

10.1. `itertools` — Functions creating iterators for efficient looping

This module implements a number of `iterator` building blocks inspired by constructs from APL, Haskell, and SML. Each has been recast in a form suitable for Python.

The module standardizes a core set of fast, memory efficient tools that are useful by themselves or in combination. Together, they form an “iterator algebra” making it possible to construct specialized tools succinctly and efficiently in pure Python.

For instance, SML provides a tabulation tool: `tabulate(f)` which produces a sequence `f(0), f(1), ...`. The same effect can be achieved in Python by combining `map()` and `count()` to form `map(f, count())`.

These tools and their built-in counterparts also work well with the high-speed functions in the `operator` module. For example, the multiplication operator can be mapped across two vectors to form an efficient dot-product: `sum(map(operator.mul, vector1, vector2))`.

Infinite Iterators:

Iterator	Arguments	Results	Example
<code>count()</code>	start, [step]	start, start+step, start+2*step, ...	<code>count(10) --> 10 11 12 13 14 ...</code>
<code>cycle()</code>	p	p0, p1, ... plast, p0, p1, ...	<code>cycle('ABCD') --> A B C D A B C D ...</code>
<code>repeat()</code>	elem [n]	elem, elem, elem, ... endlessly or up to n times	<code>repeat(10, 3) --> 10 10 10</code>

Iterators terminating on the shortest input sequence:

Iterator	Arguments	Results	Example

<code>accumulate()</code>	<code>p [func]</code>	<code>p0, p0+p1, p0+p1+p2, ...</code>	<code>accumulate([1,2,3,4,5]) --> 1 3 6 10 15</code>
<code>chain()</code>	<code>p, q, ...</code>	<code>p0, p1, ... plast, q0, q1, ...</code>	<code>chain('ABC', 'DEF') --> A B C D E F</code>
<code>chain.from_iterable()</code>	<code>iterable</code>	<code>p0, p1, ... plast, q0, q1, ...</code>	<code>chain.from_iterable(['ABC', 'DEF']) --> A B C D E F</code>
<code>compress()</code>	<code>data, selectors</code>	<code>(d[0] if s[0]), (d[1] if s[1]), ...</code>	<code>compress('ABCDEF', [1,0,1,0,1,1]) --> A C E F</code>
<code>dropwhile()</code>	<code>pred, seq</code>	<code>seq[n], seq[n+1], starting when pred fails</code>	<code>dropwhile(lambda x: x<5, [1,4,6,4,1]) --> 6 4 1</code>
<code>filterfalse()</code>	<code>pred, seq</code>	<code>elements of seq where pred(elem) is false</code>	<code>filterfalse(lambda x: x%2, range(10)) --> 0 2 4 6 8</code>
<code>groupby()</code>	<code>iterable[keyfunc]</code>	<code>sub-iterators grouped by value of keyfunc(v)</code>	
<code>islice()</code>	<code>seq, [start,] stop [step]</code>	<code>elements from seq[start:stop:step]</code>	<code>islice('ABCDEFGH', 2, None) --> C D E F G</code>
<code>starmap()</code>	<code>func, seq</code>	<code>func(*seq[0]), func(*seq[1]), ...</code>	<code>starmap(pow, [(2,5), (3,2), (10,3)]) -> 32 9 1000</code>
<code>takewhile()</code>	<code>pred, seq</code>	<code>seq[0], seq[1], until pred fails</code>	<code>takewhile(lambda x: x<5, [1,4,6,4,1]) --> 1 4</code>
<code>tee()</code>	<code>it, n</code>	<code>it1, it2, ... itn splits one iterator into n</code>	
<code>zip_longest()</code>	<code>p, q, ...</code>	<code>(p[0], q[0]), (p[1], q[1]), ...</code>	<code>zip_longest('ABCD', 'xy', fillvalue='-') --> Ax By C- D-</code>

Combinatoric generators:

Iterator	Arguments	Results
<code>product()</code>	<code>p, q, ... [repeat=1]</code>	cartesian product, equivalent to a nested for-loop
<code>permutations()</code>	<code>p[r]</code>	r-length tuples, all possible orderings, no repeated elements

<code>combinations()</code>	p, r	r-length tuples, in sorted order, no repeated elements
<code>combinations_with_replacement()</code>	p, r	r-length tuples, in sorted order, with repeated elements
<code>product('ABCD', repeat=2)</code>		AA AB AC AD BA BB BC BD CA CB CC CD DA DB DC DD
<code>permutations('ABCD', 2)</code>		AB AC AD BA BC BD CA CB CD DA DB DC
<code>combinations('ABCD', 2)</code>		AB AC AD BC BD CD
<code>combinations_with_replacement('ABCD', 2)</code>		AA AB AC AD BB BC BD CC CD DD

10.1.1. Itertool functions

The following module functions all construct and return iterators. Some provide streams of infinite length, so they should only be accessed by functions or loops that truncate the stream.

`itertools.accumulate(iterable[, func])`

Make an iterator that returns accumulated sums, or accumulated results of other binary functions (specified via the optional *func* argument). If *func* is supplied, it should be a function of two arguments. Elements of the input *iterable* may be any type that can be accepted as arguments to *func*. (For example, with the default operation of addition, elements may be any addable type including [Decimal](#) or [Fraction](#).) If the input iterable is empty, the output iterable will also be empty.

Equivalent to:

```
def accumulate(iterable, func=operator.add):
    'Return running totals'
    # accumulate([1,2,3,4,5]) --> 1 3 6 10 15
    # accumulate([1,2,3,4,5], operator.mul) --> 1 2 6 24 120
    it = iter(iterable)
    try:
        total = next(it)
    except StopIteration:
```