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Chapter 1

Functions

1.1 factor.methods – factoring methods

It uses methods of **factor.find** module or some heavier methods of related modules to find a factor. Also, classes of **factor.util** module is used to track the factorization process. options are normally passed to the underlying function without modification.

This module uses the following type:

factorlist :

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

1.1.1 factor – easiest way to factor

```
factor(n: integer, method: string='default', **options )  
→ factorlist
```

Factor the given positive integer n.

By default, use several methods internally.

The optional argument method can be:

- 'ecm': use elliptic curve method.
- 'mpqs': use MPQS method.
- 'pmom': use $p - 1$ method.
- 'rhomethod': use Pollard's ρ method.
- 'trialDivision': use trial division.

(†In fact, the initial letter of method name suffices to specify.)

1.1.2 ecm – elliptic curve method

`ecm(n: integer, **options) → factorlist`

Factor the given integer `n` by elliptic curve method.

(See `ecm` of `factor.ecm` module.)

1.1.3 mpqs – multi-polynomial quadratic sieve method

`mpqs(n: integer, **options) → factorlist`

Factor the given integer `n` by multi-polynomial quadratic sieve method.

(See `mpqsfind` of `factor.mpqs` module.)

1.1.4 pmom – $p - 1$ method

`pmom(n: integer, **options) → factorlist`

Factor the given integer `n` by $p - 1$ method.

The method may fail unless `n` has an appropriate factor for the method.
(See `pmom` of `factor.find` module.)

1.1.5 rhomethod – ρ method

`rhomethod(n: integer, **options) → factorlist`

Factor the given integer `n` by Pollard's ρ method.

The method is a probabilistic method, possibly fails in factorizations.
(See `rhomethod` of `factor.find` module.)

1.1.6 trialDivision – trial division

`trialDivision(n: integer, **options) → factorlist`

Factor the given integer `n` by trial division.

options for the trial sequence can be either:

1. `start` and `stop` as range parameters.
2. `iterator` as an iterator of primes.
3. `eratosthenes` as an upper bound to make prime sequence by sieve.

If none of the options above are given, the function divides `n` by primes from 2 to the floor of the square root of `n` until a non-trivial factor is found.
(See `trialDivision` of `factor.find` module.)

Examples

```
>>> factor.methods.factor(10001)
[(73, 1), (137, 1)]
>>> factor.methods.ecm(1000001)
[(101L, 1), (9901L, 1)]
```

Bibliography