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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)]
```