

# Contents

<b>1</b>	<b>Classes</b>	<b>2</b>
1.1	factor.util – utilities for factorization . . . . .	2
1.1.1	FactoringInteger – keeping track of factorization . . . . .	3
1.1.1.1	getNextTarget – next target . . . . .	4
1.1.1.2	getResult – result of factorization . . . . .	4
1.1.1.3	register – register a new factor . . . . .	4
1.1.1.4	sortFactors – sort factors . . . . .	4
1.1.2	FactoringMethod – method of factorization . . . . .	6
1.1.2.1	factor – do factorization . . . . .	7
1.1.2.2	†continue_factor – continue factorization . . . . .	7
1.1.2.3	†find – find a factor . . . . .	7
1.1.2.4	†generate – generate prime factors . . . . .	7

# Chapter 1

## Classes

### 1.1 factor.util – utilities for factorization

- Classes
  - **FactoringInteger**
  - **FactoringMethod**

This module uses following type:

**factorlist** :

**factorlist** is a list which consists of pairs (**base**, **index**). Each pair means  $base^{index}$ . The product of those terms expresses whole prime factorization.

### 1.1.1 FactoringInteger – keeping track of factorization

#### Initialize (Constructor)

**FactoringInteger**(number: *integer*) → *FactoringInteger*

This is the base class for factoring integers.

**number** is stored in the attribute **number**. The factors will be stored in the attribute **factors**, and primality of factors will be tracked in the attribute **primality**.

The given **number** must be a composite number.

#### Attributes

**number** :

The composite number.

**factors** :

Factors known at the time being referred.

**primality** :

A dictionary of primality information of known factors. **True** if the factor is prime, **False** composite, or **None** undetermined.

## Methods

### 1.1.1.1 getNextTarget – next target

`getNextTarget(self, cond: function=None) → integer`

Return the next target which meets `cond`.

If `cond` is not specified, then the next target is a composite (or undetermined) factor of **number**.

`cond` should be a binary predicate whose arguments are base and index.  
If there is no target factor, **LookupError** will be raised.

### 1.1.1.2 getResult – result of factorization

`getResult(self) → factors`

**number** の因数分解をする。

### 1.1.1.3 register – register a new factor

`register(self, divisor: integer, isprime: bool=None)  
→`

`divisor` が本当にある数を割るとき、**number** の `divisor` を記憶する。

その数は `divisor` により可能な限り割られる。

`isprime` tells the primality of the divisor (default to undetermined).

### 1.1.1.4 sortFactors – sort factors

`sortFactors(self) →`

要素のリストを並べる。

この関数は **getResult** に関連している。

## Examples

```
>>> A = factor.util.FactoringInteger(100)
>>> A.getNextTarget()
```

```
100
>>> A.getResult()
[(100, 1)]
>>> A.register(5, True)
>>> A.getResult()
[(5, 2), (4, 1)]
>>> A.sortFactors()
>>> A.getResult()
[(4, 1), (5, 2)]
>>> A.primalities
{4: None, 5: True}
>>> A.getNextTarget()
4
```

### 1.1.2 FactoringMethod – method of factorization

#### Initialize (Constructor)

**FactoringMethod()** → *FactoringMethod*

Base class of factoring methods.

すべての方法は **factor.methods** で定義されている。implemented as derived classes of this class. この方法は **factor** と呼ぶこともある。 他の方法は

## Methods

### 1.1.2.1 factor – do factorization

```
factor(self, number: integer, return_type: str='list', need_sort:
    bool=False )
    → factorlist
```

与えられた正の整数 `number` の因数分解を行う。

不履行の場合は **factorlist** を返す。

A keyword option `return_type` can be as the following:

1. 'list' for default type (**factorlist**).
2. 'tracker' for **FactoringInteger**.

Another keyword option `need_sort` is Boolean: `True` to sort the result. This should be specified with `return_type='list'`.

### 1.1.2.2 †continue\_factor – continue factorization

```
continue_factor(self, tracker: FactoringInteger, return_type:
    str='tracker', primeq: func=primeq )
    → FactoringInteger
```

Continue factoring of the given `tracker` and return the result of factorization.

The default returned type is **FactoringInteger**, but if `return_type` is specified as 'list' then it returns **factorlist**. The primality is judged by a function specified in `primeq` optional keyword argument, which default is **primeq**.

### 1.1.2.3 †find – find a factor

```
find(self, target: integer, **options ) → integer
```

`target` から要素を探す。

この方法は優先されるべきである。または **factor** 法も

### 1.1.2.4 †generate – generate prime factors

```
generate(self, target: integer, **options ) → integer
```

Generate prime factors of the `target` number with their valuations.

この関数が  $(1, 1)$  を返したら因数分解は不完全であることを示す。to indicate the factorization is incomplete.  
This method has to be overridden, or **factor** method should be overridden not to call this method.



# Bibliography