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# **Cawdrey**

***Release 0.4.2***

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**Several useful custom dictionaries for Python**

Docs	
Tests	
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Activity	
QA	
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## CONTENTS

- *frozendict*: An immutable dictionary that cannot be changed after creation.
- *FrozenOrderedDict*: An immutable `OrderedDict` where the order of keys is preserved, but that cannot be changed after creation.
- *AlphaDict*: A *FrozenOrderedDict* where the keys are stored in alphabetical order.
- *bdict*: A dictionary where `key, value` pairs are stored both ways round.
- *Tally*: A subclass of `collections.Counter` with additional methods.
- *HeaderMapping*: A `collections.abc.MutableMapping` which supports duplicate, case-insensitive keys.

This package also provides two base classes for creating your own custom dictionaries:

- *FrozenBase*: An Abstract Base Class for frozen dictionaries.
- *MutableBase*: An Abstract Base Class for mutable dictionaries.





## OTHER DICTIONARY PACKAGES

If you're looking to unflatten a dictionary, such as to go from this:

```
{ 'foo.bar': 'val' }
```

to this:

```
{ 'foo': { 'bar': 'val' } }
```

check out [unflatten](#), [flattery](#) or [morph](#) to accomplish that.

[indexed](#) provides an `OrederedDict` where the values can be accessed by their index as well as by their keys.

There's also [python-benedict](#), which provides a custom dictionary with **keylist/keypath** support, **I/O** shortcuts (Base64, CSV, JSON, TOML, XML, YAML, pickle, query-string) and many **utilities**.



## INSTALLATION

from PyPI

from Anaconda

from GitHub

```
$ python3 -m pip install cawdrey --user
```

First add the required channels

```
$ conda config --add channels https://conda.anaconda.org/conda-forge
```

```
$ conda config --add channels https://conda.anaconda.org/domdfcoding
```

Then install

```
$ conda install cawdrey
```

```
$ python3 -m pip install git+https://github.com/domdfcoding/cawdrey@master --user
```

### 3.1 AlphaDict

**class AlphaDict** (*seq=None, \*\*kwargs*)

Bases: *FrozenOrderedDict*[~KT, ~VT]

Initialize an immutable, alphabetised dictionary.

The signature is the same as regular dictionaries.

`AlphaDict()` -> new empty `AlphaDict`

`AlphaDict(mapping)` -> new `AlphaDict` initialized from a mapping object's (key, value) pairs

`AlphaDict(iterable)` -> new `AlphaDict` initialized as if via:

```
d = {}
for k, v in iterable:
    d[k] = v
```

`AlphaDict(**kwargs)` -> new `AlphaDict` initialized with the name=value pairs in the keyword argument list.

For example:

```
AlphaDict(one=1, two=2)
```

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>copy(*args, **kwargs)</code>	Return a copy of the <i>FrozenOrderedDict</i> .
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to value.
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>FrozenOrderedDict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>FrozenOrderedDict</i> 's keys.
<code>values()</code>	Returns an object providing a view on the <i>FrozenOrderedDict</i> 's values.

```

__contains__(key)
    Return key in self.

    Parameters key (object)

    Return type bool

__eq__(other)
    Return self == other.

    Return type bool

__getitem__(key)
    Return self[key].

    Parameters key (~KT)

    Return type ~VT

__iter__()
    Iterates over the dictionary's keys.

    Return type Iterator[~KT]

__len__()
    Returns the number of keys in the dictionary.

    Return type int

__repr__()
    Return a string representation of the DictWrapper.

    Return type str

copy(*args, **kwargs)
    Return a copy of the FrozenOrderedDict.

```

**Parameters**

- **args**
- **kwargs**

**classmethod fromkeys** (*iterable*, *value=None*)

Create a new dictionary with keys from iterable and values set to value.

**Return type** *FrozenBase*[~KT, ~VT]

**get** (*k*, *default=None*)

Return the value for *k* if *k* is in the dictionary, else *default*.

**Parameters**

- **k** – The key to return the value for.
- **default** – The value to return if *key* is not in the dictionary. Default *None*.

**items** ()

Returns a set-like object providing a view on the *FrozenOrderedDict*'s items.

**Return type** *AbstractSet*[*Tuple*[~KT, ~VT]]

**keys** ()

Returns a set-like object providing a view on the *FrozenOrderedDict*'s keys.

**Return type** *AbstractSet*[~KT]

**values** ()

Returns an object providing a view on the *FrozenOrderedDict*'s values.

**Return type** *ValuesView*[~VT]

## 3.2 bdict

**class bdict** (*seq=None*, *\*\*kwargs*)

Bases: *UserDict*

Returns a new dictionary initialized from an optional positional argument, and a possibly empty set of keyword arguments.

Each **key: value** pair is entered into the dictionary in both directions, so you can perform lookups with either the key or the value.

If no positional argument is given, an empty dictionary is created.

If a positional argument is given and it is a mapping object, a dictionary is created with the same key-value pairs as the mapping object. Otherwise, the positional argument must be an iterable object. Each item in the iterable must itself be an iterable with exactly two objects. The first object of each item becomes a key in the new dictionary, and the second object the corresponding value.

If keyword arguments are given, the keyword arguments and their values are added to the dictionary created from the positional argument.

If an attempt is made to add a key or value that already exists in the dictionary a *ValueError* will be raised.

Keys or values of *None*, *True* and *False* will be stored internally as *"\_None"*, *"\_True"* and *"\_False"* respectively

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__delitem__(key)</code>	Delete self[key].
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__repr__()</code>	Return repr(self).
<code>__setitem__(key, val)</code>	Set self[key] to value.
<code>clear()</code>	Removes all items from the <i>bdict</i> .
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>pop(k[,d])</code>	If key is not found, d is returned if given, otherwise KeyError is raised.
<code>popitem()</code>	as a 2-tuple; but raise KeyError if D is empty.
<code>setdefault(k[,d])</code>	
<code>update([E, ]**F)</code>	If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__contains__(key)`  
Return key in self.

**Parameters** **key** (object)

**Return type** bool

`__delitem__(key)`  
Delete self[key].

**Parameters** **key** (~KT)

`__eq__(other)`  
Return self == other.

**Return type** bool

`__getitem__(key)`  
Return self[key].

**Parameters** **key** (~KT)

**Return type** ~VT

`__repr__()`  
Return repr(self).

`__setitem__(key, val)`  
Set self[key] to value.

**Parameters**

- **key**
- **val**

**clear()**

Removes all items from the *bdict*.

**get** (*k*, *default=None*)

Return the value for *k* if *k* is in the dictionary, else *default*.

#### Parameters

- **k** – The key to return the value for.
- **default** – The value to return if *key* is not in the dictionary. Default *None*.

#### Overloads

- *get*(**k**: ~KT) -> Optional[~VT]
- *get*(**k**: ~KT, **default**: Union[~VT, ~T]) -> Union[~VT, ~T]

**items()**

Returns a set-like object providing a view on the *bdict*'s items.

**Return type** AbstractSet[Tuple[~KT, ~VT]]

**keys()**

Returns a set-like object providing a view on the *bdict*'s keys.

**Return type** AbstractSet[~KT]

**pop** (*k*, *d*) → *v*, remove specified key and return the corresponding value.

If key is not found, *d* is returned if given, otherwise *KeyError* is raised.

**popitem()** → (*k*, *v*), remove and return some (key, value) pair

as a 2-tuple; but raise *KeyError* if *D* is empty.

**setdefault** (*k*, *d*) → *D.get(k,d)*, also set *D[k]=d* if *k* not in *D*

**update** ([*E*], *\*\*F*) → *None*. Update *D* from mapping/iterable *E* and *F*.

If *E* present and has a *.keys()* method, does: for *k* in *E*: *D[k] = E[k]* If *E* present and lacks *.keys()* method, does: for (*k*, *v*) in *E*: *D[k] = v* In either case, this is followed by: for *k*, *v* in *F.items()*: *D[k] = v*

**values()**

Returns an object providing a view on the *bdict*'s values.

**Return type** ValuesView[~VT]

## 3.3 frozendict

### 3.3.1 About

*frozendict* is an immutable wrapper around dictionaries that implements the complete mapping interface. It can be used as a drop-in replacement for dictionaries where immutability is desired.

Of course, this is *python*, and you can still poke around the object's internals if you want.

The *frozendict* constructor mimics *dict*, and all of the expected interfaces (*iter*, *len*, *repr*, *hash*, *getitem*) are provided. Note that a *frozendict* does not guarantee the immutability of its values, so the utility of the *hash* method is restricted by usage.

The only difference is that the *copy()* method of *frozendict* takes variable keyword arguments, which will be present as key/value pairs in the new, immutable copy.

### 3.3.2 Usage

```
>>> from cawdrey import frozendict
>>>
>>> fd = frozendict({'hello': 'World' })
>>>
>>> print fd
&ltfrozendict {'hello': 'World'}>
>>>
>>> print fd['hello']
'World'
>>>
>>> print fd.copy(another='key/value')
&ltfrozendict {'hello': 'World', 'another': 'key/value'}>
>>>
```

In addition, *frozendict* supports the + and – operands. If you add a dict-like object, a new *frozendict* will be returned, equal to the old *frozendict* updated with the other object. Example:

```
>>> frozendict({"Sulla": "Marco", 2: 3}) + {"Sulla": "Marò", 4: 7}
&ltfrozendict {'Sulla': 'Marò', 2: 3, 4: 7}>
>>>
```

You can also subtract an iterable from a *frozendict*. A new *frozendict* will be returned, without the keys that are in the iterable. Examples:

```
>>> frozendict({"Sulla": "Marco", 2: 3}) - {"Sulla": "Marò", 4: 7}
&ltfrozendict {'Sulla': 'Marco', 2: 3}>
>>> frozendict({"Sulla": "Marco", 2: 3}) - [2, 4]
&ltfrozendict {'Sulla': 'Marco'}>
>>>
```

Some other examples:

```
>>> from cawdrey import frozendict
>>> fd = frozendict({"Sulla": "Marco", "Hicks": "Bill"})
>>> print(fd)
&ltfrozendict {'Sulla': 'Marco', 'Hicks': 'Bill'}>
>>> print(fd["Sulla"])
Marco
>>> fd["Bim"]
KeyError: 'Bim'
>>> len(fd)
2
>>> "Sulla" in fd
True
>>> "Sulla" not in fd
False
>>> "Bim" in fd
False
>>> hash(fd)
835910019049608535
>>> fd_unhashable = frozendict({1: []})
>>> hash(fd_unhashable)
TypeError: unhashable type: 'list'
>>> fd2 = frozendict({"Hicks": "Bill", "Sulla": "Marco"})
>>> print(fd2)
```

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```

<frozendict {'Hicks': 'Bill', 'Sulla': 'Marco'}>
>>> fd2 is fd
False
>>> fd2 == fd
True
>>> frozendict()
<frozendict {}>
>>> frozendict(Sulla="Marco", Hicks="Bill")
<frozendict {'Sulla': 'Marco', 'Hicks': 'Bill'}>
>>> frozendict(("Sulla", "Marco"), ("Hicks", "Bill"))
<frozendict {'Sulla': 'Marco', 'Hicks': 'Bill'}>
>>> fd.get("Sulla")
'Marco'
>>> print(fd.get("God"))
None
>>> tuple(fd.keys())
('Sulla', 'Hicks')
>>> tuple(fd.values())
('Marco', 'Bill')
>>> tuple(fd.items())
(('Sulla', 'Marco'), ('Hicks', 'Bill'))
>>> iter(fd)
<dict_keyiterator object at 0x7feb75c49188>
>>> frozendict.fromkeys(["Marco", "Giulia"], "Sulla")
<frozendict {'Marco': 'Sulla', 'Giulia': 'Sulla'}>
>>> fd["Sulla"] = "Silla"
TypeError: 'frozendict' object does not support item assignment
>>> del fd["Sulla"]
TypeError: 'frozendict' object does not support item deletion
>>> fd.clear()
AttributeError: 'frozendict' object has no attribute 'clear'
>>> fd.pop("Sulla")
AttributeError: 'frozendict' object has no attribute 'pop'
>>> fd.popitem()
AttributeError: 'frozendict' object has no attribute 'popitem'
>>> fd.setdefault("Sulla")
AttributeError: 'frozendict' object has no attribute 'setdefault'
>>> fd.update({"Bim": "James May"})
AttributeError: 'frozendict' object has no attribute 'update'

```

### 3.3.3 API Reference

**class frozendict** (\*args, \*\*kwargs)

Bases: *FrozenBase*[~KT, ~VT]

An immutable wrapper around dictionaries that implements the complete `collections.Mapping` interface. It can be used as a drop-in replacement for dictionaries where immutability is desired.

#### Methods:

---

`__add__`(other, \*args, \*\*kwargs)

If you add a dict-like object, a new frozendict will be returned, equal to the old frozendict updated with the other object.

---

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Table 3 – continued from previous page

<code>__and__(other, *args, **kwargs)</code>	Returns a new <i>frozendict</i> , that is the intersection between <i>self</i> and <i>other</i> .
<code>__contains__(key)</code>	Return <i>key</i> in <i>self</i> .
<code>__eq__(other)</code>	Return <i>self</i> == <i>other</i> .
<code>__getitem__(key)</code>	Return <i>self</i> [ <i>key</i> ].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>__sub__(other, *args, **kwargs)</code>	The method will create a new <i>frozendict</i> , result of the subtraction by <i>other</i> .
<code>copy(*args, **kwargs)</code>	Return a copy of the dictionary.
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to <i>value</i> .
<code>get(k[, default])</code>	Return the value for <i>k</i> if <i>k</i> is in the dictionary, else <i>default</i> .
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>sorted(*args[, by])</code>	Return a new <i>frozendict</i> , with the element insertion sorted.
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__add__(other, *args, **kwargs)`

If you add a dict-like object, a new *frozendict* will be returned, equal to the old *frozendict* updated with the other object.

`__and__(other, *args, **kwargs)`

Returns a new *frozendict*, that is the intersection between *self* and *other*.

If *other* is a *dict*-like object, the intersection will contain only the *items* in common.

If *other* is another iterable, the intersection will contain the items of *self* which keys are in *other*.

Iterables of pairs are *not* managed differently. This is for consistency.

Beware! The final order is dictated by the order of *other*. This allows the coder to change the order of the original *frozendict*.

The last two behaviours breaks voluntarily the `dict.items()` API, for consistency and practical reasons.

`__contains__(key)`

Return *key* in *self*.

**Parameters** *key* (object)

**Return type** `bool`

`__eq__(other)`

Return *self* == *other*.

**Return type** `bool`

`__getitem__(key)`

Return *self*[*key*].

**Parameters** `key` (~KT)

**Return type** ~VT

`__iter__()`

Iterates over the dictionary's keys.

**Return type** `Iterator`[~KT]

`__len__()`

Returns the number of keys in the dictionary.

**Return type** `int`

`__repr__()`

Return a string representation of the `DictWrapper`.

**Return type** `str`

`__sub__(other, *args, **kwargs)`

The method will create a new `frozendict`, result of the subtraction by `other`.

If `other` is a `dict`-like, the result will have the items of the `frozendict` that are *not* in common with `other`.

If `other` is another type of iterable, the result will have the items of `frozendict` without the keys that are in `other`.

`copy(*args, **kwargs)`

Return a copy of the dictionary.

**Return type** ~\_D

**classmethod** `fromkeys(iterable, value=None)`

Create a new dictionary with keys from `iterable` and values set to `value`.

**Return type** `FrozenBase`[~KT, ~VT]

`get(k, default=None)`

Return the value for `k` if `k` is in the dictionary, else `default`.

**Parameters**

- `k` – The key to return the value for.
- `default` – The value to return if key is not in the dictionary. Default `None`.

`items()`

Returns a set-like object providing a view on the `bdict`'s items.

**Return type** `AbstractSet`[`Tuple`[~KT, ~VT]]

`keys()`

Returns a set-like object providing a view on the `bdict`'s keys.

**Return type** `AbstractSet`[~KT]

`sorted(*args, by='keys', **kwargs)`

Return a new `frozendict`, with the element insertion sorted. The signature is the same as the builtin `sorted` function, except for the additional parameter `by`, that is `'keys'` by default and can also be `'values'` and `'items'`. So the resulting `frozendict` can be sorted by keys, values or items.

If you want more complicated sorts read the documentation of `sorted`.

The the parameters passed to the `key` function are the keys of the `frozendict` if `by = "keys"`, and are the items otherwise.

---

**Note:** Sorting by keys and items achieves the same effect. The only difference is when you want to customize the sorting passing a custom `key` function. You *could* achieve the same result using `by = "values"`, since also sorting by values passes the items to the key function. But this is an implementation detail and you should not rely on it.

---

**values** ()

Returns an object providing a view on the *bdict*'s values.

**Return type** `ValuesView[~VT]`

### 3.3.4 Copyright

Based on <https://github.com/slezica/python-frozendict> and <https://github.com/mredolatti/python-frozendict>.

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Also based on <https://github.com/Marco-Sulla/python-frozendict>

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## 3.4 FrozenOrderedDict

### 3.4.1 About

*FrozenOrderedDict* is a immutable wrapper around an *OrderedDict*. It is similar to *frozendict*, and with regards to immutability it solves the same problems:

- Because dictionaries are mutable, they are not hashable and cannot be used in sets or as dictionary keys.
- Nasty bugs can and do occur when mutable data structures are passed around.

It can be initialized just like a *dict* or *OrderedDict*. Once instantiated, an instance of *FrozenOrderedDict* cannot be altered, since it does not implement the *MutableMapping* interface.

*FrozenOrderedDict* implements the *Mapping* interface, so can be used just like a normal dictionary in most cases.

In order to modify the contents of a *FrozenOrderedDict*, a new instance must be created. The easiest way to do that is by calling the `.copy()` method. It will return a new instance of *FrozenOrderedDict* initialized using the following steps:

1. A copy of the wrapped *OrderedDict* instance will be created.
2. If any arguments or keyword arguments are passed to the `.copy()` method, they will be used to create another *OrderedDict* instance, which will then be used to update the copy made in step #1.
3. Finally, `self.__class__()` will be called, passing the copy as the only argument.

### 3.4.2 API Reference

**class** *FrozenOrderedDict* (\*args, \*\*kwargs)

Bases: *FrozenBase*[~KT, ~VT]

An immutable *OrderedDict*. It can be used as a drop-in replacement for dictionaries where immutability is desired.

#### Methods:

<code>__contains__(key)</code>	Return key in self.
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>copy(*args, **kwargs)</code>	Return a copy of the <i>FrozenOrderedDict</i> .
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to value.
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>FrozenOrderedDict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>FrozenOrderedDict</i> 's keys.
<code>values()</code>	Returns an object providing a view on the <i>FrozenOrderedDict</i> 's values.

`__contains__(key)`

Return key in self.

**Parameters** *key* (object)

**Return type** bool

`__eq__(other)`

Return self == other.

**Return type** bool

`__getitem__(key)`

Return self[key].

**Parameters** `key` (~KT)

**Return type** ~VT

`__iter__()`

Iterates over the dictionary's keys.

**Return type** `Iterator`[~KT]

`__len__()`

Returns the number of keys in the dictionary.

**Return type** `int`

`__repr__()`

Return a string representation of the *DictWrapper*.

**Return type** `str`

`copy` (\*args, \*\*kwargs)

Return a copy of the *FrozenOrderedDict*.

**Parameters**

- **args**
- **kwargs**

**classmethod** `fromkeys` (iterable, value=None)

Create a new dictionary with keys from iterable and values set to value.

**Return type** `FrozenBase`[~KT, ~VT]

`get` (k, default=None)

Return the value for k if k is in the dictionary, else default.

**Parameters**

- **k** – The key to return the value for.
- **default** – The value to return if key is not in the dictionary. Default `None`.

**Overloads**

- `get(k: ~KT) -> Optional[~VT]`
- `get(k: ~KT, default: Union[~VT, ~T]) -> Union[~VT, ~T]`

`items` ()

Returns a set-like object providing a view on the *FrozenOrderedDict*'s items.

**Return type** `AbstractSet`[`Tuple`[~KT, ~VT]]

`keys` ()

Returns a set-like object providing a view on the *FrozenOrderedDict*'s keys.

**Return type** `AbstractSet`[~KT]

`values` ()

Returns an object providing a view on the *FrozenOrderedDict*'s values.

**Return type** `ValuesView`[~VT]

### 3.4.3 Copyright

Based on <https://github.com/slezica/python-frozendict> and <https://github.com/mredolatti/python-frozendict>.

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Also based on <https://github.com/Marco-Sulla/python-frozendict>

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## 3.5 HeaderMapping

`collections.abc.MutableMapping` which supports duplicate, case-insentive keys.

New in version 0.4.0.

### Classes:

<code>HeaderMapping()</code>	Provides a <code>MutableMapping</code> interface to a list of headers, such as those used in an email message.
------------------------------	--

### class HeaderMapping

Bases: `MutableMapping[str, ~VT]`

Provides a `MutableMapping` interface to a list of headers, such as those used in an email message.

#### See also:

`email.message.Message` and `email.message.EmailMessage`

`MutableMapping` interface, which assumes there is exactly one occurrence of the header per mapping. Some headers do in fact appear multiple times, and for those headers you must use the `get_all()` method to obtain all values for that key.

#### Methods:

<code>__contains__(name)</code>	Returns whether <code>name</code> is in the <code>HeaderMapping</code> .
<code>__delitem__(name)</code>	Delete all occurrences of a header, if present.
<code>__getitem__(name)</code>	Get a header value.
<code>__iter__()</code>	Returns an iterator over the keys in the <code>HeaderMapping</code> .
<code>__len__()</code>	Return the total number of keys, including duplicates.
<code>__repr__()</code>	Return a string representation of the <code>HeaderMapping</code> .
<code>__setitem__(name, val)</code>	Set the value of a header.
<code>get(k[, default])</code>	Get a header value.
<code>get_all(k[, default])</code>	Return a list of all the values for the named field.
<code>items()</code>	Get all the message's header fields and values.
<code>keys()</code>	Return a list of all the message's header field names.
<code>values()</code>	Return a list of all the message's header values.

`__contains__(name)`  
Returns whether `name` is in the `HeaderMapping`.

**Parameters** `name` (object)

**Return type** `bool`

`__delitem__(name)`  
Delete all occurrences of a header, if present.

Does not raise an exception if the header is missing.

**Parameters** `name` (str)

`__getitem__(name)`  
Get a header value.



---

**Note:** If the header appears multiple times, exactly which occurrence gets returned is undefined. Use the `get_all()` method to get all values matching a header field name.

---

**Parameters** `name (str)`

**Return type** `~VT`

`__iter__()`

Returns an iterator over the keys in the `HeaderMapping`.

**Return type** `Iterator[str]`

`__len__()`

Return the total number of keys, including duplicates.

**Return type** `int`

`__repr__()`

Return a string representation of the `HeaderMapping`.

New in version 0.4.1.

**Return type** `str`

`__setitem__(name, val)`

Set the value of a header.

**Parameters**

- `name (str)`
- `val (~VT)`

`get(k, default=None)`

Get a header value.

Like `__getitem__()`, but returns `default` instead of `None` when the field is missing.

**Parameters**

- `k (str)`
- `default` – Default `None`.

**Overloads**

- `get(k: str) -> Optional[~VT]`
- `get(k: str, default: Union[~VT, ~_T]) -> Union[~VT, ~_T]`

`get_all(k, default=None)`

Return a list of all the values for the named field.

These will be sorted in the order they appeared in the original message, and may contain duplicates. Any fields deleted and re-inserted are always appended to the header list.

If no such fields exist, `default` is returned.

**Parameters**

- `k (str)`
- `default` – Default `None`.

**Overloads**

- `get_all(k: str) -> Optional[List[~VT]]`
- `get_all(k: str, default: Union[~VT, ~_T]) -> Union[List[~VT], ~_T]`

**items()**

Get all the message's header fields and values.

These will be sorted in the order they appeared in the original message, or were added to the message, and may contain duplicates. Any fields deleted and re-inserted are always appended to the header list.

**Return type** `List[Tuple[str, ~VT]]`

**keys()**

Return a list of all the message's header field names.

These will be sorted in the order they appeared in the original message, or were added to the message, and may contain duplicates. Any fields deleted and re-inserted are always appended to the header list.

**Return type** `List[str]`

**values()**

Return a list of all the message's header values.

These will be sorted in the order they appeared in the original message, or were added to the message, and may contain duplicates. Any fields deleted and re-inserted are always appended to the header list.

**Return type** `List[~VT]`

## 3.6 NonelessDict

### 3.6.1 About

*NonelessDict* is a wrapper around dict that will check if a value is `None`/empty/`False`, and not add the key in that case.

The class has a method `set_with_strict_none_check()` that can be used to set a value and check only for `None` values.

*NonelessOrderedDict* is based on *NonelessDict* and *OrderedDict*, so the order of key insertion is preserved.

### 3.6.2 API Reference

Provides *NonelessDict*.

**Classes:**

<code>NonelessDict(*args, **kwargs)</code>	A wrapper around dict that will check if a value is <code>None</code> /empty/ <code>False</code> , and not add the key in that case.
<code>NonelessOrderedDict(*args, **kwargs)</code>	A wrapper around <i>OrderedDict</i> that will check if a value is <code>None</code> /empty/ <code>False</code> , and not add the key in that case.

**class** *NonelessDict* (\*args, \*\*kwargs)

Bases: *MutableBase*[~KT, ~VT]

A wrapper around dict that will check if a value is `None`/empty/`False`, and not add the key in that case.

Use the `set_with_strict_none_check()` method to check only for `None`.

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__delitem__(key)</code>	Delete self[key].
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>__setitem__(key, value)</code>	Set self[key] to value.
<code>clear()</code>	
<code>copy(**add_or_replace)</code>	Return a copy of the dictionary.
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to value.
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>pop(k[,d])</code>	If key is not found, d is returned if given, otherwise KeyError is raised.
<code>popitem()</code>	as a 2-tuple; but raise KeyError if D is empty.
<code>set_with_strict_none_check(key, value)</code>	Set key in the dictionary to value, but skipping None values.
<code>setdefault(k[,d])</code>	
<code>update([E, ]**F)</code>	If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__contains__(key)`

Return key in self.

**Parameters** `key` (object)

**Return type** `bool`

`__delitem__(key)`

Delete self[key].

`__eq__(other)`

Return self == other.

**Return type** `bool`

`__getitem__(key)`

Return self[key].

**Parameters** `key` (~KT)

**Return type** ~VT

**`__iter__()`**

Iterates over the dictionary's keys.

**Return type** `Iterator[~KT]`

**`__len__()`**

Returns the number of keys in the dictionary.

**Return type** `int`

**`__repr__()`**

Return a string representation of the *DictWrapper*.

**Return type** `str`

**`__setitem__(key, value)`**

Set `self[key]` to `value`.

**`clear()`** → `None`. Remove all items from `D`.

**`copy(**add_or_replace)`**

Return a copy of the dictionary.

**`classmethod fromkeys(iterable, value=None)`**

Create a new dictionary with keys from `iterable` and values set to `value`.

**Return type** `MutableBase[~KT, ~VT]`

**`get(k, default=None)`**

Return the value for `k` if `k` is in the dictionary, else `default`.

**Parameters**

- **`k`** – The key to return the value for.
- **`default`** – The value to return if `key` is not in the dictionary. Default `None`.

**`items()`**

Returns a set-like object providing a view on the *bdict*'s items.

**Return type** `AbstractSet[Tuple[~KT, ~VT]]`

**`keys()`**

Returns a set-like object providing a view on the *bdict*'s keys.

**Return type** `AbstractSet[~KT]`

**`pop(k[, d])`** → `v`, remove specified key and return the corresponding value.

If `key` is not found, `d` is returned if given, otherwise `KeyError` is raised.

**`popitem()`** → (`k`, `v`), remove and return some (`key`, `value`) pair

as a 2-tuple; but raise `KeyError` if `D` is empty.

**`set_with_strict_none_check(key, value)`**

Set `key` in the dictionary to `value`, but skipping `None` values.

**Parameters**

- **`key`** (`~KT`)
- **`value`** (`Optional[~VT]`)

**`setdefault(k[, d])`** → `D.get(k, d)`, also set `D[k]=d` if `k` not in `D`

**`update([E], **F)`** → `None`. Update `D` from mapping/iterable `E` and `F`.

If `E` present and has a `.keys()` method, does: for `k` in `E`: `D[k] = E[k]` If `E` present and lacks `.keys()` method, does: for (`k`, `v`) in `E`: `D[k] = v` In either case, this is followed by: for `k`, `v` in `F.items()`: `D[k] = v`

**values()**

Returns an object providing a view on the *bdict*'s values.

**Return type** `ValuesView[~VT]`

**class NonelessOrderedDict** (\*args, \*\*kwargs)

Bases: `MutableBase[~KT, ~VT]`

A wrapper around `OrderedDict` that will check if a value is `None`/empty/`False`, and not add the key in that case. Use the `set_with_strict_none_check` function to check only for `None`

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__delitem__(key)</code>	Delete self[key].
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>__setitem__(key, value)</code>	Set self[key] to value.
<code>clear()</code>	
<code>copy(*args, **kwargs)</code>	Return a copy of the dictionary.
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to value.
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>pop(k[,d])</code>	If key is not found, d is returned if given, otherwise <code>KeyError</code> is raised.
<code>popitem()</code>	as a 2-tuple; but raise <code>KeyError</code> if D is empty.
<code>set_with_strict_none_check(key, value)</code>	Set key in the dictionary to value, but skipping <code>None</code> values.
<code>setdefault(k[,d])</code>	
<code>update([E,]**F)</code>	If E present and has a <code>.keys()</code> method, does: for k in E: D[k] = E[k] If E present and lacks <code>.keys()</code> method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__contains__(key)`

Return key in self.

**Parameters** **key** (object)

**Return type** `bool`

`__delitem__(key)`

Delete self[key].

`__eq__(other)`

Return self == other.

**Return type** `bool`

**`__getitem__`** (*key*)  
Return `self[key]`.

**Parameters** **key** (`~KT`)

**Return type** `~VT`

**`__iter__`** ()  
Iterates over the dictionary's keys.

**Return type** `Iterator[~KT]`

**`__len__`** ()  
Returns the number of keys in the dictionary.

**Return type** `int`

**`__repr__`** ()  
Return a string representation of the *DictWrapper*.

**Return type** `str`

**`__setitem__`** (*key*, *value*)  
Set `self[key]` to *value*.

**`clear`** () → `None`. Remove all items from *D*.

**`copy`** (*\*args*, *\*\*kwargs*)  
Return a copy of the dictionary.

**`classmethod fromkeys`** (*iterable*, *value=None*)  
Create a new dictionary with keys from *iterable* and values set to *value*.

**Return type** `MutableBase[~KT, ~VT]`

**`get`** (*k*, *default=None*)  
Return the value for *k* if *k* is in the dictionary, else *default*.

**Parameters**

- **k** – The key to return the value for.
- **default** – The value to return if *key* is not in the dictionary. Default `None`.

**`items`** ()  
Returns a set-like object providing a view on the *bdict*'s items.

**Return type** `AbstractSet[Tuple[~KT, ~VT]]`

**`keys`** ()  
Returns a set-like object providing a view on the *bdict*'s keys.

**Return type** `AbstractSet[~KT]`

**`pop`** (*k*, *d*) → *v*, remove specified key and return the corresponding value.  
If *key* is not found, *d* is returned if given, otherwise `KeyError` is raised.

**`popitem`** () → (*k*, *v*), remove and return some (*key*, *value*) pair  
as a 2-tuple; but raise `KeyError` if *D* is empty.

**`set_with_strict_none_check`** (*key*, *value*)  
Set *key* in the dictionary to *value*, but skipping `None` values.

**Parameters**

- **key** ( $\sim$ KT)
- **value** (*Optional*[ $\sim$ VT])

**setdefault** ( $k$ ,  $d$ )  $\rightarrow$   $D.get(k,d)$ , also set  $D[k]=d$  if  $k$  not in  $D$

**update** ( $[E]$ ,  $**F$ )  $\rightarrow$  None. Update  $D$  from mapping/iterable  $E$  and  $F$ .

If  $E$  present and has a `.keys()` method, does: for  $k$  in  $E$ :  $D[k] = E[k]$  If  $E$  present and lacks `.keys()` method, does: for  $(k, v)$  in  $E$ :  $D[k] = v$  In either case, this is followed by: for  $k, v$  in  $F.items()$ :  $D[k] = v$

**values** ()

Returns an object providing a view on the *bdict*'s values.

**Return type** *ValuesView*[ $\sim$ VT]

### 3.6.3 Copyright

Based on <https://github.com/slezica/python-frozendict> and <https://github.com/jerr0328/python-helpfuldicts> .

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## 3.7 Tally

Subclass of *collections.Counter* with additional methods.

New in version 0.3.0.

**Data:**

<i><math>\_F</math></i>	Invariant <i>TypeVar</i> constrained to <i>float</i> , <i>int</i> and <i>numbers.Real</i> .
-------------------------	---

**Classes:**

<i>SupportsMostCommon</i>	<i>typing.Protocol</i> for classes which support a <i>collections.Counter</i> -like <i>collections.Counter.most_common()</i> method.
---------------------------	--

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Table 11 – continued from previous page

<code>Tally([iterable])</code>	Subclass of <code>collections.Counter</code> with additional methods.
<code>Percentage</code>	Provides a dictionary interface, but with <code>collections.Counter</code> 's <code>collections.Counter.most_common()</code> method.

`_F = TypeVar(_F, float, int, Real)`

Type: `TypeVar`

Invariant `TypeVar` constrained to `float`, `int` and `numbers.Real`.

### protocol SupportsMostCommon

Bases: `typing.Protocol`

`typing.Protocol` for classes which support a `collections.Counter`-like `collections.Counter.most_common()` method.

This protocol is `runtime checkable`.

Classes that implement this protocol must have the following methods / attributes:

**items()**

Returns an iterator over the mapping's items (as (key, value) pairs).

**Return type** `Iterable[Tuple[~KT, float]]`

**most\_common(n=None)**

List the `n` most common elements and their counts from the most common to the least. If `n` is `None` then list all element counts.

```
>>> Counter('abracadabra').most_common(3)
[('a', 5), ('b', 2), ('r', 2)]
```

**Parameters** `n` (`Optional[int]`) – Default `None`.

**Return type** `Union[List[Tuple[~KT, float]], List[Tuple[~KT, int]]]`

**class Tally** (`iterable=None, /, **kws`)

Bases: `Counter[~KT]`

Subclass of `collections.Counter` with additional methods.

New in version 0.3.0.

**Methods:**

<code>as_percentage()</code>	Returns the <code>Tally</code> as a <code>collections.OrderedDict</code> comprising the count for each element as a percentage of the sum of all elements.
<code>get_percentage(item[, default])</code>	Returns the count for <code>item</code> , as a percentage of the sum of all elements.
<code>most_common([n])</code>	List the <code>n</code> most common elements and their counts from the most common to the least.

**Attributes:**



---

<code>total</code>	Returns the total count for all elements.
--------------------	---

---

**as\_percentage()**

Returns the `Tally` as a `collections.OrderedDict` comprising the count for each element as a percentage of the sum of all elements.

---

**Important:** The sum of the dictionary's values may not add up to exactly 1.0 due to limitations of floating-point numbers.

---

**Return type** `Percentage[~KT]`

**property total**

Returns the total count for all elements.

**Return type** `int`

**get\_percentage(item, default=None)**

Returns the count for `item`, as a percentage of the sum of all elements.

**Parameters**

- **item** (`~KT`)
- **default** (`Optional[~F]`) – A default percentage (as a `float`) to return if `item` is not in the dictionary. Default `None`.

**Return type** `Union[None, ~F, float]`

**Overloads**

- `get_percentage(item: ~KT) -> Optional[float]`
- `get_percentage(item: ~KT, default: ~F) -> Union[~F, float]`

**most\_common(n=None)**

List the `n` most common elements and their counts from the most common to the least. If `n` is `None` then list all element counts.

```
>>> Tally('abracadabra').most_common(3)
[('a', 5), ('b', 2), ('r', 2)]
```

**Parameters** `n` (`Optional[int]`) – Default `None`.

**Return type** `List[Tuple[~KT, int]]`

**class Percentage**

Bases: `Dict[~KT, float]`

Provides a dictionary interface, but with `collections.Counter`'s `collections.Counter.most_common()` method.

Represents the return type of `cawdrey.tally.Tally.as_percentage()`.

**Methods:**


---

<code>__contains__(key, /)</code>	True if the dictionary has the specified key, else False.
-----------------------------------	---

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Table 14 – continued from previous page

<code>__delattr__(name, /)</code>	Implement <code>delattr(self, name)</code> .
<code>__delitem__(key, /)</code>	Delete <code>self[key]</code> .
<code>__eq__(value, /)</code>	Return <code>self==value</code> .
<code>__format__(format_spec, /)</code>	Default object formatter.
<code>__ge__(value, /)</code>	Return <code>self&gt;=value</code> .
<code>__getattribute__(name, /)</code>	Return <code>getattr(self, name)</code> .
<code>__getitem__</code>	<code>x.__getitem__(y) &lt;==&gt; x[y]</code>
<code>__gt__(value, /)</code>	Return <code>self&gt;value</code> .
<code>__iter__()</code>	Implement <code>iter(self)</code> .
<code>__le__(value, /)</code>	Return <code>self&lt;=value</code> .
<code>__len__()</code>	Return <code>len(self)</code> .
<code>__lt__(value, /)</code>	Return <code>self&lt;value</code> .
<code>__ne__(value, /)</code>	Return <code>self!=value</code> .
<code>__reduce__()</code>	Helper for pickle.
<code>__reduce_ex__(protocol, /)</code>	Helper for pickle.
<code>__repr__()</code>	Return <code>repr(self)</code> .
<code>__reversed__()</code>	Return a reverse iterator over the dict keys.
<code>__setattr__(name, value, /)</code>	Implement <code>setattr(self, name, value)</code> .
<code>__setitem__(key, value, /)</code>	Set <code>self[key]</code> to <code>value</code> .
<code>__sizeof__()</code>	
<code>__str__()</code>	Return <code>str(self)</code> .
<code>clear()</code>	
<code>copy()</code>	
<code>fromkeys([value])</code>	Create a new dictionary with keys from iterable and values set to <code>value</code> .
<code>get(key[, default])</code>	Return the value for <code>key</code> if <code>key</code> is in the dictionary, else <code>default</code> .
<code>items()</code>	
<code>keys()</code>	
<code>pop(k[,d])</code>	If <code>key</code> is not found, <code>d</code> is returned if given, otherwise <code>KeyError</code> is raised
<code>popitem()</code>	Remove and return a ( <code>key</code> , <code>value</code> ) pair as a 2-tuple.
<code>setdefault(key[, default])</code>	Insert <code>key</code> with a value of <code>default</code> if <code>key</code> is not in the dictionary.
<code>update([E, ]**F)</code>	If <code>E</code> is present and has a <code>.keys()</code> method, then does: for <code>k</code> in <code>E</code> : <code>D[k] = E[k]</code> If <code>E</code> is present and lacks a <code>.keys()</code> method, then does: for <code>k, v</code> in <code>E</code> : <code>D[k] = v</code> In either case, this is followed by: for <code>k</code> in <code>F</code> : <code>D[k] = F[k]</code>
<code>values()</code>	
<code>most_common([n])</code>	List the <code>n</code> most common elements and their counts from the most common to the least.

`__contains__(key, /)`  
True if the dictionary has the specified key, else False.

`__delattr__(name, /)`  
Implement `delattr(self, name)`.

`__delitem__(key, /)`  
Delete `self[key]`.

`__eq__(value, /)`

Return self==value.

**\_\_format\_\_** (*format\_spec*, /)  
Default object formatter.

**\_\_ge\_\_** (*value*, /)  
Return self>=value.

**\_\_getattr\_\_** (*name*, /)  
Return getattr(self, name).

**\_\_getitem\_\_** ()  
x.\_\_getitem\_\_(y) <==> x[y]

**\_\_gt\_\_** (*value*, /)  
Return self>value.

**\_\_iter\_\_** ()  
Implement iter(self).

**\_\_le\_\_** (*value*, /)  
Return self<=value.

**\_\_len\_\_** ()  
Return len(self).

**\_\_lt\_\_** (*value*, /)  
Return self<value.

**\_\_ne\_\_** (*value*, /)  
Return self!=value.

**\_\_reduce\_\_** ()  
Helper for pickle.

**\_\_reduce\_ex\_\_** (*protocol*, /)  
Helper for pickle.

**\_\_repr\_\_** ()  
Return repr(self).

**\_\_reversed\_\_** ()  
Return a reverse iterator over the dict keys.

**\_\_setattr\_\_** (*name*, *value*, /)  
Implement setattr(self, name, value).

**\_\_setitem\_\_** (*key*, *value*, /)  
Set self[key] to value.

**\_\_sizeof\_\_** () → size of D in memory, in bytes

**\_\_str\_\_** ()  
Return str(self).

**clear** () → None. Remove all items from D.

**copy** () → a shallow copy of D

**fromkeys** (*value=None*, /)  
Create a new dictionary with keys from iterable and values set to value.

**get** (*key*, *default=None*, /)  
Return the value for key if key is in the dictionary, else default.

**items** () → a set-like object providing a view on D's items

**keys** () → a set-like object providing a view on D's keys

**pop** (*k*, *d*) → *v*, remove specified key and return the corresponding value.  
If key is not found, *d* is returned if given, otherwise `KeyError` is raised

**popitem** ()

Remove and return a (key, value) pair as a 2-tuple.

Pairs are returned in LIFO (last-in, first-out) order. Raises `KeyError` if the dict is empty.

**setdefault** (*key*, *default=None*, /)

Insert key with a value of *default* if key is not in the dictionary.

Return the value for key if key is in the dictionary, else *default*.

**update** ([*E*], *\*\*F*) → `None`. Update D from dict/iterable *E* and *F*.

If *E* is present and has a `.keys()` method, then does: for *k* in *E*: *D*[*k*] = *E*[*k*] If *E* is present and lacks a `.keys()` method, then does: for *k*, *v* in *E*: *D*[*k*] = *v* In either case, this is followed by: for *k* in *F*: *D*[*k*] = *F*[*k*]

**values** () → an object providing a view on D's values

**most\_common** (*n=None*)

List the *n* most common elements and their counts from the most common to the least. If *n* is `None` then list all element counts.

```
>>> Tally('abracadabra').as_percentage().most_common(3)
[('a', 0.45454545454545453), ('b', 0.18181818181818182), ('r', 0.
↪ 18181818181818182)]
```

**Parameters** *n* (`Optional[int]`) – Default `None`.

**Return type** `List[Tuple[~KT, float]]`

## 3.8 Base Classes

### 3.8.1 About

`FrozenBase` is the base class for `frozendict` and `FrozenOrderedDict`. If you wish to construct your own frozen dictionary classes, you may inherit from this class.

### 3.8.2 API Reference

Base Classes.

**Classes:**

<code>DictWrapper(*args, **kwds)</code>	Abstract Mixin class for classes that wrap a dict object or similar.
<code>FrozenBase(*args, **kwargs)</code>	Abstract Base Class for Frozen dictionaries.
<code>MutableBase(*args, **kwargs)</code>	Abstract Base Class for mutable dictionaries.

**class** `DictWrapper` (*\*args*, *\*\*kwargs*)

Bases: `Mapping[~KT, ~VT]`

Abstract Mixin class for classes that wrap a dict object or similar.

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>copy(*args, **kwargs)</code>	Return a copy of the dictionary.
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__contains__(key)`

Return key in self.

**Parameters** *key* (object)

**Return type** bool

`__eq__(other)`

Return self == other.

**Return type** bool

`__getitem__(key)`

Return self[key].

**Parameters** *key* (~KT)

**Return type** ~VT

`__iter__()`

Iterates over the dictionary's keys.

**Return type** Iterator[~KT]

`__len__()`

Returns the number of keys in the dictionary.

**Return type** int

`__repr__()`

Return a string representation of the *DictWrapper*.

**Return type** str

**abstract** `copy(*args, **kwargs)`

Return a copy of the dictionary.

**Return type** ~\_D

**get** (*k*, *default=None*)

Return the value for *k* if *k* is in the dictionary, else *default*.

**Parameters**

- **k** – The key to return the value for.
- **default** – The value to return if key is not in the dictionary. Default `None`.

**Overloads**

- `get(k: ~KT) -> Optional[~VT]`
- `get(k: ~KT, default: Union[~VT, ~T]) -> Union[~VT, ~T]`

**items** ()

Returns a set-like object providing a view on the *bdict*'s items.

**Return type** `AbstractSet[Tuple[~KT, ~VT]]`

**keys** ()

Returns a set-like object providing a view on the *bdict*'s keys.

**Return type** `AbstractSet[~KT]`

**values** ()

Returns an object providing a view on the *bdict*'s values.

**Return type** `ValuesView[~VT]`

**class FrozenBase** (\*args, \*\*kwargs)

Bases: `DictWrapper[~KT, ~VT]`

Abstract Base Class for Frozen dictionaries.

Used by *frozendict* and *FrozenOrderedDict*.

Custom subclasses must implement at a minimum `__init__`, `copy`, `fromkeys`.

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>copy(*args, **kwargs)</code>	Return a copy of the dictionary.
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to value.
<code>get(k[, default])</code>	Return the value for <i>k</i> if <i>k</i> is in the dictionary, else <i>default</i> .
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__contains__` (*key*)

Return key in self.

**Parameters** **key** (object)

**Return type** bool

**\_\_eq\_\_** (other)

Return self == other.

**Return type** bool

**\_\_getitem\_\_** (key)

Return self[key].

**Parameters** **key** (~KT)

**Return type** ~VT

**\_\_iter\_\_** ()

Iterates over the dictionary's keys.

**Return type** Iterator[~KT]

**\_\_len\_\_** ()

Returns the number of keys in the dictionary.

**Return type** int

**\_\_repr\_\_** ()

Return a string representation of the *DictWrapper*.

**Return type** str

**abstract copy** (\*args, \*\*kwargs)

Return a copy of the dictionary.

**Return type** ~\_D

**classmethod fromkeys** (iterable, value=None)

Create a new dictionary with keys from iterable and values set to value.

**Return type** FrozenBase[~KT, ~VT]

**Overloads**

- *fromkeys*(iterable) -> FrozenBase[KT, Any]
- *fromkeys*(iterable, value) -> FrozenBase[KT, VT]

**get** (k, default=None)

Return the value for k if k is in the dictionary, else default.

**Parameters**

- **k** – The key to return the value for.
- **default** – The value to return if key is not in the dictionary. Default *None*.

**items** ()

Returns a set-like object providing a view on the *bdict*'s items.

**Return type** AbstractSet[Tuple[~KT, ~VT]]

**keys** ()

Returns a set-like object providing a view on the *bdict*'s keys.

**Return type** AbstractSet[~KT]

**values()**

Returns an object providing a view on the *bdict*'s values.

**Return type** `ValuesView[~VT]`

**class MutableBase** (\*args, \*\*kwargs)

Bases: *DictWrapper*[~KT, ~VT], *MutableMapping*[~KT, ~VT]

Abstract Base Class for mutable dictionaries.

Used by *NonelessDict* and *NonelessOrderedDict*.

Custom subclasses must implement at a minimum `__init__`, `copy`, `fromkeys`.

**Methods:**

<code>__contains__(key)</code>	Return key in self.
<code>__delitem__(key)</code>	Delete self[key].
<code>__eq__(other)</code>	Return self == other.
<code>__getitem__(key)</code>	Return self[key].
<code>__iter__()</code>	Iterates over the dictionary's keys.
<code>__len__()</code>	Returns the number of keys in the dictionary.
<code>__repr__()</code>	Return a string representation of the <i>DictWrapper</i> .
<code>__setitem__(key, value)</code>	Set self[key] to value.
<code>clear()</code>	
<code>copy(*args, **kwargs)</code>	Return a copy of the dictionary.
<code>fromkeys(iterable[, value])</code>	Create a new dictionary with keys from iterable and values set to value.
<code>get(k[, default])</code>	Return the value for k if k is in the dictionary, else default.
<code>items()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's items.
<code>keys()</code>	Returns a set-like object providing a view on the <i>bdict</i> 's keys.
<code>pop(k[,d])</code>	If key is not found, d is returned if given, otherwise <i>KeyError</i> is raised.
<code>popitem()</code>	as a 2-tuple; but raise <i>KeyError</i> if D is empty.
<code>setdefault(k[,d])</code>	
<code>update([E,]**F)</code>	If E present and has a <code>.keys()</code> method, does: for k in E: D[k] = E[k] If E present and lacks <code>.keys()</code> method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v
<code>values()</code>	Returns an object providing a view on the <i>bdict</i> 's values.

`__contains__(key)`

Return key in self.

**Parameters** `key` (object)

**Return type** `bool`

`__delitem__(key)`

Delete self[key].

`__eq__(other)`

Return self == other.



**Return type** `bool`

**\_\_getitem\_\_** (*key*)  
Return `self[key]`.

**Parameters** **key** (~KT)

**Return type** ~VT

**\_\_iter\_\_** ()  
Iterates over the dictionary's keys.

**Return type** `Iterator[~KT]`

**\_\_len\_\_** ()  
Returns the number of keys in the dictionary.

**Return type** `int`

**\_\_repr\_\_** ()  
Return a string representation of the *DictWrapper*.

**Return type** `str`

**\_\_setitem\_\_** (*key*, *value*)  
Set `self[key]` to *value*.

**clear** () → None. Remove all items from D.

**abstract copy** (\*args, \*\*kwargs)  
Return a copy of the dictionary.

**Return type** ~\_D

**classmethod fromkeys** (*iterable*, *value=None*)  
Create a new dictionary with keys from *iterable* and values set to *value*.

**Return type** `MutableBase[~KT, ~VT]`

**Overloads**

- `fromkeys(iterable)` → `MutableBase[KT, Any]`
- `fromkeys(iterable, value)` → `MutableBase[KT, VT]`

**get** (*k*, *default=None*)  
Return the value for *k* if *k* is in the dictionary, else *default*.

**Parameters**

- **k** – The key to return the value for.
- **default** – The value to return if *key* is not in the dictionary. Default `None`.

**items** ()  
Returns a set-like object providing a view on the *bdict*'s items.

**Return type** `AbstractSet[Tuple[~KT, ~VT]]`

**keys** ()  
Returns a set-like object providing a view on the *bdict*'s keys.

**Return type** `AbstractSet[~KT]`

**pop** (*k*[, *d*]) → *v*, remove specified key and return the corresponding value.  
If key is not found, *d* is returned if given, otherwise `KeyError` is raised.

**popitem**() → (k, v), remove and return some (key, value) pair as a 2-tuple; but raise `KeyError` if `D` is empty.

**setdefault**(*k*, *d*) → `D.get(k,d)`, also set `D[k]=d` if `k` not in `D`

**update**(*E*, *\*\*F*) → `None`. Update `D` from mapping/iterable `E` and `F`.

If `E` present and has a `.keys()` method, does: for `k` in `E`: `D[k] = E[k]` If `E` present and lacks `.keys()` method, does: for `(k, v)` in `E`: `D[k] = v` In either case, this is followed by: for `k, v` in `F.items()`: `D[k] = v`

**values**()

Returns an object providing a view on the *bdict*'s values.

**Return type** `ValuesView[~VT]`

## 3.9 Functions

**alphabetical\_dict**(*\*\*kwargs*)

Returns an `OrderedDict` with the keys sorted alphabetically.

**Parameters** *kwargs*

**Returns**

**Return type**

**search\_dict**(*dictionary*, *regex*)

Return the subset of the dictionary whose keys match the regex.

**Parameters**

- **dictionary** (`Mapping[str, Any]`)
- **regex** (`Union[str, Pattern]`)

**Return type** `Dict[str, Any]`

## 3.10 Overview

Cawdrey uses `tox` to automate testing and packaging, and `pre-commit` to maintain code quality.

Install `pre-commit` with `pip` and install the git hook:

```
$ python -m pip install pre-commit
$ pre-commit install
```

## 3.11 Coding style

`formate` is used for code formatting.

It can be run manually via `pre-commit`:

```
$ pre-commit run formate -a
```

Or, to run the complete autoformatting suite:

```
$ pre-commit run -a
```

## 3.12 Automated tests

Tests are run with `tox` and `pytest`. To run tests for a specific Python version, such as Python 3.6:

```
$ tox -e py36
```

To run tests for all Python versions, simply run:

```
$ tox
```

## 3.13 Type Annotations

Type annotations are checked using `mypy`. Run `mypy` using `tox`:

```
$ tox -e mypy
```

## 3.14 Build documentation locally

The documentation is powered by Sphinx. A local copy of the documentation can be built with `tox`:

```
$ tox -e docs
```

## 3.15 Downloading source code

The Cawdrey source code is available on GitHub, and can be accessed from the following URL: <https://github.com/domdfcoding/cawdrey>

If you have `git` installed, you can clone the repository with the following command:

```
$ git clone https://github.com/domdfcoding/cawdrey"
> Cloning into 'cawdrey'...
> remote: Enumerating objects: 47, done.
> remote: Counting objects: 100% (47/47), done.
> remote: Compressing objects: 100% (41/41), done.
> remote: Total 173 (delta 16), reused 17 (delta 6), pack-reused 126
> Receiving objects: 100% (173/173), 126.56 KiB | 678.00 KiB/s, done.
> Resolving deltas: 100% (66/66), done.
```

Alternatively, the code can be downloaded in a ‘zip’ file by clicking:

*Clone or download → Download Zip*

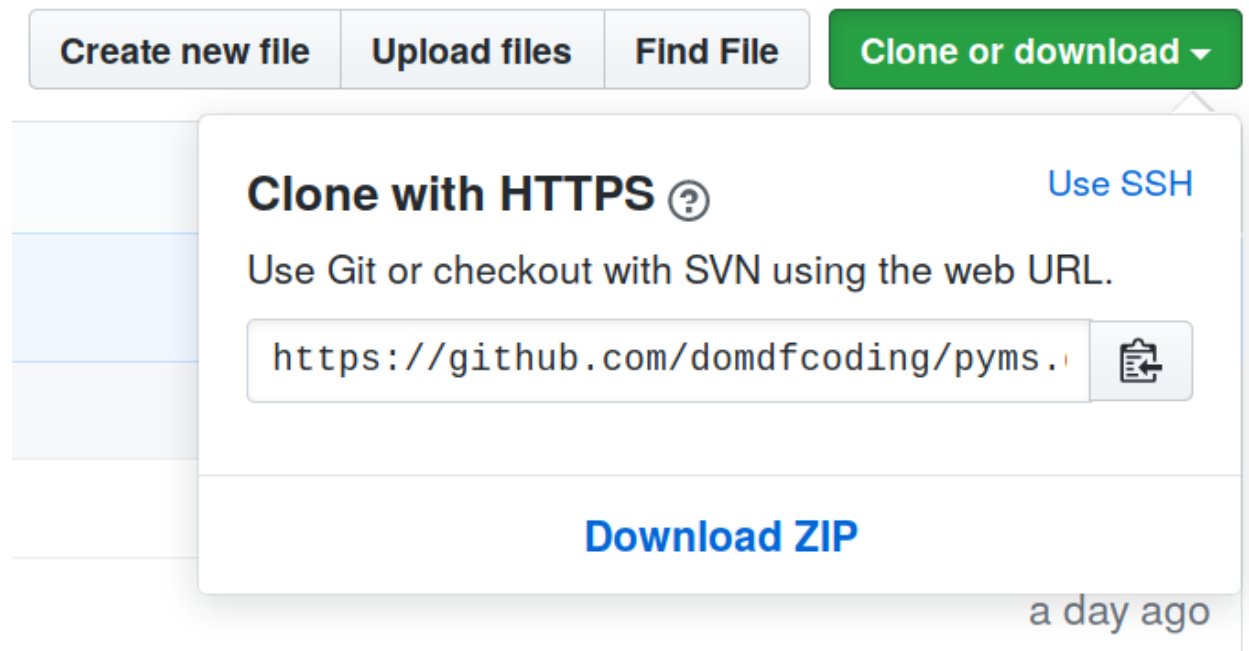


Fig. 1: Downloading a ‘zip’ file of the source code

### 3.15.1 Building from source

The recommended way to build Cawdrey is to use `tox`:

```
$ tox -e build
```

The source and wheel distributions will be in the directory `dist`.

If you wish, you may also use `pep517.build` or another **PEP 517**-compatible build tool.

View the [Function Index](#) or browse the [Source Code](#).

[Browse the GitHub Repository](#)

---

CHAPTER  
**FOUR**

---

**AND FINALLY:**

Why “Cawdrey”?



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