel', 'Comodo Dragon', 'IE10',
...              'Chrome']
>>> df.reindex(new_index)
               http_status  response_time
Safari               404.0           0.07
Iceweasel              NaN            NaN
Comodo Dragon          NaN            NaN
IE10                 404.0           0.08
Chrome               200.0           0.02
```

We can fill in the missing values by passing a value to the keyword `fill_value`. Because the index is not monotonically increasing or decreasing, we cannot use arguments to the keyword `method` to fill the `NaN` values.

```
>>> df.reindex(new_index, fill_value=0)
               http_status  response_time
Safari                 404           0.07
Iceweasel                0           0.00
Comodo Dragon            0           0.00
IE10                   404           0.08
Chrome                 200           0.02
```

```
>>> df.reindex(new_index, fill_value='missing')
              http_status response_time
Safari                404          0.07
Iceweasel         missing       missing
Comodo Dragon     missing       missing
IE10                  404          0.08
Chrome                200          0.02
```

We can also reindex the columns.

```
>>> df.reindex(columns=['http_status', 'user_agent'])
           http_status  user_agent
Firefox            200         NaN
Chrome             200         NaN
Safari             404         NaN
IE10               404         NaN
Konqueror          301         NaN
```

Or we can use "axis-style" keyword arguments

```
>>> df.reindex(['http_status', 'user_agent'], axis="columns")
           http_status  user_agent
Firefox            200         NaN
Chrome             200         NaN
Safari             404         NaN
IE10               404         NaN
Konqueror          301         NaN
```

To further illustrate the filling functionality in `reindex`, we will create a dataframe with a monotonically increasing index (for example, a sequence of dates).

```
>>> date_index = pd.date_range('1/1/2010', periods=6, freq='D')
>>> df2 = pd.DataFrame({"prices": [100, 101, np.nan, 100, 89, 88]},
...                    index=date_index)
>>> df2
            prices
2010-01-01   100.0
2010-01-02   101.0
2010-01-03     NaN
2010-01-04   100.0
2010-01-05    89.0
2010-01-06    88.0
```

Suppose we decide to expand the dataframe to cover a wider date range.

```
>>> date_index2 = pd.date_range('12/29/2009', periods=10, freq='D')
>>> df2.reindex(date_index2)
            prices
2009-12-29     NaN
2009-12-30     NaN
2009-12-31     NaN
2010-01-01   100.0
2010-01-02   101.0
2010-01-03     NaN
2010-01-04   100.0
2010-01-05    89.0
2010-01-06    88.0
2010-01-07     NaN
```

The index entries that did not have a value in the original data frame (for example, '2009-12-29') are by default filled with `NaN`. If desired, we can fill in the missing values using one of several options.

For example, to back-propagate the last valid value to fill the `NaN` values, pass `bfill` as an argument to the `method` keyword.

```
>>> df2.reindex(date_index2, method='bfill')
            prices
```

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```
2009-12-29   100.0
2009-12-30   100.0
2009-12-31   100.0
2010-01-01   100.0
2010-01-02   101.0
2010-01-03     NaN
2010-01-04   100.0
2010-01-05    89.0
2010-01-06    88.0
2010-01-07     NaN
```

Please note that the `NaN` value present in the original dataframe (at index value 2010-01-03) will not be filled by any of the value propagation schemes. This is because filling while reindexing does not look at dataframe values, but only compares the original and desired indexes. If you do want to fill in the `NaN` values present in the original dataframe, use the `fillna()` method.

See the *user guide* for more.

### pandas.DataFrame.reindex_like

`DataFrame.`**`reindex_like`**(*self: ~ FrameOrSeries*, *other*, *method: Union[str, NoneType] = None*, *copy: bool = True*, *limit=None*, *tolerance=None*) → ~FrameOrSeries

Return an object with matching indices as other object.

Conform the object to the same index on all axes. Optional filling logic, placing NaN in locations having no value in the previous index. A new object is produced unless the new index is equivalent to the current one and copy=False.

**Parameters**

**other** [Object of the same data type] Its row and column indices are used to define the new indices of this object.

**method** [{None, 'backfill'/'bfill', 'pad'/'ffill', 'nearest'}] Method to use for filling holes in reindexed DataFrame. Please note: this is only applicable to DataFrames/Series with a monotonically increasing/decreasing index.

- None (default): don't fill gaps
- pad / ffill: propagate last valid observation forward to next valid
- backfill / bfill: use next valid observation to fill gap
- nearest: use nearest valid observations to fill gap.

**copy** [bool, default True] Return a new object, even if the passed indexes are the same.

**limit** [int, default None] Maximum number of consecutive labels to fill for inexact matches.

**tolerance** [optional] Maximum distance between original and new labels for inexact matches. The values of the index at the matching locations most satisfy the equation `abs(index[indexer] - target) <= tolerance`.

Tolerance may be a scalar value, which applies the same tolerance to all values, or list-like, which applies variable tolerance per element. List-like includes list, tuple, array, Series, and must be the same size as the index and its dtype must exactly match the index's type.

New in version 0.21.0: (list-like tolerance)

**Returns**

**Series or DataFrame** Same type as caller, but with changed indices on each axis.

**See also:**

***DataFrame.set_index*** Set row labels.

***DataFrame.reset_index*** Remove row labels or move them to new columns.

***DataFrame.reindex*** Change to new indices or expand indices.

## Notes

Same as calling `.reindex(index=other.index, columns=other.columns,...)`.

## Examples

```
>>> df1 = pd.DataFrame([[24.3, 75.7, 'high'],
...                     [31, 87.8, 'high'],
...                     [22, 71.6, 'medium'],
...                     [35, 95, 'medium']],
...                    columns=['temp_celsius', 'temp_fahrenheit',
...                             'windspeed'],
...                    index=pd.date_range(start='2014-02-12',
...                                        end='2014-02-15', freq='D'))
```

```
>>> df1
            temp_celsius  temp_fahrenheit windspeed
2014-02-12          24.3             75.7      high
2014-02-13          31.0             87.8      high
2014-02-14          22.0             71.6    medium
2014-02-15          35.0             95.0    medium
```

```
>>> df2 = pd.DataFrame([[28, 'low'],
...                     [30, 'low'],
...                     [35.1, 'medium']],
...                    columns=['temp_celsius', 'windspeed'],
...                    index=pd.DatetimeIndex(['2014-02-12', '2014-02-13',
...                                            '2014-02-15']))
```

```
>>> df2
            temp_celsius windspeed
2014-02-12          28.0       low
2014-02-13          30.0       low
2014-02-15          35.1    medium
```

```
>>> df2.reindex_like(df1)
            temp_celsius  temp_fahrenheit windspeed
2014-02-12          28.0              NaN       low
2014-02-13          30.0              NaN       low
2014-02-14           NaN              NaN       NaN
2014-02-15          35.1              NaN    medium
```

### pandas.DataFrame.rename

DataFrame.**rename**(*self*, *mapper=None*, *index=None*, *columns=None*, *axis=None*, *copy=True*, *inplace=False*, *level=None*, *errors='ignore'*)

Alter axes labels.

Function / dict values must be unique (1-to-1). Labels not contained in a dict / Series will be left as-is. Extra labels listed don't throw an error.

See the *user guide* for more.

**Parameters**

**mapper** [dict-like or function] Dict-like or functions transformations to apply to that axis' values. Use either `mapper` and `axis` to specify the axis to target with `mapper`, or `index` and `columns`.

**index** [dict-like or function] Alternative to specifying axis (`mapper, axis=0` is equivalent to `index=mapper`).

**columns** [dict-like or function] Alternative to specifying axis (`mapper, axis=1` is equivalent to `columns=mapper`).

**axis** [int or str] Axis to target with `mapper`. Can be either the axis name ('index', 'columns') or number (0, 1). The default is 'index'.

**copy** [bool, default True] Also copy underlying data.

**inplace** [bool, default False] Whether to return a new DataFrame. If True then value of copy is ignored.

**level** [int or level name, default None] In case of a MultiIndex, only rename labels in the specified level.

**errors** [{'ignore', 'raise'}, default 'ignore'] If 'raise', raise a *KeyError* when a dict-like *mapper*, *index*, or *columns* contains labels that are not present in the Index being transformed. If 'ignore', existing keys will be renamed and extra keys will be ignored.

**Returns**

**DataFrame** DataFrame with the renamed axis labels.

**Raises**

**KeyError** If any of the labels is not found in the selected axis and "errors='raise'".

**See also:**

***DataFrame.rename_axis*** Set the name of the axis.

#### Examples

`DataFrame.rename` supports two calling conventions

- `(index=index_mapper, columns=columns_mapper, ...)`
- `(mapper, axis={'index', 'columns'}, ...)`

We *highly* recommend using keyword arguments to clarify your intent.

Rename columns using a mapping:

```
>>> df = pd.DataFrame({"A": [1, 2, 3], "B": [4, 5, 6]})
>>> df.rename(columns={"A": "a", "B": "c"})
   a  c
0  1  4
1  2  5
2  3  6
```

Rename index using a mapping:

```
>>> df.rename(index={0: "x", 1: "y", 2: "z"})
   A  B
x  1  4
y  2  5
z  3  6
```

Cast index labels to a different type:

```
>>> df.index
RangeIndex(start=0, stop=3, step=1)
>>> df.rename(index=str).index
Index(['0', '1', '2'], dtype='object')
```

```
>>> df.rename(columns={"A": "a", "B": "b", "C": "c"}, errors="raise")
Traceback (most recent call last):
KeyError: ['C'] not found in axis
```

Using axis-style parameters

```
>>> df.rename(str.lower, axis='columns')
   a  b
0  1  4
1  2  5
2  3  6
```

```
>>> df.rename({1: 2, 2: 4}, axis='index')
   A  B
0  1  4
2  2  5
4  3  6
```

## pandas.DataFrame.rename_axis

DataFrame.**rename_axis**(*self*, *mapper=None*, *index=None*, *columns=None*, *axis=None*, *copy=True*, *inplace=False*)

Set the name of the axis for the index or columns.

**Parameters**

**mapper** [scalar, list-like, optional] Value to set the axis name attribute.

**index, columns** [scalar, list-like, dict-like or function, optional] A scalar, list-like, dict-like or functions transformations to apply to that axis' values.

Use either `mapper` and `axis` to specify the axis to target with `mapper`, or `index` and/or `columns`.

Changed in version 0.24.0.

**axis** [{0 or 'index', 1 or 'columns'}, default 0] The axis to rename.

**copy** [bool, default True] Also copy underlying data.

**inplace** [bool, default False] Modifies the object directly, instead of creating a new Series or DataFrame.

**Returns**

**Series, DataFrame, or None** The same type as the caller or None if *inplace* is True.

**See also:**

***Series.rename*** Alter Series index labels or name.

***DataFrame.rename*** Alter DataFrame index labels or name.

***Index.rename*** Set new names on index.

## Notes

`DataFrame.rename_axis` supports two calling conventions

- `(index=index_mapper, columns=columns_mapper, ...)`
- `(mapper, axis={'index', 'columns'}, ...)`

The first calling convention will only modify the names of the index and/or the names of the Index object that is the columns. In this case, the parameter `copy` is ignored.

The second calling convention will modify the names of the the corresponding index if mapper is a list or a scalar. However, if mapper is dict-like or a function, it will use the deprecated behavior of modifying the axis *labels*.

We *highly* recommend using keyword arguments to clarify your intent.

## Examples

**Series**

```
>>> s = pd.Series(["dog", "cat", "monkey"])
>>> s
0       dog
1       cat
2    monkey
dtype: object
>>> s.rename_axis("animal")
animal
0    dog
1    cat
2    monkey
dtype: object
```

**DataFrame**

```
>>> df = pd.DataFrame({"num_legs": [4, 4, 2],
...                    "num_arms": [0, 0, 2]},
...                   ["dog", "cat", "monkey"])
>>> df
```

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```
        num_legs  num_arms
dog             4         0
cat             4         0
monkey          2         2
>>> df = df.rename_axis("animal")
>>> df
        num_legs  num_arms
animal
dog             4         0
cat             4         0
monkey          2         2
>>> df = df.rename_axis("limbs", axis="columns")
>>> df
limbs   num_legs  num_arms
animal
dog             4         0
cat             4         0
monkey          2         2
```

**MultiIndex**

```
>>> df.index = pd.MultiIndex.from_product([['mammal'],
...                                        ['dog', 'cat', 'monkey']],
...                                       names=['type', 'name'])
>>> df
limbs          num_legs  num_arms
type   name
mammal dog             4         0
       cat             4         0
       monkey          2         2
```

```
>>> df.rename_axis(index={'type': 'class'})
limbs          num_legs  num_arms
class  name
mammal dog             4         0
       cat             4         0
       monkey          2         2
```

```
>>> df.rename_axis(columns=str.upper)
LIMBS          num_legs  num_arms
type   name
mammal dog             4         0
       cat             4         0
       monkey          2         2
```

### pandas.DataFrame.reorder_levels

DataFrame.**reorder_levels**(*self*, *order*, *axis=0*) → 'DataFrame'

Rearrange index levels using input order. May not drop or duplicate levels.

**Parameters**

**order** [list of int or list of str] List representing new level order. Reference level by number (position) or by key (label).

**axis** [int] Where to reorder levels.

**Returns**

**DataFrame**

### pandas.DataFrame.replace

DataFrame.**replace**(*self*, *to_replace=None*, *value=None*, *inplace=False*, *limit=None*, *regex=False*, *method='pad'*)

Replace values given in *to_replace* with *value*.

Values of the DataFrame are replaced with other values dynamically. This differs from updating with `.loc` or `.iloc`, which require you to specify a location to update with some value.

**Parameters**

**to_replace** [str, regex, list, dict, Series, int, float, or None] How to find the values that will be replaced.

- numeric, str or regex:
  - numeric: numeric values equal to *to_replace* will be replaced with *value*
  - str: string exactly matching *to_replace* will be replaced with *value*
  - regex: regexs matching *to_replace* will be replaced with *value*
- list of str, regex, or numeric:
  - First, if *to_replace* and *value* are both lists, they **must** be the same length.
  - Second, if `regex=True` then all of the strings in **both** lists will be interpreted as regexs otherwise they will match directly. This doesn't matter much for *value* since there are only a few possible substitution regexes you can use.
  - str, regex and numeric rules apply as above.
- dict:
  - Dicts can be used to specify different replacement values for different existing values. For example, `{'a': 'b', 'y': 'z'}` replaces the value 'a' with 'b' and 'y' with 'z'. To use a dict in this way the *value* parameter should be *None*.
  - For a DataFrame a dict can specify that different values should be replaced in different columns. For example, `{'a': 1, 'b': 'z'}` looks for the value 1 in column 'a' and the value 'z' in column 'b' and replaces these values with whatever is specified in *value*. The *value* parameter should not be `None` in this case. You can treat this as a special case of passing two lists except that you are specifying the column to search in.

- For a DataFrame nested dictionaries, e.g., `{'a': {'b': np.nan}}`, are read as follows: look in column 'a' for the value 'b' and replace it with NaN. The *value* parameter should be `None` to use a nested dict in this way. You can nest regular expressions as well. Note that column names (the top-level dictionary keys in a nested dictionary) **cannot** be regular expressions.

- None:

  - This means that the *regex* argument must be a string, compiled regular expression, or list, dict, ndarray or Series of such elements. If *value* is also `None` then this **must** be a nested dictionary or Series.

See the examples section for examples of each of these.

**value** [scalar, dict, list, str, regex, default None] Value to replace any values matching *to_replace* with. For a DataFrame a dict of values can be used to specify which value to use for each column (columns not in the dict will not be filled). Regular expressions, strings and lists or dicts of such objects are also allowed.

**inplace** [bool, default False] If True, in place. Note: this will modify any other views on this object (e.g. a column from a DataFrame). Returns the caller if this is True.

**limit** [int, default None] Maximum size gap to forward or backward fill.

**regex** [bool or same types as *to_replace*, default False] Whether to interpret *to_replace* and/or *value* as regular expressions. If this is `True` then *to_replace must* be a string. Alternatively, this could be a regular expression or a list, dict, or array of regular expressions in which case *to_replace* must be `None`.

**method** [{'pad', 'ffill', 'bfill', *None*}] The method to use when for replacement, when *to_replace* is a scalar, list or tuple and *value* is `None`.

Changed in version 0.23.0: Added to DataFrame.

**Returns**

**DataFrame** Object after replacement.

**Raises**

**AssertionError**

- If *regex* is not a `bool` and *to_replace* is not `None`.

**TypeError**

- If *to_replace* is a `dict` and *value* is not a `list`, `dict`, `ndarray`, or `Series`
- If *to_replace* is `None` and *regex* is not compilable into a regular expression or is a list, dict, ndarray, or Series.
- When replacing multiple `bool` or `datetime64` objects and the arguments to *to_replace* does not match the type of the value being replaced

**ValueError**

- If a `list` or an `ndarray` is passed to *to_replace* and *value* but they are not the same length.

**See also:**

***DataFrame.fillna*** Fill NA values.

***DataFrame.where*** Replace values based on boolean condition.

*Series.str.replace* Simple string replacement.

### Notes

- Regex substitution is performed under the hood with `re.sub`. The rules for substitution for `re.sub` are the same.
- Regular expressions will only substitute on strings, meaning you cannot provide, for example, a regular expression matching floating point numbers and expect the columns in your frame that have a numeric dtype to be matched. However, if those floating point numbers *are* strings, then you can do this.
- This method has *a lot* of options. You are encouraged to experiment and play with this method to gain intuition about how it works.
- When dict is used as the *to_replace* value, it is like key(s) in the dict are the to_replace part and value(s) in the dict are the value parameter.

### Examples

**Scalar `to_replace` and `value`**

```
>>> s = pd.Series([0, 1, 2, 3, 4])
>>> s.replace(0, 5)
0    5
1    1
2    2
3    3
4    4
dtype: int64
```

```
>>> df = pd.DataFrame({'A': [0, 1, 2, 3, 4],
...                    'B': [5, 6, 7, 8, 9],
...                    'C': ['a', 'b', 'c', 'd', 'e']})
>>> df.replace(0, 5)
   A  B  C
0  5  5  a
1  1  6  b
2  2  7  c
3  3  8  d
4  4  9  e
```

**List-like `to_replace`**

```
>>> df.replace([0, 1, 2, 3], 4)
   A  B  C
0  4  5  a
1  4  6  b
2  4  7  c
3  4  8  d
4  4  9  e
```

```
>>> df.replace([0, 1, 2, 3], [4, 3, 2, 1])
   A  B  C
0  4  5  a
```

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```
1  3  6  b
2  2  7  c
3  1  8  d
4  4  9  e
```

```
>>> s.replace([1, 2], method='bfill')
0    0
1    3
2    3
3    3
4    4
dtype: int64
```

**dict-like `to_replace`**

```
>>> df.replace({0: 10, 1: 100})
     A  B  C
0   10  5  a
1  100  6  b
2    2  7  c
3    3  8  d
4    4  9  e
```

```
>>> df.replace({'A': 0, 'B': 5}, 100)
     A    B  C
0  100  100  a
1    1    6  b
2    2    7  c
3    3    8  d
4    4    9  e
```

```
>>> df.replace({'A': {0: 100, 4: 400}})
     A  B  C
0  100  5  a
1    1  6  b
2    2  7  c
3    3  8  d
4  400  9  e
```

**Regular expression `to_replace`**

```
>>> df = pd.DataFrame({'A': ['bat', 'foo', 'bait'],
...                    'B': ['abc', 'bar', 'xyz']})
>>> df.replace(to_replace=r'^ba.$', value='new', regex=True)
      A    B
0   new  abc
1   foo  new
2  bait  xyz
```

```
>>> df.replace({'A': r'^ba.$'}, {'A': 'new'}, regex=True)
      A    B
0   new  abc
1   foo  bar
2  bait  xyz
```

```
>>> df.replace(regex=r'^ba.$', value='new')
      A    B
0   new  abc
1   foo  new
2  bait  xyz
```

```
>>> df.replace(regex={r'^ba.$': 'new', 'foo': 'xyz'})
      A    B
0   new  abc
1   xyz  new
2  bait  xyz
```

```
>>> df.replace(regex=[r'^ba.$', 'foo'], value='new')
      A    B
0   new  abc
1   new  new
2  bait  xyz
```

Note that when replacing multiple `bool` or `datetime64` objects, the data types in the *to_replace* parameter must match the data type of the value being replaced:

```
>>> df = pd.DataFrame({'A': [True, False, True],
...                    'B': [False, True, False]})
>>> df.replace({'a string': 'new value', True: False})  # raises
Traceback (most recent call last):
    ...
TypeError: Cannot compare types 'ndarray(dtype=bool)' and 'str'
```

This raises a `TypeError` because one of the `dict` keys is not of the correct type for replacement.

Compare the behavior of `s.replace({'a': None})` and `s.replace('a', None)` to understand the peculiarities of the *to_replace* parameter:

```
>>> s = pd.Series([10, 'a', 'a', 'b', 'a'])
```

When one uses a dict as the *to_replace* value, it is like the value(s) in the dict are equal to the *value* parameter. `s.replace({'a': None})` is equivalent to `s.replace(to_replace={'a': None}, value=None, method=None)`:

```
>>> s.replace({'a': None})
0      10
1    None
2    None
3       b
4    None
dtype: object
```

When `value=None` and *to_replace* is a scalar, list or tuple, *replace* uses the method parameter (default 'pad') to do the replacement. So this is why the 'a' values are being replaced by 10 in rows 1 and 2 and 'b' in row 4 in this case. The command `s.replace('a', None)` is actually equivalent to `s.replace(to_replace='a', value=None, method='pad')`:

```
>>> s.replace('a', None)
0    10
1    10
2    10
```

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```
3     b
4     b
dtype: object
```

### pandas.DataFrame.resample

DataFrame.**resample**(*self*, *rule*, *axis=0*, *closed: Union[str, NoneType] = None*, *label: Union[str, NoneType] = None*, *convention: str = 'start'*, *kind: Union[str, NoneType] = None*, *loffset=None*, *base: int = 0*, *on=None*, *level=None*)

Resample time-series data.

Convenience method for frequency conversion and resampling of time series. Object must have a datetime-like index (*DatetimeIndex*, *PeriodIndex*, or *TimedeltaIndex*), or pass datetime-like values to the *on* or *level* keyword.

**Parameters**

**rule** [DateOffset, Timedelta or str] The offset string or object representing target conversion.

**axis** [{0 or 'index', 1 or 'columns'}, default 0] Which axis to use for up- or down-sampling. For *Series* this will default to 0, i.e. along the rows. Must be *DatetimeIndex*, *TimedeltaIndex* or *PeriodIndex*.

**closed** [{'right', 'left'}, default None] Which side of bin interval is closed. The default is 'left' for all frequency offsets except for 'M', 'A', 'Q', 'BM', 'BA', 'BQ', and 'W' which all have a default of 'right'.

**label** [{'right', 'left'}, default None] Which bin edge label to label bucket with. The default is 'left' for all frequency offsets except for 'M', 'A', 'Q', 'BM', 'BA', 'BQ', and 'W' which all have a default of 'right'.

**convention** [{'start', 'end', 's', 'e'}, default 'start'] For *PeriodIndex* only, controls whether to use the start or end of *rule*.

**kind** [{'timestamp', 'period'}, optional, default None] Pass 'timestamp' to convert the resulting index to a *DateTimeIndex* or 'period' to convert it to a *PeriodIndex*. By default the input representation is retained.

**loffset** [timedelta, default None] Adjust the resampled time labels.

**base** [int, default 0] For frequencies that evenly subdivide 1 day, the "origin" of the aggregated intervals. For example, for '5min' frequency, base could range from 0 through 4. Defaults to 0.

**on** [str, optional] For a DataFrame, column to use instead of index for resampling. Column must be datetime-like.

**level** [str or int, optional] For a MultiIndex, level (name or number) to use for resampling. *level* must be datetime-like.

**Returns**

**Resampler object**

**See also:**

***groupby*** Group by mapping, function, label, or list of labels.

***Series.resample*** Resample a Series.

*DataFrame.resample* Resample a DataFrame.

### Notes

See the user guide for more.

To learn more about the offset strings, please see this link.

### Examples

Start by creating a series with 9 one minute timestamps.

```
>>> index = pd.date_range('1/1/2000', periods=9, freq='T')
>>> series = pd.Series(range(9), index=index)
>>> series
2000-01-01 00:00:00    0
2000-01-01 00:01:00    1
2000-01-01 00:02:00    2
2000-01-01 00:03:00    3
2000-01-01 00:04:00    4
2000-01-01 00:05:00    5
2000-01-01 00:06:00    6
2000-01-01 00:07:00    7
2000-01-01 00:08:00    8
Freq: T, dtype: int64
```

Downsample the series into 3 minute bins and sum the values of the timestamps falling into a bin.

```
>>> series.resample('3T').sum()
2000-01-01 00:00:00     3
2000-01-01 00:03:00    12
2000-01-01 00:06:00    21
Freq: 3T, dtype: int64
```

Downsample the series into 3 minute bins as above, but label each bin using the right edge instead of the left. Please note that the value in the bucket used as the label is not included in the bucket, which it labels. For example, in the original series the bucket `2000-01-01 00:03:00` contains the value 3, but the summed value in the resampled bucket with the label `2000-01-01 00:03:00` does not include 3 (if it did, the summed value would be 6, not 3). To include this value close the right side of the bin interval as illustrated in the example below this one.

```
>>> series.resample('3T', label='right').sum()
2000-01-01 00:03:00     3
2000-01-01 00:06:00    12
2000-01-01 00:09:00    21
Freq: 3T, dtype: int64
```

Downsample the series into 3 minute bins as above, but close the right side of the bin interval.

```
>>> series.resample('3T', label='right', closed='right').sum()
2000-01-01 00:00:00     0
2000-01-01 00:03:00     6
2000-01-01 00:06:00    15
2000-01-01 00:09:00    15
Freq: 3T, dtype: int64
```

Upsample the series into 30 second bins.

```
>>> series.resample('30S').asfreq()[0:5]   # Select first 5 rows
2000-01-01 00:00:00   0.0
2000-01-01 00:00:30   NaN
2000-01-01 00:01:00   1.0
2000-01-01 00:01:30   NaN
2000-01-01 00:02:00   2.0
Freq: 30S, dtype: float64
```

Upsample the series into 30 second bins and fill the `NaN` values using the `pad` method.

```
>>> series.resample('30S').pad()[0:5]
2000-01-01 00:00:00    0
2000-01-01 00:00:30    0
2000-01-01 00:01:00    1
2000-01-01 00:01:30    1
2000-01-01 00:02:00    2
Freq: 30S, dtype: int64
```

Upsample the series into 30 second bins and fill the `NaN` values using the `bfill` method.

```
>>> series.resample('30S').bfill()[0:5]
2000-01-01 00:00:00    0
2000-01-01 00:00:30    1
2000-01-01 00:01:00    1
2000-01-01 00:01:30    2
2000-01-01 00:02:00    2
Freq: 30S, dtype: int64
```

Pass a custom function via `apply`

```
>>> def custom_resampler(array_like):
...     return np.sum(array_like) + 5
...
>>> series.resample('3T').apply(custom_resampler)
2000-01-01 00:00:00     8
2000-01-01 00:03:00    17
2000-01-01 00:06:00    26
Freq: 3T, dtype: int64
```

For a Series with a PeriodIndex, the keyword *convention* can be used to control whether to use the start or end of *rule*.

Resample a year by quarter using 'start' *convention*. Values are assigned to the first quarter of the period.

```
>>> s = pd.Series([1, 2], index=pd.period_range('2012-01-01',
...                                             freq='A',
...                                             periods=2))
>>> s
2012    1
2013    2
Freq: A-DEC, dtype: int64
>>> s.resample('Q', convention='start').asfreq()
2012Q1    1.0
2012Q2    NaN
2012Q3    NaN
2012Q4    NaN
```

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```
2013Q1    2.0
2013Q2    NaN
2013Q3    NaN
2013Q4    NaN
Freq: Q-DEC, dtype: float64
```

Resample quarters by month using 'end' *convention*. Values are assigned to the last month of the period.

```
>>> q = pd.Series([1, 2, 3, 4], index=pd.period_range('2018-01-01',
...                                                   freq='Q',
...                                                   periods=4))
>>> q
2018Q1    1
2018Q2    2
2018Q3    3
2018Q4    4
Freq: Q-DEC, dtype: int64
>>> q.resample('M', convention='end').asfreq()
2018-03    1.0
2018-04    NaN
2018-05    NaN
2018-06    2.0
2018-07    NaN
2018-08    NaN
2018-09    3.0
2018-10    NaN
2018-11    NaN
2018-12    4.0
Freq: M, dtype: float64
```

For DataFrame objects, the keyword *on* can be used to specify the column instead of the index for resampling.

```
>>> d = dict({'price': [10, 11, 9, 13, 14, 18, 17, 19],
...           'volume': [50, 60, 40, 100, 50, 100, 40, 50]})
>>> df = pd.DataFrame(d)
>>> df['week_starting'] = pd.date_range('01/01/2018',
...                                     periods=8,
...                                     freq='W')
>>> df
   price  volume week_starting
0     10      50    2018-01-07
1     11      60    2018-01-14
2      9      40    2018-01-21
3     13     100    2018-01-28
4     14      50    2018-02-04
5     18     100    2018-02-11
6     17      40    2018-02-18
7     19      50    2018-02-25
>>> df.resample('M', on='week_starting').mean()
               price  volume
week_starting
2018-01-31     10.75    62.5
2018-02-28     17.00    60.0
```

For a DataFrame with MultiIndex, the keyword *level* can be used to specify on which level the resampling needs to take place.

```
>>> days = pd.date_range('1/1/2000', periods=4, freq='D')
>>> d2 = dict({'price': [10, 11, 9, 13, 14, 18, 17, 19],
...            'volume': [50, 60, 40, 100, 50, 100, 40, 50]})
>>> df2 = pd.DataFrame(d2,
...                    index=pd.MultiIndex.from_product([days,
...                                                      ['morning',
...                                                       'afternoon']]
...                                                     ))
>>> df2
                     price  volume
2000-01-01 morning       10      50
           afternoon     11      60
2000-01-02 morning        9      40
           afternoon     13     100
2000-01-03 morning       14      50
           afternoon     18     100
2000-01-04 morning       17      40
           afternoon     19      50
>>> df2.resample('D', level=0).sum()
            price  volume
2000-01-01     21     110
2000-01-02     22     140
2000-01-03     32     150
2000-01-04     36      90
```

### pandas.DataFrame.reset_index

DataFrame.**reset_index**(*self*, *level: Union[Hashable, Sequence[Hashable], NoneType] = None*, *drop: bool = False*, *inplace: bool = False*, *col_level: Hashable = 0*, *col_fill: Union[Hashable, NoneType] = ''*) → Union[ForwardRef('DataFrame'), NoneType]

Reset the index, or a level of it.

Reset the index of the DataFrame, and use the default one instead. If the DataFrame has a MultiIndex, this method can remove one or more levels.

**Parameters**

**level** [int, str, tuple, or list, default None] Only remove the given levels from the index. Removes all levels by default.

**drop** [bool, default False] Do not try to insert index into dataframe columns. This resets the index to the default integer index.

**inplace** [bool, default False] Modify the DataFrame in place (do not create a new object).

**col_level** [int or str, default 0] If the columns have multiple levels, determines which level the labels are inserted into. By default it is inserted into the first level.

**col_fill** [object, default ''] If the columns have multiple levels, determines how the other levels are named. If None then the index name is repeated.

**Returns**

**DataFrame or None** DataFrame with the new index or None if `inplace=True`.

**See also:**

***DataFrame.set_index*** Opposite of reset_index.

***DataFrame.reindex*** Change to new indices or expand indices.

***DataFrame.reindex_like*** Change to same indices as other DataFrame.

### Examples

```
>>> df = pd.DataFrame([('bird', 389.0),
...                    ('bird', 24.0),
...                    ('mammal', 80.5),
...                    ('mammal', np.nan)],
...                   index=['falcon', 'parrot', 'lion', 'monkey'],
...                   columns=('class', 'max_speed'))
>>> df
         class  max_speed
falcon    bird      389.0
parrot    bird       24.0
lion    mammal       80.5
monkey  mammal        NaN
```

When we reset the index, the old index is added as a column, and a new sequential index is used:

```
>>> df.reset_index()
    index   class  max_speed
0  falcon    bird      389.0
1  parrot    bird       24.0
2    lion  mammal       80.5
3  monkey  mammal        NaN
```

We can use the *drop* parameter to avoid the old index being added as a column:

```
>>> df.reset_index(drop=True)
    class  max_speed
0    bird      389.0
1    bird       24.0
2  mammal       80.5
3  mammal        NaN
```

You can also use *reset_index* with *MultiIndex*.

```
>>> index = pd.MultiIndex.from_tuples([('bird', 'falcon'),
...                                    ('bird', 'parrot'),
...                                    ('mammal', 'lion'),
...                                    ('mammal', 'monkey')],
...                                   names=['class', 'name'])
>>> columns = pd.MultiIndex.from_tuples([('speed', 'max'),
...                                      ('species', 'type')])
>>> df = pd.DataFrame([(389.0, 'fly'),
...                    ( 24.0, 'fly'),
...                    ( 80.5, 'run'),
...                    (np.nan, 'jump')],
...                   index=index,
...                   columns=columns)
>>> df
               speed species
                 max    type
```

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```
class  name
bird   falcon  389.0     fly
       parrot   24.0     fly
mammal lion     80.5     run
       monkey    NaN    jump
```

If the index has multiple levels, we can reset a subset of them:

```
>>> df.reset_index(level='class')
         class  speed species
                  max    type
name
falcon    bird  389.0     fly
parrot    bird   24.0     fly
lion    mammal   80.5     run
monkey  mammal    NaN    jump
```

If we are not dropping the index, by default, it is placed in the top level. We can place it in another level:

```
>>> df.reset_index(level='class', col_level=1)
                speed species
         class    max    type
name
falcon    bird  389.0     fly
parrot    bird   24.0     fly
lion    mammal   80.5     run
monkey  mammal    NaN    jump
```

When the index is inserted under another level, we can specify under which one with the parameter *col_fill*:

```
>>> df.reset_index(level='class', col_level=1, col_fill='species')
              species  speed species
                class    max    type
name
falcon           bird  389.0     fly
parrot           bird   24.0     fly
lion           mammal   80.5     run
monkey         mammal    NaN    jump
```

If we specify a nonexistent level for *col_fill*, it is created:

```
>>> df.reset_index(level='class', col_level=1, col_fill='genus')
                genus  speed species
                class    max    type
name
falcon           bird  389.0     fly
parrot           bird   24.0     fly
lion           mammal   80.5     run
monkey         mammal    NaN    jump
```

### pandas.DataFrame.rfloordiv

DataFrame.**rfloordiv**(*self*, *other*, *axis='columns'*, *level=None*, *fill_value=None*)

Get Integer division of dataframe and other, element-wise (binary operator *rfloordiv*).

Equivalent to `other // dataframe`, but with support to substitute a fill_value for missing data in one of the inputs. With reverse version, *floordiv*.

Among flexible wrappers (*add*, *sub*, *mul*, *div*, *mod*, *pow*) to arithmetic operators: +, -, *, /, //, %, **.

**Parameters**

**other** [scalar, sequence, Series, or DataFrame] Any single or multiple element data structure, or list-like object.

**axis** [{0 or 'index', 1 or 'columns'}] Whether to compare by the index (0 or 'index') or columns (1 or 'columns'). For Series input, axis to match Series index on.

**level** [int or label] Broadcast across a level, matching Index values on the passed MultiIndex level.

**fill_value** [float or None, default None] Fill existing missing (NaN) values, and any new element needed for successful DataFrame alignment, with this value before computation. If data in both corresponding DataFrame locations is missing the result will be missing.

**Returns**

**DataFrame** Result of the arithmetic operation.

**See also:**

***DataFrame.add*** Add DataFrames.

***DataFrame.sub*** Subtract DataFrames.

***DataFrame.mul*** Multiply DataFrames.

***DataFrame.div*** Divide DataFrames (float division).

***DataFrame.truediv*** Divide DataFrames (float division).

***DataFrame.floordiv*** Divide DataFrames (integer division).

***DataFrame.mod*** Calculate modulo (remainder after division).

***DataFrame.pow*** Calculate exponential power.

#### Notes

Mismatched indices will be unioned together.