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Chapter 1

Functions

1.1 arith1 - miscellaneous arithmetic functions

1.1.1 floorsqrt – floor of square root

floorsqrt(a: *integer*/Rational**) → *integer***

Return the floor of square root of a.

1.1.2 floorpowerroot – floor of some power root

floorpowerroot(n: *integer*, k: *integer*) → *integer*

Return the floor of k-th power root of n.

1.1.3 legendre - Legendre(Jacobi) Symbol

legendre(a: *integer*, m: *integer*) → *integer*

Return the Legendre symbol or Jacobi symbol $\left(\frac{a}{m}\right)$.

1.1.4 modsqrt – square root of *a* for modulo *p*

modsqrt(a: *integer*, p: *integer*) → *integer*

Return one of the square roots of a for modulo p if square roots are exist, raise ValueError otherwise.

p must be a prime number.

1.1.5 expand – p-adic expansion

expand(n : *integer*, m : *integer*) \rightarrow *list*

Return the m -adic expansion of n .

n must be nonnegative integer. m must be greater than or equal to 2. The output is a list of expansion coefficients in ascending order.

1.1.6 inverse – inverse

inverse(x : *integer*, p : *integer*) \rightarrow *integer*

Return the inverse of x for modulo p .

p must be a prime number.

1.1.7 CRT – Chinese Remainder Theorem

CRT($nlist$: *list*) \rightarrow *integer*

Return the uniquely determined integer satisfying all modulus conditions given by $nlist$.

Input list $nlist$ must be the list of a list consisting of two elements. The first element is remainder and the second is divisor. They must be integer.

1.1.8 AGM – Arithmetic Geometric Mean

AGM(a : *integer*, b : *integer*) \rightarrow *float*

Return the Arithmetic-Geometric Mean of a and b .

1.1.9 vp – p-adic valuation

vp(n : *integer*, p : *integer*, k : *integer*=0) \rightarrow *tuple*

Return the p -adic valuation and other part for n .

‡If k is given, return the valuation and the other part for np^k .

1.1.10 issquare - Is it square?

issquare(*n: integer*) → *integer*

Check if *n* is a square number and return square root of *n* if *n* is a square. Otherwise, return 0.

1.1.11 log – integer part of logarithm

log(*n: integer*, *base: integer=2*) → *integer*

Return the integer part of logarithm of *n* to the *base*.

1.1.12 product – product of some numbers

**product(*iterable: list*, *init: integer/Rational=None*)
→ *prod: integer/Rational***

Return the products of all elements in *iterable*.

If *init* is given, the multiplication starts with *init* instead of the first element in *iterable*.

Input list *iterable* must be list of numbers including integers, **Rational** etc. The output *prod* may be determined by the type of elements of *iterable* and *init*.

Examples

```
>>> arith1.AGM(10, 15)
12.373402181181522
>>> arith1.CRT([[2, 5], [3, 7]])
17
>>> arith1.CRT([[2, 5], [3, 7], [5, 11]])
192
>>> arith1.expand(194, 5)
[4, 3, 2, 1]
>>> arith1.vp(54, 3)
(3, 2)
```

```
>>> arith1.product([1.5, 2, 2.5])
7.5
>>> arith1.product([3, 4], 2)
24
>>> arith1.product([])
1
```