Exercise: Iterators and Generators

Problems for exercise and homework for the Python OOP Course @SoftUni.
Submit your solutions in the SoftUni judge system at https://judge.softuni.org/Contests/1945.

1. Take Skip

Create a **class** called **`take_skip`**. Upon initialization, it should receive a **`step`** (int) and a **`count`** (int). Implement the **`__iter__`** and **`__next__`** functions. The iterator should return the **`count`** numbers (**starting from 0**) with the **given `step`**. For more clarification, see the examples:

Note: Submit only the class in the judge system

Examples

Test Code	Output

`numbers = take_skip(2, 6)`
`for number in numbers:`
`  print(number)`
	`0`
	`2`
	`4`
	`6`
	`8`
	`10`

`numbers = take_skip(10, 5)`
`for number in numbers:`
`  print(number)`
	`0`
	`10`
	`20`
	`30`
	`40`

2. Dictionary Iterator

Create a class called **`dictionary_iter`**. Upon initialization, it should receive a **dictionary** object. Implement the iterator to return **each key-value pair** of the dictionary as a **tuple of two elements** (the key and the value).

Note: Submit only the class in the judge system

Examples

Test Code	Output

`result = dictionary_iter({1: "1", 2: "2"})`
`for x in result:`
`  print(x)`
	`(1, '1')`
	`(2, '2')`

`result = dictionary_iter({"name": "Peter", "age": 24})`
`for x in result:`
`  print(x)`
	`("name", "Peter")`
	`("age", 24)`

3. Countdown Iterator

Create a class called **countdown_iterator**. Upon initialization, it should receive a **count**. Implement the **iterator** to return **each countdown number** (from **count** to **0** inclusive), separated by a single space.

Note: Submit only the class in the judge system

Examples

Test Code	Output

`iterator = countdown_iterator(10)`
`for item in iterator:`
`    print(item, end=" ")`
	`10 9 8 7 6 5 4 3 2 1 0`

`iterator = countdown_iterator(0)`
`for item in iterator:`
`    print(item, end=" ")`
	`0`

4. Sequence Repeat

Create a class called **sequence_repeat** which should receive a **sequence** and a **number** upon initialization. Implement an **iterator** to return the given elements, so they form a string with a length - the given **number**. If the **number is greater** than the number of elements, then the **sequence repeats** as necessary. For more clarification, see the examples:

Examples

Test Code	Output

`result = sequence_repeat('abc', 5)`
`for item in result:`
`    print(item, end ='')`
	`abcab`

`result = sequence_repeat('I Love Python', 3)`
`for item in result:`
`    print(item, end ='')`
	`I L`

5. Take Halves

You are given a skeleton with the following code:

```
def solution():
    def integers():
        # TODO: Implement

    def halves():

        for i in integers():
            # TODO: Implement

    def take(n, seq):
        # TODO: Implement

    return (take, halves, integers)
```

Implement the **three** generator functions:

- **`integers()`** - generates an **infinite** amount of **integers** (starting from **1**)
- **`halves()`** - generates the halves of those integers (each integer **/ 2**)
- **`take(n, seq)`** - takes the **first n** halves of those integers

Note: Complete the functionality in the skeleton and submit it to the judge system

Examples

Test Code	Output

`take = solution()[0]`
`halves = solution()[1]`
`print(take(5, halves()))`
	`[0.5, 1.0, 1.5, 2.0, 2.5]`

`take = solution()[0]`
`halves = solution()[1]`
`print(take(0, halves()))`
	`[]`

6. Fibonacci Generator

Create a generator function called **`fibonacci()`** that generates the **Fibonacci numbers** infinitely. **The first two numbers** in the sequence are **always 0 and 1.** Each following Fibonacci number is created by the **sum** of the **current** number **with the previous one.**

Note: Submit only the function in the judge system

Examples

Test Code	Output

`generator = fibonacci()`
`for i in range(5):`
`  print(next(generator))`
	`0`
	`1`
	`1`
	`2`
	`3`

`generator = fibonacci()`
`for i in range(1):`
`  print(next(generator))`
	`0`

7. Reader

Create a generator function called **`read_next()`** which should receive a **different number** of arguments (all iterable). On each iteration, the function should return each element from each sequence.

Note: Submit only the function in the judge system

Examples

Test Code	Output
`for item in read_next("string", (2,), {"d": 1, "i": 2, "c": 3, "t": 4}):` `  print(item, end='')`	`string2dict`

`for i in read_next("Need", (2, 3), ["words", "."]):`
`    print(i)`
	`N`
	`e`
	`e`
	`d`
	`2`
	`3`
	`words`
	`.`

8. Prime Numbers

Create a generator function called **`get_primes()`** which should receive a **list of integer numbers** and return a list containing only the **prime numbers** from the initial list. You can learn more about prime numbers from here:

Note: Submit only the function in the judge system

Examples

Test Code	Output
`print(list(get_primes([2, 4, 3, 5, 6, 9, 1, 0])))`	`[2, 3, 5]`
`print(list(get_primes([-2, 0, 0, 1, 1, 0])))`	`[]`

9. Possible permutations

Create a generator function called **`possible_permutations()`** which should receive **a list** and return lists with all possible permutations between its elements.

Note: Submit only the function in the judge system

Examples

Test Code	Output

`[print(n) for n in possible_permutations([1, 2, 3])]`	`[1, 2, 3]`
	`[1, 3, 2]`
	`[2, 1, 3]`
	`[2, 3, 1]`
	`[3, 1, 2]`
	`[3, 2, 1]`

`[print(n) for n in possible_permutations([1])]`	`[1]`